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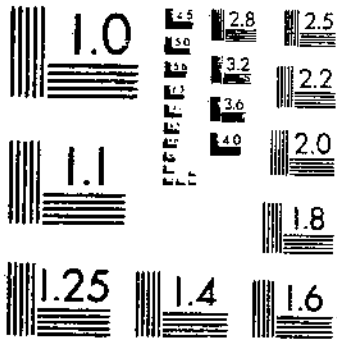
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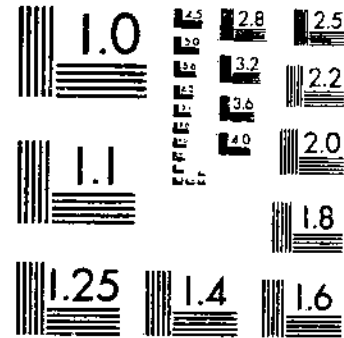
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A Revision of

The **GENUS**
COLLADONUS
(HOMOPTERA, CICADELLIDAE)

By Mervin W. Nielson

● **Technical Bulletin No. 1156**

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A Revision of

The GENUS COLLADONUS

(HOMOPTERA CICADELLIDAE)¹

By Mervin W. Nielson, collaborator, Entomology
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This revision represents the first attempt to classify all known species of *Colladonus* of the world on the basis of the genitalia. The economic importance of this group has necessitated a critical study of the morphological characters that would more clearly define the species and more fully characterize the genus. Several species are clearly recognizable externally, but usually the male genitalia are the basic criteria for separating the species. The females in this study are separated on the basis of the seventh sternum. Because of considerable intraspecific variation of this character, they are often combined into groups of species. Further studies, mainly breeding experiments, may be necessary for certain closely allied species before full realization of their specific entities can be attained.

ECONOMIC IMPORTANCE

During the past 10 years several insects of the genus *Colladonus* have become important vectors of plant viruses. At present *Colladonus* contains more species implicated as vectors of plant viruses than any other leafhopper genus. Moreover, many species undoubtedly injure the plants by suck-

ing the sap or injecting toxic substances.

Eight species of *Colladonus* have been reported as vectors of plant viruses. *C. geminatus* (Van Duzee) was reported as a vector of California aster yellows by Severin (42).² Later the transmission by this species of western X-disease of peach, western X-little-cherry virus of cherry, and yellow leaf roll of peach was reported by Wolfe, Anthon, and Jones (62), Kaloostian (25), Jensen, Frazier, and Thomas (24), and Nielson and Jones (32). Other vectors of California aster yellows, as given by Severin (42, 43), are *commissus* (Van Duzee), *flavocapitatus* (Van Duzee), *intricatus* (Ball), *rupinatus* (Ball), *kirkaldyi* (Ball), and *montanus* (Van Duzee). Recently Thornberry (48) and Gilmer (22) reported the transmission of eastern X-disease of peach by *clitelarius* (Say).

¹ Submitted for publication June 18, 1956. This bulletin is based on information contained in a thesis submitted to the Graduate School of Oregon State College in partial fulfillment of the requirements for the degree of doctor of philosophy.

² Italic numbers in parentheses refer to the Bibliography, p. 48.

DISTRIBUTION AND HOSTS

The members of *Colladonus* are restricted largely to North America, from Costa Rica to Alaska. Only one species, *toruceilus* (Zetterstedt), is known to occur in Europe and Asia. It has been reported from Sweden, England, France, and Siberia. In North America *Colladonus* is most abundant west of the Rocky Mountains. Mexico is probably just as rich as the Western United States in this genus.

The species of *Colladonus* strongly prefer the arid regions and to a large extent inhabit trees and shrubs. Many species have a wide host range, others are quite specific. Several have been collected recently from various species of *Arctostaphylos* all along the Pacific coast of North America. Several economic species are common on herbaceous dicotyledons, particularly alfalfa, clover, and perennial delphiniums. Other species, such as *tahotus* Ball, *ponderosus* Ball, and *beameri* (Ball), occur exclusively on pine.

INTRASPECIFIC AND INTERSPECIFIC VARIATION

Several species of *Colladonus* exhibit intraspecific color variation, which may or may not be geographic. *C. belli* (Uhler) shows considerable color variation, from black in New Mexico to light green in Utah and Idaho. Specimens of *flavocapitatus* from Alaska are dark, whereas those from Utah and Colorado are very light. *C. clitellarius* varies from extreme light golden to black, but these variations are intermixed within its geographical range. The genitalia and other morphological structures do not show a corresponding geographical variation.

Certain species that show considerable likeness in general habitus are distinguishable by the

genital structures. *C. clitellarius* and *furculatus* (Osborn) are almost indistinguishable externally, but the genital differences are great. A similar situation occurs with *belli*, n. sp., and *montanus montanus* (Van Duzee).

Complex species groups are evident among some members of the genus. *C. brunneus* (Osborn), *youngi*, n. sp., *toruceilus*, *belli*, and *fasciaticollis* (Stal), all occupying distinct geographical ranges, are similar in general habitus, but their genital differences are great enough to warrant treating them as full species for the present. The most complex situation occurs with *youngi* and *brunneus*, in which individuals from the middle of their respective ranges possess characters common to both species. It is not known whether these characters represent intergradation in structures. Until such material is available for further study, these forms are considered distinct.

A slightly different situation occurs with a subspecies complex or possibly sibling species. Two forms, typical *montanus montanus* and *montanus reductus* (Van Duzee), occupy approximately the same geographical range, but their abundance appears to differ geographically. *C. montanus montanus* is extremely abundant in its northern range of Washington and British Columbia, but it is poorly represented in its southern range of California. On the other hand, with *montanus reductus* this situation is reversed. Since these two forms overlap in their ranges, it appears that they may be distinct species. However, both forms are identical in many morphological aspects, and until further study it seems best to retain their present status. It is obvious that rearing studies should be undertaken with these forms and

probably with other species of *Colladonus*.

STUDY TECHNIQUE

Approximately 5,000 specimens were examined during this study. They represented nearly every major section of North America from Mexico to Alaska. A few specimens from Europe were included.

Each individual was first given an ownership label and then arranged in species groups according to the author's own ideas. Each group or species was studied separately through dissection of the genitalia and then rearranged on this basis. Whenever possible 25 specimens of each species were dissected, each selected from a different locality to allow for as much geographical variation as possible. During the subsequent examination of the male genitalia, the lengths of the aedeagal shaft and bifurcate processes were determined. The genitalia of each species were illustrated from type material whenever available.

The methods of Oman (34) and Young (63) for dissecting the genitalia were followed. The best results were obtained by inserting a fine needle between the thorax and the abdomen and gently prying the two apart. The abdomen was placed in a solution of 10-percent potassium hydroxide, which was slowly heated until the desired clearing was obtained, and then placed in acidulated water for a few minutes to remove and neutralize the excess acid. It was then placed in a hollow ground slide containing a few drops of glycerin and examined under a binocular microscope.

The male internal genital structure was removed by severing the 9th segment from the abdomen. One needle was placed against the plate to hold it firmly while another needle was used to cut

the articulation between the plate and the style. The connection between the basal apodeme of the aedeagus and the 10th segment was severed to allow the removal of the entire internal structure in one piece.

The preparation for dissection was essentially the same for the female. However, only the seventh sternum was removed.

A detailed study of the male internal genitalia and the female seventh sternum was facilitated by fixing the parts to a small amount of boric acid ointment covered with a few drops of glycerin. An ocular grid was used for the freehand drawings. After the genitalia were illustrated, the internal parts were placed in the genital capsule, which in turn was put in the abdominal capsule. These parts were placed in a small vial containing a small amount of glycerin for preservation. The pin bearing the specimen was thrust obliquely through the cork of the vial.

MORPHOLOGY AND TERMINOLOGY

The reader is referred to the publications of Evans (17), Oman (34), Kramer (27), and Singh-Pruthi (46) for detailed studies of the morphology and the terminology of leafhoppers. Here, the study is restricted to the characters used in the classification of the *Colladonus* species.

The entire dorsal aspect of the head exclusive of the eyes is termed the crown. The anterior margin of the crown varies from acutely angled to uniformly rounded (figs. 1 and 2 in pl. 1).³

Male genitalia.—The ninth segment of the male consists of two large dorsolateral areas of integument, continuous dorsally, commonly known as the pygofer (fig.

³ The figures are shown consecutively in plates 1-13.

3). Ventrally there are two subgenital plates, broad basally and somewhat attenuated apically. Basad of the subgenital plates is a triangular structure called the valve. The homologues of the valve and subgenital plates are not fully understood, but these structures are not believed to represent true segmental appendages. The pygofer, subgenital plates, and valve are collectively known as the genital capsule.

In general, the pygofer is the most diagnostic character for most of the species. The caudal margin of this structure is modified from convex to truncate, or the caudoventral portion is produced posteriorly to a narrow or broad, convex, truncate, or finger-like lobe. Associated with the margin or lobe is a prominent pygofer spine arising variously from the caudal margin or from the apex of the lobe. The pygofer spine varies in form from lanceolate to falcate. Certain species, such as *egenus* Ball and *aureolus* (Van Duzee), possess falcate pygofer spines, which are unique. The lanceolate pygofer spine is the commonest type, but it is so similar in some species that internal characters must be used for species differentiation. Often there are numerous long coarse setae along the submarginal areas of the caudodorsal and dorsal margins of the pygofer and many minute setae on the caudoventral margin.

Within the genital capsule are the paired styles, the connective, and the aedeagus (fig. 5). The styles are attached to each subgenital plate along a dorsomesal elevated ridge of the plate. The anteromesal portion of the style is attached to each anterior arm of the connective. Since the connective is generically uniform, it is of no significant taxonomic value for separating species. The aedeagus is attached basally to,

and articulates freely with, the distal portion of the connective. The distal portion of the aedeagus is free and extends dorsoposteriorly. The apex of the style distad of the preapical lobe is designated the styler shaft, which varies in size and shape. Sometimes it is broad or bulbous apically in certain species. The styler shaft possesses laterally a distinct structure designated the styler spine. This spine may arise apically or subapically depending on the species, the former condition occurring in most species. In certain species, such as *clitelarius*, *furculatus*, and *eburatus* (Van Duzee), the styler spine is subapical and is diagnostic.

The aedeagus (fig. 4) is a simple recurved tube, somewhat broad basally, with the narrow apical portion strongly reflexed and bifurcated. The bifurcate apical processes vary in length and may be tubular or flat and broad at midlength depending on the species. The bifurcate processes vary in length from less than one-half to more than one-half as long as the aedeagal shaft and are quite constant for a given species. The aedeagal shaft is that portion exclusive of the bifurcate processes, and a portion of it is traversed by the gonoduct, which terminates at the gonopore. The gonopore is on the dorsal surface of the shaft and depending on the species occurs at various locations along the length of the shaft. It is significant to note that in most species the position of the gonopore and the length of the bifurcate processes are correlated. This occurs in *furculatus*, *nugax* (Van Duzee), and other species, in which the gonopore is basad of the midlength of the shaft and the bifurcate processes are about three-fourths as long as the shaft. Conversely, in *januatus* (Ball) and *ponderosus* the gonopore is

distad of the midlength of the shaft, and the bifurcate processes are about one-fourth as long as the shaft.

Female genitalia.—The only character used of taxonomic importance was the seventh sternum (figs. 6 and 7). This structure is almost always twice as wide as long, and the lateral margins are usually parallel. Medially along the posterior margin there is a V- or U-shaped emargination, which varies in depth and width. Usually arising from its base is a spatulate process, which occasionally may be absent. The spatulate process varies in length and shape. It is rather useful for distinguishing the females of several species, but it is rarely useful for closely related forms. The seventh sternum is the least reliable of all the genital characters used because of its broad intraspecific variability.

TAXONOMY OF THE GENUS

In 1936 Ball (6) erected a number of new genera from the broadly defined old world genus *Thamnotettix* Zetterstedt. These genera included species inhabiting trees and shrubs, which supposedly represented distinct groups far removed from the type of *Thamnotettix*. *Colladonus* Ball was described among these groups, and *Thamnotettix collaris* Ball was designated the type of the genus. The members of this genus were defined as usually possessing a broad yellow transverse band across the pronotum or a distinct yellow spot on the clavi of the forewings or both.

Oman (34) first recognized the importance of genital characters of the genus, and as a result of his work *Conodonus* Ball, *Friscananus* Ball, and *Hypospadianus* Ribaut were found to be congeneric with *Colladonus*. *Conodonus* and *Friscananus* were originally erected on the basis of the shape

of the anterior margin of the head, lack of the yellow transverse band on the pronotum, and lack of the yellow claval spot on the forewings. *Hypospadianus* was differentiated by the male genitalia, primarily the aedeagus.

Descriptions of *Colladonus*, *Conodonus*, and *Friscananus* were published simultaneously, *Colladonus* being the valid genus because of page priority. Ribaut's (39) description of *Hypospadianus* appeared later and therefore was invalid.

Since its erection *Colladonus* has been placed in several subfamilies by different workers. It was put in Euscelinae by Evans (18) and Ribaut (39), Jassinæ by DeLong and Caldwell (13), and Athysaninae by Medler (29). Oman (34) placed *Colladonus* in Deltocephalinae, stating that the supergeneric name based on *Deltocephalus* antedated those based on *Athysanus* or *Euscelis*.

Colladonus Ball

- Colladonus* Ball, 1936, Brooklyn Ent. Soc. Bul. 31, p. 57. Type, by original designation, *Thamnotettix collaris* Ball.
- Conodonus* Ball, 1936, *ibid.*, p. 58. Type, by original designation, *Thamnotettix flavocapitatus* Van Duzee.
- Friscananus* Ball, 1936, *ibid.*, p. 60. Type, by original designation, *Thamnotettix intricatus* Ball.
- Hypospadianus* Ribaut, 1942, [Toulouse] Soc. d'Hist. Nat. Bul. 77, p. 264. Type, by original designation, *Thamnotettix torneolus* Zetterstedt.

Ball's original description of *Colladonus* is as follows:

Resembling *Thamnotettix* in venation and general form. Head conical, much narrower than pronotum, longer and more pointed but not as deep as in *Idiodonus*. Elytra appressed posteriorly giving a triangular appearance. Female segment usually deeply emarginate with a strap-shaped projection; male plates together long spoon-shaped. General color black, brown, or golden with metallic iridescence, usually with two black spots on vertex, an ivory

collar or saddle or both and a hyaline or ivory costal area.

Type of the genus *Thamnotettix collaris* Ball.

This genus will include the group of highly ornamented typically tree and shrub feeding forms from *clitellarius* to *belli*, the greater number of which can be recognized at once by the broad collar or saddle or both.

Ball's concept of the genus *Colladonus* was based largely on external morphological characters. He included species possessing a characteristic yellow or ivory transverse band across the pronotum and/or a distinct yellow or ivory spot on the clavi of the forewings when in repose. Many species of *Colladonus* do not possess these characters, but they were placed in the genus on the basis of certain male genital characters later introduced by Oman, whose concept of the genus was based primarily on the ninth segment of the male and its components.

The principal characters that distinguish *Colladonus* from all other leafhopper genera are the presence in the males of a spine on the caudal margin of the pygofer and the simple recurved aedeagus, with its strongly reflexed apical bifurcate processes. The females are characterized usually by the presence of a spatulate process arising from the base of a V- or U-shaped median emargination on the posterior margin of the seventh sternum. Females of many species, however, do not possess this character. Furthermore, females of other genera exhibit the spatulate process. Thus it becomes necessary to examine the males for their proper generic and specific classification.

Description of the genus.—Color fuscous, brown, or tawny; length 3.5 to 6 mm.

Head nearly as wide as to slightly wider than pronotum, crown with anterior margin rounded to acutely angled, with or without 2 or more distinct

round or triangular black spots on anterior margin; pronotum with or without distinct yellow or ivory transverse band; forewing long and narrow, sometimes with distinct ivory or yellow sub-oval spot on clavus; male plates together usually spoon shaped, with many spinelike setae on lateral and apical margins.

Male pygofer either with caudal margin convex or truncate or caudoventral margin produced posteriorly to distinct narrow or broad convex or truncate lobe; caudodorsal or dorsal submarginal areas with many spinelike setae; pygofer spine usually lanceolate, arising from caudal margin or apex of caudoventral lobe, projecting usually posterodorsally.

Connective Y-shaped, distal portion extending to or beyond apex of style; style well developed, stylar shaft long and narrow or short and robust, with distinct spine arising apically or subapically and projecting laterally; aedeagus simple, recurved, with apical bifurcate processes strongly reflexed, tubular, or flat and broad at midlength, extending from less to more than half length of aedeagal shaft; gonopore situated from basad to distad of midlength on dorsal surface of aedeagal shaft.

Female seventh sternum about twice as wide as long, lateral margins usually parallel, posterior margin on each side of median spatulate process convex, truncate, or concave; spatulate process present or absent; when present, arising from base of V- or U-shaped median emargination and extending from before to beyond posterior margin of segment.

A number of genera are rather closely related to *Colladonus* on the basis of the male genitalia. According to Oman (34), *Nigradonus* is the closest; it is a more specialized relative and lacks only the pygofer spine. The genus *Doleranus*, considered more primitive, possesses a narrow spinelike lobe on the caudal margin of the pygofer but differs in the internal genital structures characteristic of *Colladonus*. In general, species of *Colladonus* having this well-developed pygofer spine possess an acutely or obtusely angled crown; conversely, those having a poorly developed pygofer spine also have a crown but with a rounded anterior margin. The

gonopore situated basad of the midlength of the aedeagal shaft is present in those forms considered primitive, whereas it is at or distad of the midlength in the more specialized forms.

SYNONYMY AND KEYS

Oman (34) listed 36 names in his study, 5 of which are new synonyms and 9 new combinations, totaling 31 valid species. In this study 62 names are listed, of which 10 are new species, 5 new synonyms, and 14 new combinations, totaling 57 valid species. Two old species and 12 new combinations are treated as incertae sedis (see Appendix).

The first couplet of the following keys divides the genus into

two groups on the basis of the shape of the anterior margin of the head. The second couplet segregates these groups further on the basis of the absence or presence of certain color characteristics. These characters were used for convenience and not to show any phylogenetic relationships. Each couplet thereafter, with few exceptions, segregates various groups, down to the species, on the basis of genital characteristics. Because of intraspecific variation of the female seventh sternum, the females were often segregated only into species groups. The species in these groups may be distinguished only after proper association with the male.

KEY TO MALES⁴

1. In dorsal aspect head with anterior margin acutely or obtusely angled; eye with inner margin less than three-fourths distance from posterior margin of crown to anterior extremity; apex of crown either acutely pointed or rounded (fig. 1) 2
- In dorsal aspect head with anterior margin rounded or obtusely angled, never acutely angled; eye with inner margin three-fourths or more distance from posterior margin of crown to anterior extremity; apex of crown never acutely pointed (fig. 2) 23
- 2 (1). Crown with anterior margin immaculate 3
- Crown with 2 or more distinct round or triangular black spots on anterior margin 14
- 3 (2). Pygofer with caudoventral margin produced posteriorly to convex or truncate lobe, which is narrow, fingerlike, broadly truncate, or convex (figs. 8c-13c) 4
- Pygofer without caudoventral lobe; caudal margin convex or truncate (figs. 14c-19c) 9
- 4 (3). Aedeagus with gonopore basad of midlength of shaft (figs. 8b-10b) 5
- Aedeagus with gonopore at about midlength of shaft (figs. 11b-13b) 7
- 5 (4). Styler spine subapical; aedeagus with bifurcate processes reflexed away from shaft (fig. 8a, b) *ungar* (Van Duzee)
- Styler spine apical; aedeagus with bifurcate processes straight or reflexed toward shaft (figs. 9a, b, and 10a, b) 6
- 6 (5). Aedeagus with bifurcate processes more than one-half as long as shaft; styler shaft with sides broader distally (fig. 9a, b) *arenulus* Ball
- Aedeagus with bifurcate processes about one-half as long as shaft; styler shaft with sides parallel (fig. 10a, b) *holmesi* Blyven
- 7 (4). Styler spine subapical; pygofer spine arising from apex of fingerlike caudoventral lobe (fig. 11a, c) *commissus* (Van Duzee)
- Styler spine apical; pygofer spine arising from truncate or convex caudoventral lobe 8
- 8 (7). Pygofer with caudoventral lobe truncate; styler shaft expanded apically; styler spine short (fig. 12a, c) *cachetus* Ball

⁴Includes only 43 of the 57 valid species of *Colladonus*. Twelve of the remainder are treated as incertae sedis in the Appendix. The 2 remaining species for which males are not known are *citronellus* (Provancher) and *incertus* (Gillette and Baker).

- Pygofer with caudoventral lobe convex; stylar shaft with sides parallel; stylar spine long (fig. 13a, c).....*intricatus* (Ball)
- 9 (3). Pygofer spine falcate..... 10
Pygofer spine lanceolate..... 11
- 10 (9). Pygofer spine large, smooth, arising ventrally from caudal margin of pygofer; aedeagus with gonopore at midlength of shaft; bifurcate processes about one-half as long as aedeagal shaft (fig. 14b, c).....*auricolus* (Van Duzee)
- Pygofer spine small, serrate, arising from middle of caudal margin of pygofer; aedeagus with gonopore basad of midlength of shaft; bifurcate processes more than one-half as long as aedeagal shaft (fig. 15b, c).....*egenus* Ball
- 11 (9). Pygofer with caudoventral margin serrate and folded strongly medio-anteriorly, many spines on folded portion (fig. 16c).....*arctostaphyli* Downes
- Pygofer with caudoventral margin smooth, not folded..... 12
- 12 (11). Aedeagus with gonopore at midlength of shaft; bifurcate processes one-half as long as aedeagal shaft.....*atropunctatus* (Van Duzee)
- Aedeagus with gonopore basad of midlength of shaft; bifurcate processes one-half to three-fourths as long as aedeagal shaft..... 13
- 13 (12). Aedeagus with bifurcate processes about three-fourths as long as shaft; stylar shaft broad distally; pygofer spine projecting dorsad.....*robustus*, n. sp.
- Aedeagus with bifurcate processes one-half as long as shaft; stylar shaft with sides parallel; pygofer spine projecting caudad.....*espinosus*, n. sp.
- 14 (2). Pygofer spine long, lanceolate, arising from middle of caudal margin of pygofer..... 15
Pygofer spine short, stubby, or falcate, rarely arising from middle of caudal margin of pygofer..... 19
- 15 (14). Aedeagus with gonopore basad of midlength of shaft; bifurcate processes more than one-half as long as aedeagal shaft..... 16
Aedeagus with gonopore at midlength of shaft; bifurcate processes either one-half or less than one-half as long as aedeagal shaft..... 17
- 16 (15). Pygofer with caudal margin convex; pygofer spine arising from about middle of caudal margin and projecting dorsoposteriorly.....*vanduzeei*, n. sp.
- Pygofer with caudoventral margin produced posteriorly to truncate lobe; pygofer spine arising from caudodorsal portion and projecting dorsally.....*truncatus*, n. sp.
- 17 (15). Pronotum with distinct yellow or ivory transverse band; stylar spine long, projecting lateroposteriorly; aedeagus with bifurcate processes less than one-half as long as aedeagal shaft.....*mendicus* (Ball)
- Pronotum without yellow or ivory transverse band; stylar spine long, projecting laterally; aedeagus with bifurcate processes one-half to less than one-half as long as shaft..... 18
- 18 (17). Stylar shaft much longer than basal width; aedeagus with bifurcate processes about one-half as long as shaft.....*rupinatus* (Ball)
- Stylar shaft about as long as basal width; aedeagus with bifurcate processes less than one-half as long as shaft.....*lineatus*, n. sp.
- 19 (14). Aedeagus with gonopore basad of midlength of shaft; bifurcate processes more than one-half as long as aedeagal shaft..... 20
Aedeagus with gonopore at midlength of shaft; bifurcate processes one-half to less than one-half as long as aedeagal shaft..... 21
- 20 (19). Pygofer spine falcate, serrate, arising from about middle of caudal margin of pygofer; stylar shaft with apex swollen.....*kirkaldyi* (Ball)
- Pygofer spine short, linear, smooth, arising from caudoventral margin of pygofer; stylar shaft with sides parallel.....*davisi*, n. sp.
- 21 (19). Pygofer spine minute, arising from middle of caudal margin of pygofer; stylar spine minute (European and Asian).....*torneellus* (Zetterstedt)
- Pygofer spine short, robust, arising either dorsally or ventrally from caudal margin of pygofer; stylar spine large, slender, or robust (North American)..... 22
- 22 (21). Pygofer with caudal margin broadly subtruncate; pygofer spine arising ventrally from caudal margin; stylar spine slender, projecting antero-laterally.....*omant*, n. sp.
- Pygofer with caudodorsal margin strongly produced posteriorly to

- convex lobe; pygofer spine arising from apex of lobe; stylar spine robust, projecting laterally.....*collaris* (Ball)
- 23 (1). Pronotum usually with distinct broad or narrow yellow or ivory transverse band; or if not, then forewings with distinct yellow or ivory spot on clavi..... 24
Pronotum without transverse band; forewings without spot on clavi..... 33
- 24 (23). Forewings with distinct yellow or ivory suboval spot on clavi..... 25
Forewings without such spot on clavi..... 30
- 25 (24). Stylar spine subapical; stylar shaft very long or robust (figs. 30a-32a)..... 26
Stylar spine apical; stylar shaft short (figs. 33a-36a)..... 28
- 26 (25). Aedeagus with gonopore basad of midlength of shaft; bifurcate processes more than one-half as long as aedeagal shaft; stylar spine minute.....*furciculatus* (Osborn)
Aedeagus with gonopore at midlength of shaft; bifurcate processes short, less than one-half as long as aedeagal shaft; stylar spine long..... 27
- 27 (26). Pronotum with distinct yellow or ivory transverse band; forewings with yellow or ivory suboval spot on clavi; pygofer spine arising from middle of caudal margin of pygofer.....*clitellarius* (Say)
Pronotum without transverse band; forewings with distinct yellow or ivory subquadrate spot on clavi; pygofer spine arising from caudoventral margin of pygofer.....*eburatus* (Van Duzee)
- 28 (25). Pygofer with distinct caudoventral fingerlike lobe produced dorso-posteriorly; pygofer spine small, arising from apex of lobe.....*balli*, n. sp.
Pygofer without caudoventral lobe; pygofer spine long, lanceolate, arising from caudoventral margin..... 29
- 29 (28). Aedeagus with bifurcate processes about one-half as long as shaft; stylar shaft serrate.....*montanus mulsus* Ball
Aedeagus with bifurcate processes less than one-half as long as shaft; stylar shaft smooth.....*montanus montanus* (Van Duzee)
- 30 (24). Aedeagus with bifurcate processes less than one-half as long as shaft; pygofer spine long, lanceolate, arising caudoventrally and projecting posteriorly.....*montanus reductus* (Van Duzee)
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- 31 (30). Pygofer with caudoventral margin produced posteriorly to lobe; pygofer spine long, arising from apex of lobe; aedeagus with bifurcate processes about three-fourths as long as shaft.....*brunneus* (Osborn)
Pygofer without caudoventral lobe; pygofer spine very short; aedeagus with bifurcate processes at least one-half as long as shaft..... 32
- 32 (31). Pygofer spine arising from caudoventral margin of pygofer; base of spine and portion of caudoventral margin heavily sclerotized; aedeagus with bifurcate processes one-half as long as shaft; stylar spine wanting.....*fasciaticollis* (Stål)
Pygofer spine arising from caudodorsal margin of pygofer; base of spine and caudal margin of pygofer normally sclerotized; aedeagus with bifurcate processes more than one-half as long as shaft; stylar spine present.....*belli* (Uhler)
- 33 (23). Crown with anterior margin immaculate..... 34
Crown with spots or markings on anterior margin..... 39
- 34 (33). Pygofer with caudoventral margin produced posteriorly to lobe; pygofer spine arising from apex of lobe.....*citrinifrons* (Gillette and Baker)
Pygofer without caudoventral lobe; pygofer spine arising variously from caudal margin of pygofer..... 35
- 35 (34). Pygofer spine extremely long, more than one-half as long as width of pygofer, lanceolate, arising ventrally from caudal margin of pygofer (fig. 41c).....*atriflavus* Downe
Pygofer spine less than one-half as long as width of pygofer, arising caudoventrally or from middle of caudal margin of pygofer (figs. 42c-45c)..... 36
- 36 (35). Pygofer spine arising from middle of caudal margin of pygofer; aedeagus with gonopore distad of midlength of shaft in lateral aspect.....*januatus* (Ball)
Pygofer spine arising from caudoventral margin of pygofer; aedeagus

| | | |
|----------|---|----|
| | with gonopore at midlength of shaft in lateral aspect..... | 37 |
| 37 (36). | Pygofer with caudal margin strongly convex; pygofer spine arising from middle of caudal margin; lateral surface of pygofer with numerous fine setae..... | 37 |
| | Pygofer with caudal margin truncate; pygofer spine arising somewhat caudoventrally; dorsal and caudodorsal submarginal areas of pygofer with many coarse setae..... | 38 |
| 38 (37). | Stylar spine projecting laterally; bifurcate processes flat and broad at midlength..... | 38 |
| | Stylar spine projecting posterolaterally; bifurcate processes somewhat tubular..... | 39 |
| 39 (33). | Pygofer with caudoventral margin produced posteriorly to narrow lobe; pygofer spine arising from apex of lobe..... | 40 |
| | Pygofer without caudoventral lobe; pygofer spine arising ventrally or from middle of caudal margin..... | 41 |
| 40 (39). | Aedeagus with gonopore at midlength of shaft; bifurcate processes one-half as long as aedeagal shaft..... | 41 |
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| 41 (39). | Pygofer spine very long, arising ventrally from caudal margin of pygofer; gonopore of aedeagus distad of midlength of shaft..... | 41 |
| | Pygofer spine short, arising from middle of caudal margin of pygofer; gonopore of aedeagus at midlength of shaft..... | 42 |
| 42 (41). | Aedeagus with bifurcate processes less than one-half as long as shaft; caudoventral submargin of pygofer with many minute spines; stylar spine short..... | 42 |
| | Aedeagus with bifurcate processes one-half as long as shaft; caudoventral submargin of pygofer without such spines; stylar spine long..... | 42 |

KEY TO FEMALES⁵

| | | |
|--------|---|----|
| 1. | In dorsal aspect head with anterior margin acutely or obtusely angled; eye with inner margin less than three-fourths distance from posterior margin of crown to anterior extremity; apex of crown either acutely pointed or rounded (fig. 1)..... | 2 |
| | In dorsal aspect head with anterior margin rounded or obtusely angled, never acutely angled; eye with inner margin three-fourths or more distance from posterior margin of crown to anterior extremity; apex of crown never acutely pointed (fig. 2)..... | 15 |
| 2 (1). | Crown with anterior margin immaculate..... | 3 |
| | Crown with 2 or more distinct round or triangular black spots on anterior margin..... | 9 |
| 3 (2). | Seventh sternum with spatulate process about as long or slightly longer than basal width (figs. 51-56)..... | 4 |
| | Seventh sternum with spatulate process much longer than basal width (figs. 57-62)..... | 8 |
| 4 (3). | Seventh sternum with median emargination broadly v-shaped; posterior margin strongly convex (fig. 51)..... | 5 |
| | Seventh sternum with median emargination typically U-shaped; posterior margin truncate or slightly concave..... | 5 |
| 5 (4). | Median emargination never more than one-fourth as deep as segment; spatulate process produced considerably beyond posterior margin..... | 6 |
| | Median emargination never less than one-fourth as deep as segment; spatulate process produced up to or slightly beyond posterior margin..... | 7 |
| 6 (5). | Spatulate process with sides convergent apically to narrow truncate margin (fig. 52)..... | 7 |
| | Spatulate process with sides parallel (fig. 53)..... | 7 |
| 7 (5). | Seventh sternum with posterior margin slightly concave..... | 7 |
| | Seventh sternum with posterior margin truncate or slightly convex..... | 7 |

⁵Includes 41 species. Four species of which female specimens were not available are *incertus* (Gillette and Baker), *citronellus* (Provancher), *davisi*, n. sp., and *vanduzeei*, n. sp. The remaining 12 species are listed in the Appendix as incertae sedis.

-*egensis* Ball, *arculus* Ball
- 8 (3). Median emargination typically v-shaped; posterior margin of segment distinctly convex.....
-*areostaphyli* Downes, *intricatus* (Ball), *cachellus* Ball
- Median emargination typically u-shaped; posterior margin of segment truncate or slightly convex.....
-*holmesi* Bliven, *commissus* (Van Duzee), *aureolus* (Van Duzee)
- 9 (2). Spatulate process absent (European and Asian).....
-*lorneceus* (Zetterstedt)
- Spatulate process present (North American)..... 10
- 10 (9). Spatulate process rather large, produced considerably beyond posterior margin of segment..... 11
- Spatulate process small to medium size, produced to or slightly beyond posterior margin of segment..... 13
- 11 (10). Spatulate process constricted medially.....*omani*, n. sp. 12
- 12 (11). Spatulate process with sides parallel.....
- Pronotum with yellow or ivory transverse band.....*mendicus* (Ball)
- Pronotum without such band.....*rupinatus* (Ball)
- 13 (10). Pronotum with yellow or ivory transverse band.....*collaris* (Ball)
- Pronotum without such band..... 14
- 14 (13). Median emargination typically v-shaped.....*kirkaldyi* (Ball)
- Median emargination typically u-shaped.....
-*lineatus*, n. sp., *truncatus*, n. sp.
- 15 (1). Spatulate process very small or wanting..... 16
- Spatulate process present, very large..... 17
- 16 (15). Spatulate process very small; posterior margin of segment converging apically to median emargination.....*fasciaticollis* (Stål)
- Spatulate process absent; posterior margin of segment truncate (figs. 72-75).....
-*brunneus* (Osborn), *belli* (Uhler), *youngi*, n. sp., *beameri* (Ball)
- 17 (15). Pronotum with yellow or ivory transverse band; if not, then forewings with distinct spot on clavi..... 18
- Pronotum without such band; forewings without such spot..... 21
- 18 (17). Spatulate process short, slightly longer than basal width.....
-*montanus montanus* (Van Duzee),
-*montanus reductus* (Van Duzee), *montanus mulsus* Ball, *balli*, n. sp.
- Spatulate process long, more than twice as long as basal width..... 19
- 19 (18). Median emargination distinctly v-shaped.....*furculatus* (Osborn)
- Median emargination distinctly u-shaped..... 20
- 20 (19). Pronotum with yellow or ivory transverse band.....*clitellarius* (Say)
- Pronotum without such band.....*cburatus* (Van Duzee)
- 21 (17). Pronotum with anterior margin immaculate..... 22
- Pronotum with distinct spots on anterior margin..... 23
- 22 (21). Seventh sternum with lateral margins acutely convex.....
-*citrinifrons* (Gillette and Baker)
- Seventh sternum with lateral margins parallel.....
-*setaceus*, n. sp., *januatus* (Ball),
-*waldanus* (Ball), *flavocapitatus* (Van Duzee), *atriflavus* Downes
- 23 (21). Median emargination deep; posterior margin of segment convex.....
-*tahotus* Ball
- Median emargination very shallow; posterior margin of segment truncate.....*ponderosus* Ball, *geminatus* (Van Duzee)

DESCRIPTIONS OF THE SPECIES

Colladonus nugax (Van Duzee)

(Figs. 8 and 52)

Scaphoideus nugax Van Duzee, 1925, Calif. Acad. Sci. Proc., Ser. 4, 14 (17): 419.

Osbornellus nugax, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 23.

Friscananus nugax, DeLong and Knoll, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 57.

Colladonus nugax, Oman, 1949, Wash. Ent. Soc. Mem., No. 3, p. 125.

Head acutely angled and pointed apically; pronotum without transverse band; forewings without spot on clavi; similar to *intricatus* in habitus and to *arculus* in male genital characteristics.

Pygofer in lateral aspect about 1½ times as long as wide ventral margin concave about middle, caudoventral margin produced posteriorly to lobe, dorsal margin with distal portion convex; pygofer spine straight, lanceolate, arising from apex of lobe, projecting

caudodorsad; caudodorsal submarginal area of pygofer with many long setae. (Fig. 8c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow about $2\frac{1}{2}$ times as long as wide, convex apically; stylar spine subapical, long, slightly curved anterolaterally, attenuated apically; aedeagus with bifurcate processes long, more than one-half as long as aedeagal shaft, tubular, strongly curved laterally, attenuated apically, crossing in dorsal view; gonopore basad of midlength of shaft. (Fig. 8a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination V-shaped, very shallow, less than one-fourth length of segment; spatulate process short, about as long as basal width, produced considerably beyond posterior margin, sides not parallel, converging distally to slightly bifid apex. (Fig. 52.)

Distribution.—Pacific coast of the United States and Canada. Specimens are at hand from *California*: Arroyo Seco River, Atascadero, Jamesburg, Lompoc, Monterey, Obispo, Pacific Grove, Redwood Canyon, San Luis, Santa Cruz, Santa Margarita, Stinson Beach; *British Columbia*: Goldstream, Thormanby Islands.

Collection dates.—From June 14 to August 24.

Host plants.—Numerous specimens were collected on *Arctostaphylos manzanita* Parry and *tomentosae* (Pursh) Lindl. in California by R. H. Beamer and L. W. Hepner.

Type.—The male holotype (No. 1799) from Mill Valley, Marin County, Calif., is in the collection of the California Academy of Sciences.

Remarks.—Examined 110 specimens; of these, 21 males were dissected.

From *intricatus* to which it is similar in habitus, *nugax* can be distinguished by its stylar spine situated subapically on the stylar shaft, the bifurcate processes curved laterally, and the location of the gonopore basad of the mid-

length of the aedeagal shaft. Several specimens showed a marked difference in the total length of the aedeagus and bifurcate processes, both being nearly twice as long as in the paratype and other specimens. There is no geographical pattern for this character, and the specimens were identical in all other respects.

Colladonus arculus Ball

(Figs. 9 and 56)

Colladonus arculus Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 31.

Head acutely angled but with rounded apex; pronotum without transverse band; forewings without spot on clavi; resembling *egenus* in shape of head and body form; similar to *holmesi* in certain male genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave about middle, caudoventral margin produced slightly posteriorly to small lobe, caudodorsal margin nearly straight, dorsal margin with distal portion convex; pygofer spine straight, broad basally, somewhat lanceolate, arising from apical portion of lobe, projecting caudodorsad; caudodorsal and dorsal submarginal areas of pygofer with many long setae. (Fig. 9c.)

Style in dorsal aspect nearly twice as long as connective; stylar shaft robust, about 3 times as long as basal width, broad subapically, with apex truncate or nearly so; stylar spine apical, long, broad basally, not sharply attenuated apically, projecting laterally; aedeagus with bifurcate processes long, more than one-half as long as aedeagal shaft, flat and broad at midlength, sharply attenuated apically; gonopore of aedeagus basad of midlength of aedeagal shaft. (Fig. 9a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process short, about as long as basal width, produced beyond posterior margin, with sides parallel, apex bifid. (Fig. 56.)

Distribution.—California and Oregon. Specimens are at hand from *California*: Alameda County, Auburn, Newcastle, Niles Canyon, Santa Cruz County, Yolo County; *Oregon*: Medford.

Collection dates.—As early as May 15 and as late as September 21.

Host plants.—Unknown.

Type.—The female holotype from Medford, Oreg., is in the United States National Museum, Washington, D. C. A holotype label is attached to a pin with 3 specimens; of these, 1 is a female and 2 are males. The female, which is the third specimen from the pin, is the holotype.

Remarks.—Examined 15 specimens; of these, 8 males were dissected.

From *egenus* to which it is similar in habitus, *arculus* can be distinguished by the lanceolate pygofer spine arising from the apex of a caudoventral lobe of the pygofer. From *holmesi* to which it is similar is most genital characteristics, *arculus* can be separated by its longer bifurcate processes and its broader apex of the stylar shaft.

Colladonus holmesi Bliven

(Figs. 10 and 60)

Colladonus holmesi Bliven, 1954, Brooklyn Ent. Soc. Bul. 49, p. 116.

Head with anterior margin acutely angled, apex pointed; pronotum without transverse band; forewings without spot on clavi; similar to *flavocapitatus* in habitus but distinct from it in certain male genital characteristics.

Pygofer in lateral aspect about 1½ times as long as wide, ventral margin slightly concave about middle, caudoventral margin produced posteriorly to distinct lobe, caudodorsal margin nearly straight, dorsal margin with distal portion convex; pygofer spine well developed, long, straight, lanceolate, arising from apex of caudoventral lobe, projecting posterodorsally; caudodorsal submarginal area of pygofer with many long setae. (Fig. 10c.)

Style in dorsal aspect about 1½ times as long as connective; stylar shaft robust, short, about twice as long as wide, with sides parallel, apex truncate; stylar spine apical, long, attenuated apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat, narrow, attenuated apically, crossing in dorsal

view; gonopore basad of midlength of shaft. (Fig. 10a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral margin curved mesally, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, deep, slightly less than one-half length of segment; spatulate process narrow, about twice as long as wide, produced slightly beyond posterior margin, with sides parallel, apex bifid. (Fig. 60.)

Distribution.—California: Davenport, Guatay, Jamesburg, Pine Valley, Santa Cruz Mountains, Shively, Towle, Truckee.

Collection dates.—From July to September; most abundant during August.

Host plants.—Numerous specimens have been collected from *Arctostaphylos manzanita* Parry, *tomentosa* (Pursh) Lindl., and *andersonii* Gray by R. H. Beamer, R. I. Sailer, and L. W. Hepner. Bliven (9) reported it from redwood (*Sequoia sempervirens* (D. Don) Endl.).

Type.—The male holotype is in the United States National Museum.

Remarks.—Examined 97 specimens; of these, 32 were males, 4 of which were dissected. A male paratype was also dissected. Comparisons with the male holotype and illustrations of the genitalia were made.

This species can be differentiated from its related *flavocapitatus* by the head with the anterior margin acutely angled, the pygofer with the caudoventral margin produced posteriorly to a convex lobe, and the gonopore of the aedeagus situated basad of the midlength of the shaft.

Colladonus commissus (Van Duzee)

(Figs. 11 and 61)

Thamnolettix commissus Van Duzee, 1917, Calif. Acad. Sci. Proc., Ser. 4, 7 (11): 299.

Conodonus commissus, DeLong and Caldwell, 1937, Check List of the

Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Colladonus commissus, DeLong and Knull, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 57.

Colladonus flavocapitatus, DeLong and Severin, 1948, Hilgardia 18: 194.

Head subacutely angled and pointed apically; pronotum without yellow transverse band; forewings without yellow spot on clavi; allied to *holmesi* in habitus and similar to *nugax* in certain genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin deeply concave about middle, caudoventral margin produced somewhat posterodorsally to narrow tapering lobe, caudodorsal margin truncate, dorsal margin with distal portion convex; pygofer spine well developed, long, slightly curved, lanceolate, arising from apex of caudoventral lobe, projecting posterodorsally; caudodorsal submarginal area of pygofer with many long setae. (Fig. 11c.)

Style in dorsal aspect nearly twice as long as connective; stylar shaft robust, about twice as long as wide, expanded apically, apex convex; stylar spine subapical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, sharply attenuated apically, crossing in dorsal view; gonopore situated at about midlength of aedeagal shaft. (Fig. 11a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin uniformly convex on each side of median spatulate process; median emargination U-shaped, deep, about one-half length of segment; spatulate process about $1\frac{1}{2}$ times as long as basal width, extending to posterior segmental margin, with sides parallel, apex bifid. (Fig. 61.)

Distribution.—California: Davenport, Lake County, Monterey, Mount Tamalpais, Santa Cruz Mountains.

Collection dates.—August 10-13.

Host plants.—Many specimens were collected on *Arctostaphylos andersonii* Gray, *tomentosa* (Pursh) Lindl., *bracteosa* (DC.) Abrams, and *pumila* Nutt. by R. H. Beamer and R. I. Sailer. DeLong and Severin (15) reported it on California blackberry, bush lupine, monkey-

flower, bracken, allepo pine, and Boston ivy.

Type.—The female holotype (No. 367) from Lake County, Calif., is in the collection of the California Academy of Sciences.

Remarks.—Examined 76 specimens; of these, 49 were males, 20 of which were dissected.

This species resembles *holmesi* in habitus but has a somewhat broader head and pronotum. The genitalia of *commissus* and *nugax* are rather similar, but *commissus* can be distinguished by the position of the gonopore, which is situated at the midlength of the aedeagal shaft in lateral aspect, the bifurcate processes, which are curved mesally, and the slightly longer pygofer spine. DeLong and Severin's (15) illustrations of the genitalia of this species do not agree with the type of *commissus* but rather with the type of *flavocapitatus*. The plate of *commissus* illustrated in DeLong and Severin's report is also that of *flavocapitatus*.

This species has been reported as a vector of California aster yellows by Severin (43).

***Colladonus cachellus* Ball**

(Figs. 12 and 59)

Colladonus cachellus Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 30.

Head obtusely angled, apex pointed; similar to *mundiens* in body form but without distinct yellow transverse band on pronotum; related to *truncatus* in certain male genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave about middle, caudoventral margin produced posteriorly to truncate lobe, caudodorsal margin slightly convex, dorsal margin with distal portion convex; pygofer spine well developed, long, irregularly curved, arising from caudodorsal portion of lobe, projecting posterodorsally; caudodorsal submarginal area of pygofer with several long setae. (Fig. 12c.)

Style in dorsal aspect about twice as long as connective; stylar shaft about $1\frac{1}{2}$ times as long as basal width, sides not parallel, expanded apically and apex convex; stylar spine apical, short,

broad basally, abruptly narrowed apically, projecting somewhat anterolaterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, flat and broad at midlength, attenuated apically, crossing in dorsal view; gonopore situated at about midlength of aedeagal shaft. (Fig. 12a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin strongly convex on each side of median spatulate process; median emargination broadly V-shaped, deep, about one-half length of segment; spatulate process about $1\frac{1}{2}$ times as long as basal width, produced slightly beyond posterior margin, with sides parallel, apex slightly bifid. (Fig. 59.)

Distribution.—Western United States, from the southern extremity of California, north to Oregon, and as far east as Utah. Specimens are at hand from California: Brown, Butte County, Modesto, Shasta County; Oregon: Bend; Utah: Logan, Logan Canyon, Milford.

Collection dates.—From May 15 to September 3; most abundant during July.

Host plants.—Collected from cedar at Milford, Utah, by E. W. Davis and on *Juniperus californica* Carr. from California (locality not known) by W. A. Pierce.

Type.—The female holotype from Logan Canyon, Utah, is in the United States National Museum.

Remarks.—Examined 44 specimens; of these, 26 were males, all of which were dissected.

From *truncatus* to which it is similar in having the margin of the caudoventral lobe of pygofer truncate, *cachellus* can be separated by its gonopore situated midlength of the aedeagal shaft in lateral aspect and the bifurcate processes about one-half as long as the aedeagal shaft. The caudoventral margin of the pygofer lacks the short spinelike setae present in *truncatus*.

Colladonus intricatus (Ball)

(Figs. 13 and 58)

Thamnotettix intricata Ball, 1911, Canad. Ent. 43: 198.

Thamnotettix intricatus, Van Duzee, 1917, Calif. Acad. Sci. Proc., Ser 4, 7 (11): 297.

Friscanonus intricatus, Ball, 1936, Brooklyn Ent. Soc. Bul. 31, p. 60.

Colladonus intricatus, Oman, 1949, Wash. Ent. Soc. Mem., No. 3, p. 125.

Head acutely angled, apex sharply pointed; pronotum without transverse band; forewings without spot on clavi; remarkably similar in habitus to *rufinatus* and can be distinguished from it only through the male genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave at middle, caudoventral margin produced posteriorly to broad convex lobe, dorsal margin with posterior portion convex; pygofer spine straight, lanceolate, arising from apex of caudoventral lobe, projecting dorsally; caudo-dorsal and dorsal submarginal areas of pygofer with many long setae. (Fig. 13c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, about 3 times as long as basal width, with sides parallel, apex truncate or nearly so; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically; gonopore at about midlength of aedeagal shaft. (Fig. 13a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved slightly mesally, posterior margin uniformly convex on each side of median spatulate process; median emargination V-shaped, shallow, less than one-fourth length of segment; spatulate process about $1\frac{1}{2}$ times as long as basal width, produced beyond posterior margin, with sides parallel, apex deeply bifid. (Fig. 58.)

Distribution.—California: San Francisco, Stinson Beach.

Collection dates.—From July 25 to September 9; most common during August.

Host plants.—Collected from *Ceanothus thyrsiflorus* Esch. and *Arctostaphylos manzanita* Parry from Stinson Beach by R. H. Beamer. DeLong and Severin

(15) reported it on monkey-flower, *Mimulus* sp., and bracken.

Type.—One male cotype collected September 9, 1907, by E. D. Ball, here designated lectotype, is in the United States National Museum.

Remarks.—Examined 45 specimens; of these, 26 were males, 11 of which were dissected.

From *rupinatus* to which it is similar in habitus, *intricatus* can be separated by having the caudoventral margin of the pygofer produced posteriorly to a broad convex lobe and the shorter stylar shaft.

DeLong and Severin's (15) illustrations of the genitalia of this species do not agree with the type of *intricatus* but rather with the type of *kirkaldyi*.

Severin (43) reported this species as a vector of California aster yellows.

***Colladonus aureolus* (Van Duzee)**

(Figs. 14 and 62)

Thamnotettix aureola Van Duzee, 1894, Buffalo Soc. Nat. Sci. Bul. 5, p. 213.

Thamnotettix aureolus, Van Duzee, 1916, Check List of the Hemiptera (Excepting the Aphididae, Aleurodidae and Coccidae) of America, North of Mexico, p. 74.

Cynodonus aureolus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Colladonus aureolus, DeLong and Knull, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 56.

Head subacutely angled, apex pointed; pronotum without distinct transverse band; forewings without distinct spot on clavi; similar to *holmesi* in habitus except pronotum and scutellum, which are usually distinctly reddish brown, and forewings, which are paler.

Pygofer in lateral aspect slightly longer than wide, ventral margin slightly concave about middle, caudal margin truncate or nearly so, dorsal margin with distal portion convex; pygofer spine well developed, very large, flat, falcate, arising ventrally from caudal margin, projecting dorsally; caudo-dorsal and dorsal submarginal areas with many long setae. (Fig. 14c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about twice as long as basal width, curved slightly posterolaterally, with sides parallel, apex truncate; stylar spine apical, long, rather broad basally, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, tubular, sharply narrowed apically, parallel in dorsal view; gonopore situated at about midlength of aedeagal shaft. (Fig. 14a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, deep, about one-half length of segment; spatulate process long, narrow, about twice as long as basal width, produced slightly beyond posterior margin, with sides parallel, apex broadly bifid. (Fig. 62.)

Distribution.—Western United States and western Canada, ranging from southern California to British Columbia. *California*: Boulder Creek, Clayton, Cuyamaca Reservoir, Fresno County, Giant Forest, Jamesburg, Lompoc, Los Angeles County, Los Gatos, Lucerne, Marin County, Miramar, Monterey, Muir Woods, Oakland, Salinas, Santa Cruz Mountains, Santa Rosa, Sargent, Yosemite National Park; *Oregon*: Ashland, McMinnville, Mount Hood, The Dalles; *Washington*: Wenatchee; *British Columbia*: Alta Lake, Lilloot, Saanich District, Victoria.

Collection dates.—From May 29 to as late as September 12; most abundant during July and August.

Host plants.—Unknown. It has been collected on sticky-board traps in The Dalles, Oreg., by the author.

Type.—The male holotype (No. 336) from California collected by D. W. Coquillett and labeled *Thamnotettix aureola* Uhler is in the collection of Iowa State College.

Remarks.—Examined 76 specimens; of these, 20 were males, 11 of which were dissected.

From *holmesi* to which it is similar in habitus, *aureolus* can be easily separated by its unique large flat falcate pygofer spine arising ventrally from the caudal margin of the pygofer.

Colladonus egenus Ball

(Figs. 15 and 55)

Colladonus egenus Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 30.

Head obtusely angled, apex rounded; pronotum without transverse band; forewings without spot on clavi; similar to *cachellus* in habitus but distinct in genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave at middle, caudal margin broadly convex, dorsal margin with distal portion convex; pygofer spine small, falcate, serrate, arising from middle of caudal margin, projecting dorsally; caudodorsal and dorsal submargins with many long setae. (Fig. 15c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft robust, short, slightly longer than wide, sides not parallel, broader apically; stylar spine long, bluntly pointed, projecting laterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, tubular, narrowed apically, crossing in dorsal view; gonopore of aedeagus basad of mid-length of shaft. (Fig. 15a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved slightly mesally, posterior margin uniformly truncate on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process short, about as long as basal width, produced as far as posterior margin, with sides parallel, apex truncate. (Fig. 55.)

Distribution.—Western United States and Canada, from Utah northwestwardly to British Columbia. Specimens are at hand from Oregon; McMinnville; Utah: Spanish Fork; British Columbia: Chilliwack.

Collection dates.—From July 28 in Utah to November 4 in Oregon; most abundant during August.

Host plants.—Collected from unknown shrubs and cover at

McMinnville, Oreg., by K. M. Fender.

Type.—The male holotype (No. 2016) from Chilliwack, British Columbia, July 28, 1924, is in the United States National Museum.

Remarks.—Examined 35 specimens; of these, 4 were males, all of which were dissected.

From *cachellus* to which it is similar in body form, *egenus* can be distinguished by its unique falcate, serrate pygofer spine.

Colladonus arctostaphyli Downes

(Figs. 16 and 57)

Colladonus arctostaphyli Downes, 1952, Canad. Ent. 84: 253.

Head obtusely angled, apex pointed; pronotum without distinct transverse band; forewings without spot on clavi; similar to *espinosus* in habitus but has different genitalia.

Pygofer in lateral aspect about as long as wide, ventral margin broadly concave at about middle, caudal margin obtusely convex, dorsal margin with distal portion straight, caudoventral margin folded strongly medioanteriorly; pygofer spine short, straight, lanceolate, arising about midway from caudal margin, projecting dorsally; many minute black spines on folded portion and exposed margin of pygofer below pygofer spine; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 16c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about $2\frac{1}{2}$ times as long as wide, with sides parallel, apex truncate; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore at about mid-length of aedeagal shaft. (Fig. 16a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin subtruncate on each side of median spatulate process; median emargination V-shaped, shallow, less than one-half length of segment; spatulate process about $1\frac{1}{2}$ times as long as basal width, produced considerably beyond posterior margin, with sides parallel, apex slightly bifid. (Fig. 57.)

Distribution.—Pacific coast of the United States and Canada, ranging from California northward to British Columbia.

California: Lompoc, Monterey, Santa Cruz; *British Columbia*: Malahat Ridge, Vancouver Island.

Collection dates.—From July 18 in California to September 21 in British Columbia; most abundant during August.

Host plants.—It is common on various species of *Arctostaphylos*. Downes (16) reported it from *A. tomentosa* (Pursh) Lindl. in British Columbia. Numerous specimens were collected on *bracteosa* (DC.) Abrams, *canoscens* Eastw., *tomentosa*, *pumila* Nutt., and *pechoensis viridissima* Eastw. in California by R. H. Beamer and R. I. Sailer.

Type.—The male holotype from Malahat, British Columbia, August 18, 1950, is in the personal collection of W. Downes, Victoria, British Columbia.

Remarks.—Examined 270 specimens; of these, 18 males were dissected.

From *espinosus* to which it is similar, *arctostaphyli* can be distinguished by its unique characteristic pygofer. The caudoventral margin is folded strongly medio-anteriorly, with many short black spines on the folded portion and margin, giving it a serrate appearance.

***Colladonus atropunctatus*
(Van Duzee)**

(Figs. 17 and 54)

Thamnotettix atropunctatus Van Duzee, 1890, Ent. Amer. 6: 91.

Thamnotettix atropunctatus, Van Duzee, 1892, Psyche 5: 306.

Conodonus atropunctatus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Colladonus atropunctatus, DeLong and Knull, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 56.

Head obtusely angled, apex pointed; pronotum without distinct transverse band; forewings without distinct spot on clavi; similar to *kirkaldyi* in habitus and certain genital characteristics.

Pygofer in lateral aspect about 1½ times as long as wide, ventral margin

concave about middle, caudal margin broadly convex. dorsal margin with distal portion convex; pygofer spine well developed, lanceolate, straight, broad basally, arising midway from caudal margin, projecting dorsally; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 17c.)

Style in dorsal aspect about 1½ times as long as connective; stylar shaft robust, short, about twice as long as basal width, sides not parallel, broad, somewhat swollen apically; stylar spine apical, large, broad basally, abruptly pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat, narrow throughout, narrowed apically, crossing in dorsal view; gonopore situated at midlength of aedeagal shaft. (Fig. 17a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin slightly convex on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process short, about as long as wide, produced beyond posterior margin, with sides parallel, apex slightly bifid. (Fig. 54.)

Distribution.—Western United States and Mexico, occurring in the northwestern portion of Mexico northward into California and as far east as Utah. Specimens are at hand from *California*: Alpine, Atascadero, Beaumont, Big Bear Lake, Cajon Pass, Colton, Del Mar, Guatay, La Jolla, Mint Canyon, Monterey, Mount Diablo, Ontario, Pasadena, Pine Valley, Salinas, San Diego County, San Jacinto Mountains, San Mateo County, Watsonville; *Utah*: Tooele; *Mexico*: Tijuana.

Collection dates.—From March 1 in San Diego County, Calif., to September 13 in Alpine, Calif.; most abundant during July.

Host plants.—Specimens were collected on *Salix* sp., March 3, 1932, in San Mateo, Calif., by F. D. Klyver. Van Duzee (57) reported it from grass in California.

Type.—The female holotype (No. 630) from California collected by D. W. Coquillett is in the collection of Iowa State College.

Remarks.—Examined 103 specimens; of these, 36 were males, 23 of which were dissected.

From *kirkaldyi* to which it is closely related, *atropunctatus* can be distinguished by its lanceolate pygofer spine, the aedeagus with bifurcate processes about one-half as long as the shaft, and the gonopore situated midlength of the aedeagal shaft.

***Colladonus robustus*, new species**

(Figs. 18 and 53)

Head with anterior margin acutely angled, apex pointed; pronotum without transverse band; forewings without spot on clavi; general color brown; similar to *intricatus* but without spots or markings on crown.

Length of male 4.19 mm., female 4.53 mm.

Head about as wide as pronotum, crown nearly one-half longer at middle than next to mesal margin of eye; pronotum with lateral angles convex, meeting truncate posterior margin; forewings long and narrow; clypeus flattened, with lateral sutures nearly straight, converging distally to concave apex; clypellus constricted about middle; male valve typically triangular; plates together spoon shaped, with numerous fine setae along lateral and apical margins.

Crown light brown, immaculate; eyes reddish black; pronotum and scutellum brown; forewings smoky brown; entire face somewhat fulvous; clypeus with longitudinal row of black arcs on each side of middle, sutures black; legs pale brown; abdomen brown; male valve and plates brown.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave at middle, caudal margin convex, dorsal margin with distal portion convex; pygofer spine short, straight, lanceolate, arising from middle of caudal margin of pygofer, projecting dorsally; caudoventral margin below pygofer spine with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 18c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short, robust, about twice as long as basal width, sides not parallel, much broader subapically, with apex truncate; stylar spine apical, short, stubby, projecting laterally; aedeagus with bifurcate processes long, more than one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically,

crossing in dorsal view; gonopore of aedeagus basad of midlength of shaft. (Fig. 18a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, shallow, about one-fourth length of segment; spatulate process short, slightly longer than basal width, produced beyond posterior margin, with sides parallel, apex slightly bifid. (Fig. 53.)

Host plants.—Unknown.

Types.—The male holotype, female allotype, and 1 female paratype, Keen Camp, Calif., May 24, 1946, D. J. and J. N. Knull, in the collection of Ohio State University. Additional paratypes, 2 females, Keen Camp, Calif., May 24, 1946, D. J. and J. N. Knull, in the collection of the author; 20 females, Keen Camp, Calif., June 24, 1946, D. J. and J. N. Knull, in the United States National Museum.

Remarks.—From *intricatus* to which it is closely related, *robustus* can be separated by its very broad robust stylar shaft, the aedeagus with bifurcate processes more than one-half as long as the aedeagal shaft, and the gonopore situated basad of the midlength of the aedeagal shaft.

***Colladonus espinosus*, new species**

(Figs. 19 and 51)

Head with anterior margin subacutely angled, apex pointed; pronotum without transverse band; forewings without spot on clavi; general color testaceous; similar to *arctostaphyli* in habitus but larger.

Length of male 4.70 mm., female 5.53 mm.

Head about as wide as pronotum, crown more than one-third longer at middle than next to mesal margin of eye; pronotum with lateral angles nearly straight, curved mesally, meeting slightly concave posterior margin; forewings long and narrow; clypeus somewhat flattened, lateral sutures expanded medially below antennal pits, converging distally to broad concave apex; clypellus with lateral sutures constricted medially; male valve broadly triangular, apex rounded; plates together

spoon shaped, with many long fine setae on lateral and apical margins.

Crown ochrous, suffused with fuscous between eyes; eyes pale green; pronotum with narrow pale ochrous band along anterior margin, testaceous below; scutellum ochrous, with deep black transverse line at middle, lateral angles deeply ochrous; forewings testaceous, with 2 or 3 ivory chevron marks on commissural line; veins of clavi pale brown, ivory on membrane; face ochrous, with sutures black; clypeus with longitudinal row of fuscous arcs on each side of middle; legs pale testaceous; abdomen black, connexivum pale testaceous; male valve black; plates black basally, pale testaceous apically; color varies from pale ochrous to deep testaceous.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave about middle, caudal margin strongly convex, dorsal margin with distal portion convex; pygofer spine short, straight, lanceolate, arising from middle of caudal margin of pygofer, projecting posteriorly; caudoventral and caudodorsal margins with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 19c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short and narrow, about twice as long as wide, sides parallel, swollen apically; stylar spine apical, long, sharply pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, curved laterally, flat and broad at midlength, narrowed apically, crossing in dorsal view; gonopore of aedeagus basad of midlength of shaft. (Fig. 19a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margins triangularly convex on each side of median spatulate process; median emargination v-shaped, shallow, less than one-half length of segment; spatulate process slightly longer than wide, produced beyond posterior margin, sides parallel, apex slightly bifid. (Fig. 51.)

Host plants.—Numerous specimens have been collected from *Arctostaphylos manzanita* Parry, *numila* Nutt., *tomentosa* (Pursh) Lindl., and *Ceanothus thyrsiflorus* Esch. at Davenport, Monterey, and Stinson Beach, Calif., by R. H. Beamer.

Types.—The male holotype (No. 62757), female allotype, 2 male and 6 female paratypes, all from Del Mar, Calif., June 2, 1935, P. W. Oman, in the United States National Museum. Additional paratypes, 15 males, San Diego County, Calif., July 5, 1929, R. H. Beamer; San Diego, Calif., August 7, 1935, R. H. Beamer; Monterey, Calif., August 10, 1938, R. H. Beamer; Santa Cruz Mountains, Calif., August 13, 1938, Stinson Beach, Calif., August 15, 1938, L. W. Hepner; La Jolla, Calif., July 13, 1941, R. H. Beamer and E. L. Todd; 9 females, San Diego, Calif., August 7, 1935, R. H. Beamer; Davenport, Calif., August 13, 1938, R. H. Beamer; Santa Cruz Mountains, Calif., August 13, 1938, R. H. Beamer; Stinson Beach, Calif., August 15, 1938, R. H. Beamer; La Jolla, Calif., July 13, 1941, R. H. Beamer; in the Snow collection of the University of Kansas; 4 females, San Benito County, Calif., August 9, 1940, D. J. and J. N. Knull, in the collection of Ohio State University; 1 male, Eureka, Calif., June 23, 1924, E. D. Ball; 1 female, Redwood Canyon, Alameda County, Calif., August 1916, W. M. Giffard; in the collection of the California Academy of Sciences; 3 males and 1 female, Watsonville, Calif., June 15, 1934, E. D. Ball, in the collection of Oregon State College; 2 males and 4 females, Del Mar., Calif., June 2, 1935, P. W. Oman, in the collection of the author.

Remarks.—From *arctostaphyli* to which it is closely related, *spinuosus* can be separated by its gonopore of aedeagus situated basad of the midlength of the aedeagal shaft in lateral aspect and the presence of many minute setae along the caudal submargin of the pygofer.

***Colladonus citronellus*
(Provancher)**

Jassus citronellus Provancher, 1872,
Nat. Canad. 4: 378.

Thamnotettix citronellus, Provancher,
1886, Petite Fauna Entomologique
du Canada . . . , v. 3, p. 283.

Colladonus citronellus, Oman, 1949.
Wash. Ent. Soc. Mem., No. 3, p.
125.

Type.—The type is presumably
in the Musée de la Province,
Quebec.

Remarks.—The author was not
successful in seeing or having
specimens compared with Pro-
vancher's types. It appears best
to follow the interpretations of
Van Duzee (56, p. 328), who per-
sonally examined Provancher's
material and then published the
results as follows:

Thamnotettix citronellus Prov.
Under this name is a very pale speci-
men of *churata* Van D., but it does not
answer to the description in the Nat.
Can., p. 378, and cannot be that insect.

Deltacephalus citronellus Prov. The
insect on this label is a *Thamnotettix*
probably still undescribed. It is not
the form described in the Nat. Can., p.
378.

The original description does
not seem to fit the generic char-
acters of *Colladonus*, i.e., the size
of "3.25 mm." is unusually small,
and the "fairly long triangular
head" is not typical of *Colladonus*.
It appears best to treat this
species as *incertae sedis* until its
status is clarified.

Oman (34) did not designate
this species as a new combination.
No illustrations of the genitalia
are included here because of the
lack of specimens.

***Colladonus vanduzeei*,
new species**

(Fig. 20)

Head with anterior margin subacute-
ly angled, apex pointed; pronotum
without transverse band; forewings
without spot on clavi; general color
dark green; similar to *geminatus* but
smaller and crown much more pro-
duced.

Length of male 4.24 mm.

Head nearly as wide as pronotum,
crown more than one-third longer at
middle than next to mesal margin of
eye; pronotum with lateral angles near-
ly straight, curved mesally, meeting
slightly concave posterior margin; fore-
wings long and narrow; clypeus flat-
tened, lateral sutures nearly straight,
converging distally to broad truncate
apex; clypellus with lateral sutures
parallel; male valve broadly triangular;
plates together spoon shaped, with long
fine setae on lateral and apical margins.

Crown flavous, with 4 black spots, 2
situated transversely on apex of an-
terior margin, other 2 next to mesal
margin of each eye; eyes yellowish-
green; pronotum with narrow yellowish-
green band along anterior margin, dark
green below; scutellum flavous, with
deep fuscous transverse line at middle;
forewings smoky green, veins flavous;
clypeus light brown, with series of black
ares on each side of middle, sutures
black; clypellus and lorae with sutures
black, gena suffused with black below
and around eyes; legs pale brown; ab-
domen black; male valve fuscous; plates
fuscous basally, pale apically.

Pygofer in lateral aspect about twice
as long as wide, ventral margin concave
about middle, caudal margin convex,
dorsal margin with distal portion con-
vex; pygofer spine well developed, long,
lanceolate, arising from middle of cau-
dal margin of pygofer, projecting pos-
terodorsad; caudodorsal and dorsal
submarginal areas with many long
setae. (Fig. 20c.)

Style in dorsal aspect about 1½
times as long as connective; stylar shaft
long, about 3 times as long as basal
width, sides parallel, apex truncate;
stylar spine apical, long, pointed api-
cally, projecting laterally; aedeagus
with bifurcate processes long, more
than one-half as long as aedeagal shaft,
flat and broad at midlength, pointed
apically, crossing in dorsal view; gono-
pore of aedeagus basad of midlength of
shaft. (Fig. 20a, b.)

Host plants.—Unknown.

Types.—The male holotype and
2 male paratypes, Towle, Calif.,
August 20, 1938, R. H. Beamer,
in the Snow collection of the Uni-
versity of Kansas. Additional
paratypes, 2 males, Towle, Calif.,
August 20, 1938, R. I. Sailer, in
the United States National Mu-
seum; 2 males, Towle, Calif., Au-
gust 20, 1938, R. H. Beamer, in
the collection of the author.

Remarks.—From *geminatus* to which it is closely related, *van-duzeei* can be separated by its longer pygofer spine arising from the middle of the convex caudal margin of the pygofer, the aedeagus with bifurcate processes more than one-half as long as the shaft, and the gonopore situated basad of the midlength of the shaft.

This species is named for the late E. P. Van Duzee, who has contributed much to our knowledge of this genus.

***Colladonus truncatus,*
new species**

(Figs. 21 and 70)

Head with anterior margin obtusely angled, apex pointed; pronotum without transverse band; forewings without spot on clavi; general color fuscous; similar to *rupinatus* but more robust.

Length of male 4.53 mm., female 4.70 mm.

Head about as wide as pronotum, crown more than one-third longer at middle than next to mesal margin of eye; pronotum with lateral angles nearly straight, curved mesally, meeting truncate posterior margin; forewings long and narrow; clypeus with lateral sutures expanded medially below antennal pits, converging basally to truncate apex; clypellus with sides nearly parallel; male valve broadly triangular, apex rounded; plates together spoon shaped, with numerous long fine setae on lateral and apical margins.

Crown ivory, with 4 black irregular-shaped spots, 2 triangular ones situated transversely on extreme apex and 2 large subquadrate ones situated transversely on either side of middle between eyes; narrow black band about middle of mesal margin of eyes, extending below to base of antennae; eyes pale green; pronotum with narrow interrupted yellowish-ivory band along anterior margin, lateral angles fuscous becoming ochrous around middle; scutellum ochrous, with deep uneven fuscous line at middle, lateral angles suffused with deep ochre; forewings fuscous, with 2 ivory chevrons on commissural line, rest of veins ivory to pale brown; clypeus deep fuscous to ochrous, with series of black arcs on each side of middle; clypellus, genae, and lorae fuscous to ochrous; legs pale testaceous; abdomen black; male valve black; plates black basally, pale ivory

apically; color varies from fuscous in males to deep ochrous in females.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin slightly concave at middle, caudoventral margin produced posteriorly to truncate lobe, dorsal margin with distal portion slightly convex; pygofer spine well developed, long, straight, lanceolate, arising from caudodorsal angle of truncate lobe, projecting dorsally; caudoventral margin below pygofer spine with many minute setae; caudodorsal submarginal area with few long setae. (Fig. 21c.)

Style in dorsal aspect about twice as long as connective; stylar shaft long and narrow, about 3 times as long as wide, projecting slightly posterolaterad, with sides parallel, apex truncate; stylar spine apical, long, projecting laterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, nearly tubular, narrowed apically, crossing in dorsal view; gonopore of aedeagus basad of midlength of shaft. (Fig. 21a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin strongly convex on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process narrow, about $1\frac{1}{2}$ times as long as basal width, produced as far as posterior margin, sides parallel, apex slightly bifid. (Fig. 70.)

Host plant.—Numerous specimens have been collected from *Arctostaphylos andersonii* Gray at Santa Cruz Mountains, Calif., by R. H. Beamer and R. I. Sailer.

Types.—The male holotype, female allotype, 10 male paratypes, and 10 female paratypes, all from Santa Cruz Mountains, Calif., August 13, 1938, R. H. Beamer, in the Snow collection of the University of Kansas. Additional paratypes, 10 males and 10 females, all from the type locality, in the United States National Museum; 5 males and 5 females, all from the type locality, in the collection of Oregon State College; 10 males and 5 females, Santa Cruz Mountains, Calif., August 13, 1938, R. I. Sailer, in the collection of the California Academy of Sciences; 20 males and 6

females, all from the type locality, in the collection of the author.

Remarks.—From *rupinatus* to which it is similar, *truncatus* can be separated by its aedeagus having bifurcate processes more than one-half as long as the aedeagal shaft, the gonopore situated basad of the midlength of the shaft, and the caudoventral margin of the pygofer produced posteriorly to a broad truncate lobe.

Colladonus mendicus (Ball)

(Figs. 22 and 65)

Thamnottetix mendica Ball, 1902. *Canad. Ent.* 34: 16.

Thamnottetix mendicus, Van Duzee, 1916, Check List of the Hemiptera (Excepting the Aphididae, Aleyrodidae and Coccidae) of America. North of Mexico, p. 74.

Colladonus mendicus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America. North of Mexico, p. 47.

Head obtusely angled, apex rounded; pronotum with distinct yellow transverse band; forewings without spot on clavi; similar to *omani* in form but differs considerably in male genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave at middle, caudal margin nearly truncate, dorsal margin with distal portion convex; pygofer spine well developed, straight, lanceolate, arising midway from caudal margin, projecting dorsally; caudodorsal and dorsal submarginal areas with many long setae; caudoventral margin with several minute setae. (Fig. 22c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about 3 times as long as wide, curved strongly posterolaterally, with sides nearly parallel, apex truncate; stylar spine apical, long, narrow, pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half length of aedeagal shaft, flat and broad at midlength, pointed apically, crossing dorsally; gonopore situated about midlength of aedeagal shaft. (Fig. 22a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, very shallow, less than one-fourth length of segment;

spatulate process short, about as long as basal width, produced considerably beyond posterior margin, sides not parallel, converging apically, apex truncate or nearly so. (Fig. 65.)

Distribution.—Well represented in the Western United States and Canada, occurring from southern California northward along the coast to British Columbia and as far east as Colorado. *California:* Berkeley, Los Angeles County, Montara, Muir Woods, Nice, Niles Canyon, Oakland, San Luis Obispo, Ventura; *Colorado:* Fort Collins; *Idaho:* Bellevue, Genesee; *Utah:* Logan Canyon, Richfield; *Washington:* Cliffdell, Puyallup; *British Columbia:* Kelowna.

Collection dates.—From February 6 to September 27 in California. Severin (43) reported it abundant throughout the spring and summer in California.

Host plant.—Numerous specimens have been collected on a nettle (*Urtica holoserica* Nutt.), which is presumably the main host plant. Van Duzee (60) reported it abundant everywhere in California on nettle.

Type.—A male cotype specimen from Santa Clara County, Calif., collected by D. W. Coquillett, here designated lectotype, is in the United States National Museum.

Remarks.—Examined 172 specimens; of these, 111 were males, 25 of which were dissected.

From *omani* to which it is similar in form and size, *mendicus* differs considerably in having a distinct yellow transverse band on the pronotum and a narrower pygofer spine, which arises from the middle of the caudal margin of the pygofer.

Severin (43) reported a parasite, *Allomethus oleus* Rapp (Dorylaidae), infesting this species. He also reported the failure of the species to transmit California aster yellows.

***Colladonus rupinatus* (Ball)**

(Figs. 23 and 66)

Thamnotettix rupinata Ball, 1911, Canad. Ent. 43: 199.*Thamnotettix rupinatus*, Van Duzee, 1916, Check List of the Hemiptera (Excepting the Aphididae, Aleyrodidae and Coccidae) of America, North of Mexico, p. 74.*Friscanonus rupinatus*, DeLong and Knull, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 47.*Friscanonus rupinatus* var. *brunneus*, DeLong and Severin, 1948, Hilgardia 18: 198, (new synonymy).*Colladonus rupinatus*, Oman, 1949, Wash. Ent. Soc. Mem., No. 3, p. 125.

Head subacutely angled, apex rounded; pronotum without distinct transverse band; forewings without spot on clavi; similar to *intricatus* in habitus but can be distinguished from it through the male genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave at middle, caudal margin broadly and obtusely convex, dorsal margin with distal portion convex; pygofer spine straight, lanceolate, arising from middle of caudal margin, projecting dorsally; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 23c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about 3 times as long as wide, curved slightly posterolaterally, sides nearly parallel, slightly wider basally, apex truncate; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, narrowed apically, crossing in dorsal view; gonopore situated at about midlength of aedeagal shaft. (Fig. 23a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, very shallow, about one-fourth length of segment; spatulate process short, slightly longer than basal width, produced considerably beyond posterior margin, with sides nearly parallel, apex convex. (Fig. 66.)

Distribution.—California: Lands End, San Francisco, Stinson Beach.

Collection dates.—From June 28 to September 9; most abundant during June.

Host plants.—DeLong and

Severin (15) reported its occurrence on bracken and monkey-flower in California.

Type.—A male cotype specimen from San Francisco, Calif., collected on June 28, 1908, by E. D. Ball, here designated lectotype, is in the United States National Museum.

Remarks.—Examined 56 specimens; of these, 31 were males, 25 of which were dissected.

Van Duzee (60) stated that *rupinatus* was doubtfully distinct from *intricatus*. However, the author found the genitalia of *rupinatus* to be quite distinct from those of *intricatus*; in the former insect the caudal margin of the pygofer was obtusely convex. Also the apex of the crown was rounded.

Severin (43) reported this species as a vector of California aster yellows.

***Colladonus lineatus*, new species**

(Figs. 24 and 69)

Head with anterior margin acutely angled, apex pointed; pronotum without transverse band; forewings without spot on clavi; general color fulvous; similar to *gemmatum* in habitus but more linear and crown much more produced.

Male 4.70 mm., female 5.24 mm.

Head about as wide as pronotum, crown more than one-third longer at middle than next to mesal margin of eye; pronotum with lateral angles nearly straight, curved mesally, meeting truncate posterior margin; forewings long and narrow; clypeus somewhat flattened, with lateral sutures nearly straight, converging distally to broad concave apex; clypellus with lateral sutures slightly constricted medially; male valve typically triangular; plates spoon shaped, with many long setae on lateral and apical margins.

Crown fulvous, ivory in females, 2 large triangular black spots situated transversely on apex; fuscous uneven narrow band between eyes, narrow line along mesal margin of each eye, forming 3-sided box; eyes green; pronotum fulvous, with narrow ivory band along anterior margin, more distinct in females; scutellum fulvous or ivory, with narrow deep transverse line at middle, 2 faint spots above, lateral angles deep

ochrous; forewings somewhat smoky, suffused with dark green, veins flavous; entire face fulvous; clypeus with longitudinal row of black arcs on either side of middle; abdomen flavous below, black above; male valve fulvous; plates fulvous; color varies from creamy ivory to fulvous, more distinct in females.

Pygofer in lateral aspect slightly longer than wide, ventral margin slightly concave about middle, caudal margin nearly truncate, dorsal margin with distal portion convex; pygofer spine short, straight, lanceolate, arising from middle of caudal margin of pygofer, projecting posterodorsally; caudoventral margin below pygofer spine with few minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 24c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short, narrow, about twice as long as wide, sides parallel, apex convex; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 24a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin convex on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process about twice as long as basal width, produced beyond posterior margin, sides not parallel, broader basally, apex slightly bifid. (Fig. 69.)

Host plants.—Unknown.

Types.—The male holotype, Monterey, Calif., August 10, 1938, L. W. Hepner; female allotype, Monterey, Calif., August 10, 1938, R. I. Sailer; 3 female paratypes, Monterey, Calif., August 10, 1938, R. I. Sailer and L. W. Hepner; in the Snow collection of the University of Kansas. Additional paratypes, 2 males, Monterey, Calif., August 10, 1938, R. H. Beamer; Santa Cruz Mountains, Calif., August 13, 1938, L. W. Hepner; in the United States National Museum; 1 male, Monterey, Calif., August 10, 1938, L. W. Hepner; 2 females, Monterey, Calif., August 10, 1938, L. W. Hepner and R. H.

Beamer; in the collection of the author.

Remarks.—From *geminatus* to which it is similar, *lineatus* can be separated by its aedeagus having the bifurcate processes less than one-half as long as the shaft.

Colladonus kirkaldyi (Ball)

(Figs. 25 and 68)

Thamnotettix kirkaldyi Ball, 1911, Canad. Ent. 43: 197.

Idiodonus kirkaldyi, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 46.

Colladonus intricatus, DeLong and Severin, 1948, Hilgardia 18: 196.

Colladonus kirkaldyi, Oman, 1949, Wash. Ent. Soc. Mem., No. 3, p. 125.

Head obtusely angled, apex rounded; pronotum without transverse band; forewings without spot on clavi; related to *atropunctatus* but distinguishable by certain male genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave about middle, caudal margin triangularly convex, dorsal margin with distal portion convex; pygofer spine with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 25c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft robust, about twice as long as basal width, sides not parallel, expanded apically; stylar spine apical, sharply pointed, projecting laterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, flat, narrow throughout, narrowed apically, crossing in dorsal view; gonopore of aedeagus basal of midlength of shaft. (Fig. 25a, b.)

Female seventh sternum slightly more than twice as wide as long, lateral margins parallel, posterior margin acutely convex on each side of median spatulate process; median emargination V-shaped, shallow, less than one-half length of segment; spatulate process short, slightly longer than wide, produced slightly beyond posterior marginal extremity, with sides parallel, apex truncate. (Fig. 68.)

Distribution.—Coastal area of northern Mexico and California. Specimens are at hand from *California*: Del Mar, La Jolla, La Mesa, Lucerne, Miramar,

Montara, Salinas, San Diego, San Francisco, Santa Cruz, Santa Margarita, Stinson Beach, Watsonville; *Mexico*: Tijuana.

Collection dates.—From June 2 to August 15; most abundant during July and August.

Host plants.—DeLong and Severin (15) reported it on sagebrush (*Artemisia* sp.) in the summer and autumn from San Mateo County, Calif. Severin (43) reported its natural host as coast sagebrush (*Artemisia californica* Less.). Van Duzee (57) reported it on mallows.

Type.—A male cotype specimen, labeled Tijuana, Mexico, June 15, 1908, collected by E. P. Van Duzee, here designated lectotype, is in the United States National Museum.

Remarks.—Examined 102 specimens; of these, 46 were males, 20 of which were dissected.

From *atropunctatus* to which it is similar in general habitus and certain male genital characteristics, *kirkaldyi* can be separated by its serrate, falcate pygofer spine and the gonopore of the aedeagus basad of the midlength of the shaft.

Severin (43) reported this species as a vector of California aster yellows.

***Colladonus davisii*, new species**

(Fig. 26)

Head with anterior margin obtusely angled, apex slightly pointed; pronotum without transverse band; forewings without spot on clavi; general color yellowish green; similar to *geminatus* in habitus but smaller.

Length of male 4.00 mm.

Head about as wide as pronotum, crown slightly more than one-third longer at middle than next to mesal margin of eye; pronotum with lateral angles convex, curved mesally, meeting slightly concave posterior margin; forewings long, narrow; clypeus slightly tumid medially, lateral sutures nearly straight, converging distally to rather broad concave apex; clypellus with lateral sutures constricted medially; male valve typically triangular; plates

long, spoon shaped, with numerous fine long setae on lateral and apical margins.

Crown ivory, suffused with ocher, 4 black spots on anterior margin, 2 large approximate ones situated transversely on extreme apex, 2 smaller ones just behind ocelli next to mesal margin of eyes; eyes pale green; pronotum yellowish, suffused with ivory; scutellum ochrous, with deep fuscous transverse line at middle; forewings somewhat smoky hyaline, veins deeply flavous or ivory, fuscous at apex of wings; face ivory, suffused with deep ocher, sutures fuscous; clypeus with 2 rows of deep ochrous arcs on each side of middle; legs ivory, suffused with ocher; abdomen ivory below, suffused with deep fuscous above; male valve and plates ivory, suffused with light ocher.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave at middle, caudoventral margin somewhat produced posteriorly to broad lobe, dorsal margin with distal portion slightly convex; pygofer spine short, straight, lanceolate, arising from apex of caudoventral lobe, projecting dorsally; caudoventral margin below pygofer spine with few minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 26c.)

Style in dorsal aspect about twice as long as connective; stylar shaft short, narrow, about twice as long as wide, sides not parallel, slightly broader subapically, apex convex; stylar spine apical, short, sharply pointed apically, projecting laterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, flat and broad at midlength, curved laterally, sharply narrowed apically, crossing in dorsal view; gonopore of aedeagus basad of midlength of shaft. (Fig. 26a, b.)

Host plants.—Unknown.

Types.—The male holotype (No. 62756) and male paratype, Pine Valley, Calif., July 6, 1931, E. D. Ball, in the United States National Museum.

Remarks.—From *intricatus* to which it is related, *davisii* can be separated because the gonopore of the aedeagus is situated basad of the midlength of the shaft and the bifurcate processes are more than one-half as long as the aedeagal shaft.

This species is named for John Davis of the Oregon State Department of Agriculture,

Colladonus torneellus
(Zetterstedt)

(Figs. 27 and 63)

Cicada Torneella Zetterstedt, 1828,
His Fauna Insectorum Lapponica,
p. 528.

Thamnotettix torneella, Zetterstedt,
1840, *His Insecta Lapponica*, p. 294.

Thamnotettix oxalidis Fieber, 1885, *Rev.*
d' Ent. 4: 71.

Hypospadianus torneellus, Ribaut, 1942,
[Toulouse] *Soc. d' Hist. Nat. Bul.*
77, p. 264.

Colladonus torneellus, Oman, 1949,
Wash. Ent. Soc. Mem., No. 3, p. 125.

Head obtusely angled, apex rounded; pronotum with faint narrow olive transverse band; forewings without spot on clavi; similar to *youngi* in habitus and certain genital characteristics.

Pygofer in lateral aspect about as long as wide, ventral margin concave about middle, caudal margin truncate, dorsal margin with distal portion straight; pygofer spine poorly developed, very small, short, arising from middle of caudal margin, projecting dorsally; caudodorsal submarginal area with several long setae. (Fig. 27c.)

Style in dorsal aspect about 1½ times as long as connective; stylar shaft long, narrow, about 3 times as long as wide, curved posterolaterally, with sides parallel, apex truncate; stylar spine apical, small, projecting laterally; aedeagus with bifurcate processes about half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 27a, b.)

Female seventh sternum twice as wide as long, lateral margins parallel, posterior margin triangularly convex on each side of median emargination; median emargination shallow, about one-fourth length of segment, narrowly U-shaped basally, broadly V-shaped distally; spatulate process absent. (Fig. 63.)

Distribution.—England, Europe, and Siberia. It is the only palaeartic species of *Colladonus*. Specimens are at hand from *England*: Cheshire, Darent Wood, Kent, Lancashire; *Sweden*: Jäckvik, Lapponia Tornensis, Lemmenjoki, Ringslet, Tjärnberg, Vestgott.

Collection dates.—June and July.

Host plants.—Zetterstedt (65)

reported it inhabiting pines and grains.

Type.—Zetterstedt's type is presumably lost. A male specimen (No. 191) and a female specimen (No. 192) bearing the label *C. Torneella*, here designated male neotype and female neallotype, are in the Entomologisk Museum of Lund, Sweden. According to Ossiannilsson (37), many of Zetterstedt's types were designated as idiospecies (metatypes), since the types of 1828 (*Fauna Insectorum Lapponica*) were presumably replaced by specimens used by the author in his work of 1840 (*Insecta Lapponica*). Furthermore, certain colored labels were placed with the specimens in 1850 by A. G. Dahlbom to signify the collection dates made by Zetterstedt. The light green labels associated with *C. Torneella* signified that Zetterstedt collected them in 1840 and used them for the basis of his description at that time.

Remarks.—Examined 8 specimens; of these, 4 were males, all of which were dissected.

From *youngi* to which it is similar in general habitus, *torneellus* can be distinguished by its minute pygofer spine barely discernible from the caudal margin of the pygofer and the bifurcate processes about one-half as long as the aedeagal shaft.

Colladonus omani, new species

(Figs. 28 and 64)

Head with anterior margin subacutely angled, apex pointed; pronotum without transverse band; forewings without spot on clavi; general color yellowish green; similar to *geminatus* but larger and more robust.

Length of male 5.53 mm., female 5.83 mm.

Head about as wide as pronotum, crown almost one-half longer at middle than next to mesal margin of eye; pronotum with lateral angles convex, meeting slightly concave posterior margin; forewings long and narrow, with hyaline costal area; clypeus slightly tumid, with lateral sutures expanded

below antennal pits, converging basally to broad concave apex; clypellus with lateral sutures nearly parallel; male valve short, broadly triangular, apex rounded; plates together spoon shaped, with numerous long fine setae on lateral and apical margins.

Crown creamy ivory, with 4 distinct black spots on anterior margin, 2 situated transversely on either side of extreme apex, 2 smaller ones behind ocelli next to mesal margin of eyes; eyes dark green; pronotum ivory, suffused with yellow above and green below; scutellum ivory, with deep fuscous line at middle, suffused with yellow at middle, deep ochrous at lateral angles; forewings smoky green, becoming fuscous at apex, veins ivory yellow, costa hyaline; clypeus ivory, suffused with light ochre, longitudinal row of fuscous arcs on each side of middle, sutures fuscous; clypellus, lorae, and genae ivory, suffused with light ochre; legs ivory, suffused with light ochre; abdomen black, connexivum yellow; male valve deep ochrous; plates fuscous basally, yellowish apically.

Pygofer in lateral aspect about as long as broad, ventral margin convex at middle, caudal margin truncate or nearly so, dorsal margin with distal portion slightly convex; pygofer spine very short, robust, straight, arising nearly ventrally, projecting dorsally; caudodorsal submarginal area with many long setae. (Fig. 28c.)

Style in dorsal aspect almost twice as long as connective; stylar shaft long, about $2\frac{1}{2}$ times as long as basal width, projecting posterolaterally, sides parallel, apex truncate; stylar spine apical, short, pointed apically, projecting slightly anterolaterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, forceps shaped in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 28a, b.)

Female seventh sternum about $2\frac{1}{2}$ times as wide as long, lateral margins parallel, posterior margin subtruncate on each side of median spatulate process; median emargination U-shaped, deep, broad, about one-half length of segment; spatulate process long, broad, about twice as long as basal width, produced beyond posterior margin, with sides concave medially, apex deeply bifid. (Fig. 64.)

Host plants.—Numerous specimens have been collected on *Arctostaphylos glandulosa* Eastw. and *pringlei drupacea* Parry from the San Jacinto Mountains and

Idyllwild, Calif., by R. H. Beamer.

Types.—The male holotype, female allotype, 30 male paratypes, and 30 female paratypes, all from San Jacinto Mountains, Calif., July 30, 1938, R. H. Beamer, in the Snow collection of the University of Kansas. Additional paratypes, 20 males and 20 females, all from the type locality, in the United States National Museum; 11 males and 9 females, San Jacinto Mountains, Calif., July 31, 1936, D. R. Lindsay, in the collection of the California Academy of Sciences; 4 males and 2 females, Idyllwild, Calif., July 29, 1938, R. H. Beamer, in the collection of Oregon State College; 26 males and 15 females, from the type locality, in the collection of the author.

Remarks.—From *geminatus* to which it is similar, *omani* can be separated by its short stubby pygofer spine arising nearly ventrally from the caudal margin of the pygofer.

This species is named for Paul W. Oman of the Entomology Research Branch.

Colladonus collaris (Ball)

(Figs. 29 and 67)

Thamnotettix collaris Ball, 1902, *Canad. Ent.* 34: 15.

Thamnotettix exquisitos Osborn, 1905, *N. Y. State Mus. Bul.* 97, p. 534.

Colladonus collaris, Ball, 1936, *Brooklyn Ent. Soc. Bul.* 31, p. 57.

Colladonus exquisitos, Oman, 1949, *Wash. Ent. Soc. Mem.*, No. 3, p. 125.

Head obtusely angled, apex rounded; pronotum with distinct yellow transverse band; forewings with distinct yellow elliptical spot on clavi; similar to *fulvulatus* in habitus but distinct from it in male genital characteristics.

Pygofer in lateral aspect twice as long as wide, ventral margin slightly concave about middle, caudoventral margin long, curved posterodorsally, caudodorsal margin produced posteriorly to convex lobe, dorsal margin quite long and straight; pygofer spine short, stubby, base fused to caudodorsal margin of pygofer, distal portion free, arising from apex of caudodorsal lobe, projecting posterodorsally, margin of

fused portion irregularly serrate; dorsal submarginal area with many long setae. (Fig. 29c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft large, about 3 times as long as wide, sides not parallel, broader apically, apex truncate; stylar spine apical, broad at base, short, blunt at apex, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, broad at mid-length, acutely pointed apically, crossing in dorsal aspect; gonopore at mid-length of aedeagal shaft. (Fig. 29a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin uniformly convex on each side of median spatulate process; median emargination broadly V-shaped, deep, slightly less than one-half length of segment; spatulate process about twice as long as basal width, produced up to posterior margin, sides parallel, apex acutely bifid. (Fig. 67.)

Distribution.—Rather rare, occurs only in the Eastern United States and eastern Canada. Its southern limit appears to be Virginia, and it extends northward to Ontario, Canada, and as far west as Ohio. Specimens are at hand from Connecticut; Maryland: Plummer Island; New York: East Aurora, Hamburg, Ithaca, McLean, Old Forge, Otter Lake; Ohio: Pennsylvania: Cresson, Du Bois, Kane; Virginia; Ontario: Ingersoll, Strathroy.

Collection dates.—From June 12 in Maryland to September 12 in Ontario; most abundant during July and August.

Host plants.—Osborn (35) collected it from deep woods, in boggy swamps, and on underbrush in Ohio. DeLong (11) reported it abundant in cool, moist woods on *Impatiens* sp. in Connecticut.

Types.—The female holotype (no data label) is in the United States National Museum. A co-type specimen, labeled *Thamnotettix exquisitos*, from Hamburg, N. Y., collected August 8, 1904, by E. P. Van Duzee, here designated lectotype, is in the Snow

collection of the University of Kansas.

Remarks.—Examined 27 specimens; of these, 10 were males, all of which were dissected.

From *furculatus* to which it is similar in general habitus, *collaris* can be separated by its caudo-dorsal margin of the pygofer produced posteriorly to a convex lobe, the short stubby pygofer spine, the bifurcate processes less than one-half as long as the aedeagal shaft, and the apical stylar spine.

Colladonus furculatus (Osborn)

(Figs. 30 and 80)

Thamnotettix furculatus Osborn, 1905, Ohio Nat. 5: 275.

Colladonus furculatus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 46.

Head with anterior margin rounded; pronotum with distinct yellow transverse band; forewings with distinct yellow oval spot on clavi; remarkably similar to *clitellaris* in habitus but quite distinct in genital characteristics.

Pygofer in lateral aspect about twice as long as wide, ventral margin slightly concave, with triangular hyaline area at middle, caudal margin obtusely convex, dorsal margin with distal portion convex; pygofer spine well developed, lanceolate, arising from caudoventral margin of pygofer, projecting posterodorsally; caudoventral marginal area with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 30c.)

Style in dorsal aspect twice as long as connective; stylar shaft long, about 4 times as long as basal width, curved posterolaterally at distal half, apex acutely convex; stylar spine subapical, minute; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, narrow, tubular, parallel except at apical half, curve laterally in dorsal view; gonopore of aedeagus basad of midlength of shaft. (Fig. 30a, b.)

Female seventh sternum about 3 times as wide as long, lateral margins parallel, posterior margin somewhat concave on each side of median spatulate process; median emargination broadly V-shaped, deep, more than one-half length of segment; spatulate process about 5 times as long as basal width, produced

considerably beyond posterior margin, with sides parallel, apex deeply bifid. (Fig. 80.)

Distribution.—Rather rare, occurring from the Eastern and Central United States to eastern Canada. Specimens are at hand from *Illinois*: Apple River Canyon State Park, Warren; *Iowa*: Ames; *Kansas*: Onaga; *Maryland*: Forest Glen, Plummer Island; *New York*: Greene County, Onteora Mountain; *Ohio*: Columbus, Sandusky; *Wisconsin*: St. Croix Falls; *Ontario*: Merivale, Ridgeway.

Collection dates.—From May 10 to August 28.

Host plants.—Osborn (36) reported it from low vegetation bordering woods. Some specimens have been collected in light traps.

Type.—The female holotype is in the Herbert Osborn collection of Ohio State University.

Remarks.—Examined 18 specimens; of these, 8 were females and 10 were males, all of which were dissected.

This species is so similar to *clitellarius* that dissection of the genitalia is necessary to separate the two species. From *clitellarius* to which it is related, *furculatus* can be distinguished by its aedeagus having the bifurcate processes more than one-half as long as the shaft, the minute stylar spine, and the gonopore basad of the midlength of the aedeagal shaft. Superficial body characters of *furculatus*, though not reliable, are the more robust size and the spot on the clavi of the forewings, which does not reach the basal apex of the scutellum.

Colladonus clitellarius (Say)

(Figs. 81 and 81)

Jassus clitellaria Say, 1830, Acad. Nat. Sci. Phila. Jour. 6: 309.

Jassus clitellarius, Harris, 1835, Hitchcock's Geology of Massachusetts, p. 580.

Bythoscopus clitellarius, Fitch, 1851, [Albany, N. Y.] State Cabinet Nat. Hist. Ann. Rpt. 4: 58.

Thamnotettix clitellarius, Uhler, 1884, Riverside Natural History, v. 2. p. 246.

Thamnotettix clitellaria, Van Duzee, 1894, Amer. Ent. Soc. Trans. 21: 301.

Colladonus clitellarius, Ball, 1936, Brooklyn Ent. Soc. Bul. 31, p. 57.

Colladonus clitellarius var. *marcidus* Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 29.

Head with anterior margin rounded; forewings with distinct yellow suboval spot on clavi reaching base of scutellum; related to *furculatus* in habitus but distinct from it in genital characteristics.

Length of male 5.19 mm., female 5.70 mm.

Head about as wide as pronotum, crown slightly longer at middle than along mesal margin of eye; pronotum with lateral angles curved slightly mesally, abruptly meeting truncate posterior margin; scutellum typically triangular; forewings long, narrow, with hyaline costal area; frons tumid; clypeus with lateral marginal lines expanded medially below antennal pits, converging apically to narrow slightly convex apex; clypellus with sides nearly parallel; male valve small, triangular, rounded distally; plates together spoon shaped, becoming attenuated distally, produced slightly beyond pygofer, with many long fine hairlike setae along lateral and apical margins, interspersed with several short coarse spinelike setae.

Crown ivory, with 2 small approximate transverse black spots on anterior margin; eyes ferruginous-testaceous; pronotum with distinct yellow transverse band occupying most of basal portion; scutellum fuscous; forewings fuscous, costa hyaline; face yellowish ivory; clypeus with 2 rows of fulvous transverse lines below each spot; legs entirely yellowish ivory; abdomen yellowish ivory ventrally, black dorsally; body color may vary from light golden to black.

Pygofer in lateral aspect about twice as long as wide, ventral margin obtusely concave about middle, broadly convex at posterior portion, caudal margin obtusely convex, dorsal margin with distal portion slightly convex; pygofer spine well developed, long, lanceolate, straight, arising caudoventrally, projecting posterodorsally from caudal margin of pygofer; caudoventral marginal area with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 31c.)

Style in dorsal aspect about twice as long as connective; stylar shaft about 4 times as long as basal width, produced posteriorly, with sides parallel, apex convex; stylar spine subapical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 31a, b.)

Female seventh sternum twice as wide as long, lateral margins parallel, posterior margin obtusely concave on either side of median spatulate process; median emargination U-shaped, deep, about one-half length of segment; spatulate process long, about 3 times as long as basal width, produced beyond posterior margin, with sides parallel, apex acutely bifid. (Fig. 81.)

Distribution.—Very common in the United States and Canada east of the Rocky Mountains. Specimens are at hand from *Alabama*: Antioch, Havana, Lima, Monticello, Oquawka, Volo; *Indiana*: Lafayette, Rogers; *Iowa*: Ames, Gilbert, Mount Pleasant, Muscatine; *Kansas*: Cherokee County, La Cygne, Onaga; *Kentucky*: Covington; *Maryland*: Ashton, Beltsville, Plummer Island; *Massachusetts*: Boston; *Michigan*: Benton Harbor, Park Rapids; *Minnesota*: Ramsey County; *Missouri*: St. Louis; *New Jersey*: Roselle, Rutherford; *New York*: Ithaca, Lancaster, Minetto, Rochester; *Ohio*: Barberton, Columbus; *Pennsylvania*: Pittsburg, Rohrsburg; *Tennessee*: Elkton, Hamilton County; *Virginia*: Nelson County; *Wisconsin*: Madison, Reedsville; *Manitoba*: McCreary; *Ontario*: Ingersoll, Mer Bleue, Ottawa, Trenton; *Quebec*: Alcouve, Hemmingford, Hull.

Collection dates.—From May to September; most abundant during June and July.

Host plants.—Collected from *Wisteria* sp., *Acer saccharum* Marsh., *Buddleia* sp., Lombardy poplar, *Salix sericea* Marsh., birch, and goldenrod. Glick (23) reported it was collected at

1,000 feet by airplane traps in Louisiana.

Type.—The type of Say's species is presumably lost. A male specimen from Lafayette, Ind., collected from willow on October 5, 1931, by A. W. Trippel has been dissected and found to agree with Lawson's (28) illustration of this species. Lawson's illustration appears to be the earliest on record to include sufficient diagnostic detail to distinguish this species from *furculatus*, which occurs in the same range. This specimen from Lafayette is here designated male neotype of *Jassus clitellaria* Say and is in the United States National Museum.

Remarks.—Examined 352 specimens; of these, 148 were males, 44 of which were dissected.

This species is so similar to *furculatus* in general habitus that it can be distinguished only through the following genital characteristics: Bifurcate processes of the aedeagus less than one-half as long as the aedeagal shaft, stylar spine longer, sides of stylar shaft parallel, and gonopore at midlength of the aedeagal shaft in lateral aspect. The median emargination of the female seventh sternum is distinctly U-shaped.

Muesebeck (31) reported the accepted common name as the saddled leafhopper.

Thornberry (48) and Gilmer (22) reported this species as a vector of eastern X-disease virus of peach.

***Colladonus eburatus* (Van Duzee)**

(Figs. 32 and 82)

Thamnotettix eburata Van Duzee, 1889, Canad. Ent. 21: 10.

Thamnotettix eburatus, Van Duzee, 1892, Psyche 6: 306.

Colladonus eburatus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Head with anterior margin rounded; pronotum without transverse band; forewings with distinct subquadrate yellow or ivory spot on clavi; similar to *setaceus* in habitus and related to *clitellarius* in many genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave, broadly convex at posterior portion, caudal margin nearly truncate, dorsal margin with distal portion convex; pygofer spine well developed, long, straight, lanceolate, arising caudoventrally, projecting posterodorsally; caudoventral marginal area with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 32c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft narrow, about 3 times as long as wide, sides parallel, apex convex; stylar spine subapical, short, sharply pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, tubular, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 32a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, deep, about one-half length of segment; spatulate process long, narrow, about 3 times as long as basal width, heavily sclerotized, produced as far as posterior margin, sides not parallel, broad distally, apex bifid. (Fig. 82.)

Distribution.—Northeastern United States and Canada, westward to Montana and British Columbia. *Michigan*: Mackinac Island State Park; *Minnesota*: Clearwater County, Lutsen; *Montana*: Gallatin County; *New Hampshire*: Franconia, Willey House; *Wisconsin*: Kawashi River, Trout Lake, Vilas County; *Alberta*: Crows Nest Pass, Waterton Lakes; *British Columbia*: Crankbrook, Pentlicton, Quesnel, Sugar Lake; *Manitoba*: Awene, Mafeking; *Ontario*: Lake Temagami, Norman; *Quebec*: Forestville, Kazubazua, Lac des Quinze, Lac Mercier, Muskoka.

Collection dates.—From July 8 to September 10; most abundant during August.

Host plant.—Several specimens were collected on poplar, which is presumably the host.

Type.—The male lectotype from Muskoka Lake, Ontario, collected in July 1888 by E. P. Van Duzee is in the collection of Iowa State College; it was designated by Oman (33) in 1947.

Remarks.—Examined 30 specimens; of these, 17 were males, all of which were dissected.

From *setaceus* to which it is similar in habitus, *eburatus* can be distinguished by its subapical stylar spine and the aedeagus with bifurcate processes less than one-half as long as the aedeagal shaft. It can be separated from *clitellarius* by the subquadrate spot on the clavi of the forewings and the absence of the transverse band on the pronotum.

Colladonus balli, new species

(Figs. 33 and 79)

Head with anterior margin obtusely angled; pronotum with distinct broad yellow or ivory transverse band occupying most of basal portion, ochrous above; forewings with distinct yellow or ivory subquadrate spot on clavi; general color flavous; similar to *montanus* in habitus but without the 2 spots on the front.

Length of male 4.53 mm., female 5.53 mm.

Head about as wide as pronotum, apex rounded, crown about one-third longer at middle than next to mesal margin of eye; pronotum with lateral angles convex, curved mesally, meeting slightly concave posterior margin; forewings long and narrow, with costal area hyaline; clypeus slightly tumid, lateral sutures converging to narrow concave apex; clypeus with lateral sutures nearly parallel; male valve short, broadly triangular; plates together spoon shaped, attenuated apically, with numerous long fine setae on lateral and apical margins.

Crown flavous, immaculate; eyes pale green; scutellum ochrous, with deep fuscous transverse line at middle; forewings transparent, tinged with ochre, costa hyaline; entire face deeply flavous; legs and abdomen flavous; male valve and plates deeply flavous; color varies from light flavous to ochrous.

Pygofer in lateral aspect about $1\frac{1}{2}$

times as long as wide, ventral margin concave, caudoventral margin produced posterodorsally to fingerlike lobe, caudodorsal margin straight, dorsal margin with distal portion straight; pygofer spine poorly developed, short, lanceolate, arising from apex of lobe, projecting posterodorsally; caudodorsal submarginal area with many long setae. (Fig. 33c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft robust, short, about twice as long as wide, curved slightly posterolaterally, sides not parallel, broader apically, roughly sinuate, apex truncate; stylar spine apical, short, broad basally, pointed apically projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, narrow, nearly tubular, sharply narrowed apically, parallel in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 33a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin slightly concave on each side of medial, spatulate process; median emargination U-shaped, deep, nearly one-half length of segment; spatulate process short, about as long as basal width, produced before posterior margin, sides nearly parallel, apex deeply bifid. (Fig. 79.)

Host plants.—Unknown.

Types.—The male holotype (paratype of *Colladonus montanus mulsus* Ball), Wells, Nev., July 20, 1912, E. D. Ball; female allotype, Carson City, Nev., August 1940, L. C. Kuitert; 11 paratypes, 7 males, Wells, Nev., July 20, 1912, E. D. Ball; Unity, Oreg., July 11, 1927, H. E. Wallace; Burns, Oreg., July 12, 1927, H. E. Wallace; Ironside, Oreg., July 11, 1928, H. E. Wallace; 4 females, Cedar, Utah, September 12, 1915, E. D. Ball; St. George, Utah, August 8, 1936, E. W. Davis; Beaver, Utah, June 6, 1948, G. F. Knowlton; in the United States National Museum. Additional paratypes, 11 males, Cove Fort, Utah, August 14, 1929, P. W. Oman and R. H. Beamer; Fish Lake, Utah, August 16, 1929, R. H. Beamer; Maybell, Colo., June 29, 1931, L. D. Anderson and R. H. Beamer; Durango, Colo., July 2 and 6, 1937, R. H. Beamer; 11 females,

Mesa Verde National Park, Colo., June 1927, V. M. Tanner; Cove Fort, Utah, August 14, 1929, R. H. Beamer; Craig, Colo., June 6, 1931, R. H. Beamer; Haines, Oreg., July 10, 1931, R. H. Beamer; Fall River Pass, Rocky Mountain National Park, Colo., August 17, 1936, R. H. Beamer; Durango, Colo., July 6, 1937, R. H. Beamer; Austin, Nev., August 12, 1940, L. C. Kuitert; in the Snow collection of the University of Kansas; 2 males, Durango, Colo., July 4, 1937, L. D. Tutthill, in the collection of Iowa State College; 2 females, Provo Beach, Utah, September 8, 1932, G. F. Knowlton and M. J. James; Duchesne, Utah, September 3, 1937, G. F. Knowlton and F. C. Harms-ton; in the collection of Utah State Agricultural College; 3 males, Victoria, British Columbia, July 11, 1918, W. Downes; Austin, Nev., August 12, 1921, L. C. Kuitert; St. George, Utah, June 10, 1928, E. W. Davis; 3 females, Pocatello, Idaho, July 21, 1901, E. S. G. Titus; Soldier Summit, Utah, August 13, 1906; Colorado, (No. 2011); in the collection of the author.

Remarks.—The species allied to *montanus montanus* can be separated by the distinct caudoventral fingerlike lobe of the pygofer and the small spine arising from its apex.

Colladonus montanus mulsus Ball

(Figs. 34 and 78)

Colladonus montanus mulsus Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 29.

Head obtusely rounded, apex rounded; pronotum with distinct yellow transverse band; forewings with distinct yellow spot on clavi; related to *montanus montanus* but always light to dark golden in color.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave at middle, caudal margin nearly truncate, dorsal margin with distal portion convex; pygofer spine long, lanceolate, arising caudoventrally, projecting posterodorsally; caudoventral

submarginal area with many minute setae; caudodorsal submarginal area with many long setae. (Fig. 34c.)

Style in dorsal aspect nearly twice as long as connective; stylar shaft somewhat robust, short, about twice as long as basal width, sides nearly parallel, serrate, apex truncate; stylar spine apical, short, blunt apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, sharply pointed apically; gonopore of aedeagus at midlength of shaft. (Fig. 34a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin uniformly convex on each side of median spatulate process; median emargination U-shaped, deep, slightly less than one-half length of segment; spatulate process about $1\frac{1}{2}$ times as long as basal width, produced beyond posterior margin, with sides parallel, apex convex. (Fig. 78.)

Distribution.—Western United States. Specimens are at hand from *California*: Leona Heights, Marin County, Muir Woods, Stinson Beach, Watsonville; *Oregon*: McMinnville.

Collection dates.—July and October.

Host plants.—Unknown.

Type.—The female holotype is in the United States National Museum.

Remarks.—Examined 13 specimens; of these, 6 males were dissected.

This species is more closely related to *montanus montanus* than to *montanus reductus*, because the male genitalia are similar. However, it can be separated by its longer bifurcate processes and more robust stylar shaft.

There was not sufficient evidence to justify a full species rank for this subspecies, and until further specimens are known, it seems best to retain its present status.

***Colladonus montanus montanus*
(Van Duzee)**

(Figs. 35 and 76)

Thamnotettix montanus Van Duzee, 1892, *Canad. Ent.* 24: 268.

Thamnotettix citellaria, Gillette and

Baker, 1895, *Colo. Agr. Expt. Sta. Bul.* 31, *Tech. Ser.* 1, p. 96.

Colladonus montanus, DeLong and Caldwell, 1937, *Check List of the Cicadellidae (Homoptera) of America, North of Mexico*, p. 46.

Head with anterior margin rounded; pronotum with distinct yellow or ivory transverse band; forewings with distinct yellow or ivory spot on clavi; related to *montanus reductus* in habitus and certain genital characteristics.

Pygofer in lateral aspect about as long as wide, ventral margin concave about middle, caudal margin truncate or nearly so, dorsal margin with distal portion convex; pygofer spine well developed, long, straight, lanceolate, arising caudoventrally, projecting dorsally; caudoventral marginal area with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 35c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about $2\frac{1}{2}$ times as long as basal width, sides parallel, curved slightly posterolaterally, apex truncate; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal aspect; gonopore of aedeagus at midlength of shaft. (Fig. 35a, b.)

Female seventh segment about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process short, about $1\frac{1}{4}$ as long as basal width, produced beyond posterior margin, with sides parallel, apex truncate. (Fig. 76.)

Distribution.—United States and Canada west of the Rocky Mountains. Specimens are at hand from *California*: Elko, Eureka, Huntington Beach, Laguna Mountains, Lake Tahoe, Los Angeles, Occidental, Palo Alto, Pine Valley, San Diego; *Colorado*: Craig, Kremmling, Steamboat Springs; *Idaho*: Burley, Franklin, Lake Waha, Nampa, Rexburg, Riverdale, Taylor, Whitney; *Montana*: Charlo, Deborgia, Gardiner, Hamilton, Henrys Lake, Hot Springs, Missoula, Ravalli; *Nevada*:

Steamboat; Oregon: Bend, Bonneville, Corvallis, Culver, Forest Grove, Grand Ronde, Granger, Hood River, McMinnville, North Powder, Portland, Prineville, The Dalles, Woodburn; Utah: Avon, Cedar City, Cove, Farmington, Harrisville, Hooper, Kaysville, Lehi, Lewiston, Logan, Magna, Nephi, Paradise, Pleasant Grove, Providence, Provo, Richfield, Salt Lake City, Thistle; Washington: Cheney, Du Pont, Ellensburg, Fairfield, Fort Lewis, Kalama, Olympia, Pullman, Puyallup, Seattle, Spokane; Alberta: Lethbridge, Medicine Hat; British Columbia: Merritt, Oliver, Penticton, Summerland, Vancouver, Vancouver Island, Vernon.

Collection dates.—From April to October; most abundant during May and September.

Host plants.—This species is very common on alfalfa and clover throughout its range. It has been reported from sugar beet, vine maple, potato, gooseberry, strawberry, carrot, delphinium, *Atriplex rosea* L., celery, radish, willow, parsnip, apple, prune, peach, cherry, lettuce, tumbleweed, and pea.

Type.—The male lectotype, Colorado Accession Catalog 191, is in the collection of Iowa State College. Oman (33) designated the lectotype in 1947.

Remarks.—Examined 406 specimens; of these, 33 males were dissected.

From *montanus reductus* to which it is closely related, *montanus montanus* can be distinguished by its shorter pygofer spine and the presence of a distinct yellow or ivory spot on the clavi of the forewings.

Further clarification of Ball's statements in his original description is necessary here after a study of additional material of the *montanus* subspecies complex. In *montanus montanus* the body varies from black to golden, and

the yellow or ivory spot on the clavi of the forewings is always present. In *montanus reductus* the body also varies from black to golden, but the spot on the clavi of the forewings is very small and faint or entirely absent. In *montanus mulsus* the body is nearly always golden, sometimes dark golden, and the spot on the clavi of the forewings is always present but usually smaller than in *montanus montanus*. The scutellum is usually yellow and does not blend in with the rest of the body, giving it a rather prominent triangular appearance.

***Colladonus montanus reductus*
(Van Duzee)**

(Figs. 36 and 77)

Thamnotettix montanus reductus Van Duzee, 1917, Calif. Acad. Sci. Proc., Ser. 4, 7 (11): 298.

Colladonus montanus reductus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 46.

Colladonus montanus, DeLong and Severin, 1948, Hilgardia 18: 190.

Head with rounded anterior margin; pronotum with distinct yellow or ivory transverse band; forewings with spot on clavi very much reduced or absent; related to *montanus montanus* in habitus and most genital characteristics.

Pygofer in lateral aspect about as long as wide, ventral margin concave at middle, caudal margin truncate or nearly so, dorsal margin with distal portion straight; pygofer spine well developed, very long, slightly curved, lanceolate, arising caudoventrally, projecting posteriorly; caudoventral marginal area below pygofer spine with several minute setae; caudodorsal submarginal area with many long setae. (Fig. 36c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about twice as long as wide, curved slightly posterolaterally, sides nearly parallel, apex truncate; stylar spine apical, pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at about midlength of shaft. (Fig. 36a, b.)

Female seventh sternum about twice

as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin truncate on each side of median spatulate process; median emargination U-shaped, shallow, less than one-half length of segment; spatulate process short, about $1\frac{1}{2}$ times as long as basal width, produced beyond posterior margin, with sides parallel, apex truncate. (Fig. 77.)

Distribution.—United States and Canada west of the Rocky Mountains. It is much more common in California, its southern range, than in Washington or British Columbia, its northern range. Specimens are at hand from *Arizona*: Littlefield; *California*: Antioch, Bakersfield, Berkeley, Clarksburg, Escondido, Kernville, La Jolla, Los Angeles, Mission Beach, Olancha, Oxnard, San Diego, San Francisco, Santa Monica, Sargent, Solano, Weed, Woodland, Yosemite; *Colorado*: Grand Junction, North Peak; *Idaho*: Jerome; *Montana*: Charlo, Dixon, Stevensville; *Nevada*: Glendale, Las Vegas, Reno; *Oregon*: Bend, Corvallis, Dufur, Granger, Gresham, Hermiston, McMinnville, Medford, Redmond, Woodburn; *Utah*: Castle Dale, Elmo, Lapoint, Lupine, Moab; *Washington*: Auburn, Puyallup, Ritzville, Seattle, Toppenish, Walla Walla; *British Columbia*: Penticton, Summerland, Vernon, Victoria.

Collection dates.—From March 6 in California to October 2 in Oregon; most abundant during June and September.

Host plants.—This subspecies is common on alfalfa and clover throughout its range. Other host plants are *Malva parviflora* L. and *Atriplex* sp.

Type.—The male holotype (No. 336) is in the collection of the California Academy of Sciences.

Remarks.—Examined 341 specimens; of these, 25 males were dissected.

This subspecies is allied to *montanus montanus*, and it can be

separated from it by the larger pygofer spine projecting posteriorly and the much reduced size or absence of the spot on the clavi of the forewings.

A species under the name of *montanus* was reported by Severin (32) to be a vector of California aster yellows. However, it is highly probable that he was using *montanus reductus* instead. This belief is based on a report by DeLong and Severin (15), in which they illustrated the genitalia of specimens used in vector experiments. These illustrations agreed perfectly with the type of *montanus reductus*. Moreover, *montanus reductus* is much more abundant in California than *montanus montanus*. It is quite possible that both subspecies have been used in vector experiments, but until they are verified by further vector testing and genitalic identification of the specimens used, the valid vector is considered as *montanus reductus*.

Severin and Klostermeyer (44) reported the life history of a species under the name of *montanus*. The illustration of the body fits the description of *montanus reductus*.

Colladonus brunneus (Osborn)

(Figs. 37 and 72)

- Thamnotettix belli*, Forbes, 1900, Ill. State Ent. 10 (21): 76.
Thamnotettix belli var. *brunneus* Osborn, 1915, Maine Agr. Expt. Sta. Bul. 238, p. 135.
Thamnotettix belli var. *gilletti*, Leonard, 1926, Cornell Agr. Expt. Sta. Mem. 101, p. 170.
Colladonus belli var. *brunneus*, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.
Idiodonus belli var. *brunneus*, Medler, 1942, Minn. Agr. Expt. Sta. Tech. Bul. 155, p. 105.

Head with anterior margin rounded; pronotum with distinct pale or ivory transverse band, faint or absent in females; forewings without spot on clavi; similar to *belli* in habitus but distinct from it in genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave about middle, caudoventral margin produced slightly posteriorly to broad lobe, dorsal margin with distal portion straight; pygofer spine long, straight, lanceolate, arising from caudodorsal portion of lobe, projecting dorsally; caudodorsal submarginal area with many long setae. (Fig. 37c.)

Style in dorsal aspect slightly longer than connective; stylar shaft short, about twice as long as basal width, sides not parallel, slightly broader basally, apex truncate; stylar spine apical, very small, projecting laterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, somewhat tubular, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 37a, b.)

Female seventh sternum about twice as wide as long, lateral margins truncate on each side of median emargination; median emargination V-shaped, very shallow, less than one-fourth length of segment; spatulate process absent. (Fig. 72.)

Distribution.—Eastern United States and Canada. Specimens are at hand from *Connecticut*: Lynn; *Illinois*: Main; *Maine*: Orono; *Minnesota*: New Hampshire: Bretton Woods; *New York*: Arnot Forest, Stanford; *North Carolina*: Ohio: Greene County; *Pennsylvania*: Springbrook; *Tennessee*: Great Smoky Mountains National Park; *Ontario*: Quebec.

Collection dates.—From April 25 to October 10.

Host plants.—Unknown.

Types.—The female lectotype, Orono, Maine, July 29, 1913, and the male neallotype, Cranberry Lake, N. Y., collected on July 6, 1917, by C. J. Drake are here designated and are in the Herbert Osborn collection of Ohio State University.

Remarks.—Examined 35 specimens; of these, 6 males were dissected.

This species shows rather obvious sexual dimorphic color variation. The males have a distinct ivory transverse band across the pronotum and ivory to yellowish veins on the forewings. The females lack these distinct color

patterns but may show a rather faint band on the pronotum. This species is rather similar to *belli* in habitus but is somewhat more robust and larger. It can be distinguished from *belli* by the aedeagus having longer bifurcate processes and a longer and more distinct pygofer spine arising from the apex of a caudoventral lobe of the pygofer.

Colladonus fasciaticollis (Stål)

(Figs. 38 and 71)

Jassus fasciaticollis Stal, 1864, Stettin. Ent. Ztg. 25: 86.

Thamnotis fasciaticollis, Van Duzee, 1892, Psyche 6: 306.

Colladonus fasciaticollis, DeLong and Caldwell, 1937. Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Idiодonus tubulus DeLong, 1946, Ohio Jour. Sci. 46 (1): 22, (new synonymy).

Idiодonus discrus DeLong, 1946, *ibid.*: 24, (new synonymy).

Head with rounded anterior margin; pronotum with distinct narrow yellow transverse band; forewings without spot on clavi; similar to *belli* in habitus and certain genital characteristics.

Pygofer in lateral aspect about as long as wide, ventral margin slightly concave, caudal margin broadly convex, nearly truncate, dorsal margin with distal portion strongly convex; pygofer spine small, very short, acutely and abruptly pointed, arising midway from caudal margin, projecting dorsally, caudoventral margin just below pygofer spine strongly sclerotized; caudodorsal submarginal area with many long setae. (Fig. 38c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, narrow, about 3 times as long as basal width, sides nearly parallel, slightly broader basally, apex truncate; stylar spine absent; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 38a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin converging strongly posteromesally; median emargination V-shaped, very shallow, less than one-fourth length of segment; spatulate process very short, about one-half as long as basal width, produced slightly beyond posterior marginal

extremity, sides not parallel, broader basally, convergent apically, apex truncate. (Fig. 71.)

Distribution.—Restricted largely to Central America and Mexico, its range reaching the southern border of California. Specimens are at hand from *California*; *Costa Rica*: San Pedro de Montes de Oca; *Mexico*: Chapingo, D. F.; Peñón Marquez, D. F.; and Puebla, Puebla.

Collection dates.—From March 17 to October 18 in Mexico.

Host plants.—This species has been taken at 8,500 to 9,900 feet on evergreens by A. Dampf, C. C. Plummer, J. S. Caldwell, E. E. Good, and D. M. DeLong. Other specimens were collected on *Lipinia berlandieri* Schaver from San Pedro de Montes de Oca, Costa Rica, by C. H. Ballou.

Type.—A specimen bearing the name "*Jassus fasciaticollis* Stål," presumably the type and in Stål's own handwriting, is in the Naturhistorisches Museum, Vienna, Austria. The abdomen of the type is lost; therefore, a female specimen is designated homotype and placed with the type.

Remarks.—Examined 11 specimens. Two additional specimens from the Naturhistorisches Museum of Vienna were determined as *fasciaticollis* (Stål) by Ball and were presumably compared with the type by him. Since the abdomen of the type is lost, a male specimen was dissected and used as the basis for the illustration.

From *belli* to which it is similar, *fasciaticollis* can be distinguished by its somewhat larger size, the longer connective, absence of the stylar spine, and the pygofer having a heavily sclerotized caudoventral margin.

***Colladonus belli* (Uhler)**

(Figs. 39 and 73)

Jassus belli Uhler, 1877, U. S. Geol. and Geog. Survey Ter. Bul. 3, No. 2, p. 471.

Thamnotettix belli, Van Duzee, 1892, Psyche 6: 306.

Thamnotettix semipullatus Van Duzee, 1892, *ibid.*

Thamnotettix gillettei Van Duzee, 1892, *ibid.*

Thamnotettix Gillettei, Van Duzee, 1892, *Canad. Ent. 24*: 267.

Thamnotettix gillettei, Van Duzee, 1894, *Amer. Ent. Soc. Trans. 21*: 303.

Thamnotettix sonorae Gillette and Baker, 1895, *Colo. Agr. Expt. Sta. Bul. 31*, *Tech. Ser. 1*, p. 100.

Thamnotettix belli var. *gillettei*, Van Duzee, 1917, *Calif. Agr. Expt. Sta. Tech. Bul. 2*, p. 679.

Colladonus belli, DeLong and Caldwell, 1937, *Check List of the Cicadellidae (Homoptera) of America, North of Mexico*, p. 47.

Colladonus belli var. *gillettei*, DeLong and Caldwell, 1937, *ibid.*

Idiodonus belli, DeLong and Knull, 1945, *Ohio State Univ. Biol. Sci. Ser. 1*, p. 56.

Idiodonus belli var. *gillettei*, DeLong and Knull, 1945, *ibid.*

Colladonus gillettei, Oman, 1949, *Wash. Ent. Soc. Mem.*, No. 3, p. 125.

Colladonus sonorae, Oman, 1949, *ibid.*

Colladonus semipullatus, Oman, 1949, *ibid.*

Head with rounded anterior margin; pronotum with distinct narrow yellow or ivory transverse band; forewings without spot on clavi; related to *fasciaticollis* in habitus and certain genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin slightly concave, caudal margin truncate, dorsal margin with distal portion convex; pygofer spine short, straight, lanceolate, arising caudodorsally, projecting dorsally; caudoventral marginal area with many minute setae; caudo-dorsal and dorsal submarginal areas with many long setae. (Fig. 39c.)

Style in dorsal aspect about 1½ times as long as connective; stylar shaft long, narrow, about 3 times as long as wide, projecting posterolaterally, with sides parallel, apex truncate; stylar spine apical, short, pointed apically, projecting laterally; aedeagus with bifurcate processes more than one-half as long as aedeagal shaft, flat and broad at mid-length, pointed apically, crossing in dorsal aspect; gonopore of aedeagus at midlength of shaft. (Fig. 39a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin slightly convex on each side of median emargination; median emargination U-shaped, shallow, narrow, about one-third length of

segment, about twice as deep as broad; spatulate process absent. (Fig. 73.)

Distribution.—North America west of the Rocky Mountains, from Mexico to British Columbia. It is apparently restricted to the mountainous areas and does not occur along the Pacific coast. Specimens are at hand from *Arizona*: Alpine, Chiricahua Mountains, Flagstaff, Patagonia, San Francisco Mountains, Santa Rita Mountains, Tucson, White Mountains; *Colorado*: Boulder, Creede, Denver, Eldora, Fort Collins, Garfield, North Park, Pueblo, Rico, Ward; *Idaho*: Moscow, Rexburg; *Montana*: Bozeman, Butte; *New Mexico*: Chermo, Cloudcroft, Cowles, Estancia, Jemez Spring, Las Vegas, Pecos; *Utah*: Boneta, Elsinore, Ferron, Heber, Layton, Lehi, Logan, Marysvale, Ogden, Parowan, Payson, Richfield; *Wyoming*: Laramie, Yellowstone National Park; *British Columbia*: Chimney, Soda Creek; *Mexico*: Orizaba, Veracruz.

Collection dates.—From December in Mexico to September in Utah; most common during June and July.

Host plant.—Trapped on peach in Utah by the author.

Types.—The female holotype of *Jassus belli* Uhler (No. 43520) is in the United States National Museum. The female holotype of *Thamnotettix Gilletti* Van Duzee, "Col. Ac. Cat. 173," is in the collection of Iowa State College. A female cotype, "Colo. No. 633," here designated lectotype of *Thamnotettix sonorae* Gillette and Baker, is in the collection of Colorado A. & M. College.

Remarks.—Examined 507 specimens; of these, 157 were males, 36 of which were dissected.

From *fasciaticollis* to which it is similar, *belli* can be distinguished by the presence of a stylar spine and the pygofer spine arising from the caudodorsal margin

of the pygofer. Specimens from New Mexico and southern Arizona exhibit much darker, almost black, coloration. Specimens from Colorado and Utah to the north are much lighter, almost yellowish green. The species is rather variable in color, but the genitalia are rather similar structurally.

Studies with sticky-board traps in Utah by the author indicate that this insect has one generation a year, with the peak of abundance in July.

Colladonus citrinifrons (Gillette and Baker)

(Figs. 40 and 83)

Thamnotettix citrinifrons Gillette and Baker, 1895, Colo. Agr. Expt. Sta. Bul. 31, Tech. Ser. 1, p. 95.

Colladonus citrinifrons, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Head obtusely angled, apex rounded; pronotum without transverse band; forewings without spot on clavi; related to *waldanus* in habitus and many genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave at middle, caudoventral margin produced slightly posterodorsally to small convex lobe, dorsal margin with distal portion slightly convex; pygofer spine long, lanceolate, arising at apex of lobe, projecting somewhat posterodorsally; caudodorsal submarginal area with few long setae. (Fig. 40c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short, slender, about twice as long as basal width, sides nearly parallel, apex truncate; stylar spine apical, long, broad basally, pointed apically, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, flat and broad at mid-length, sharply narrowed apically, crossing in dorsal view; gonopore of aedeagus distad of midlength of shaft. (Fig. 40a, b.)

Female seventh sternum slightly more than twice as wide as long, lateral margins obtusely convex, posterior margin nearly truncate on each side of median spatulate process; median emargination V-shaped, shallow, about one-fourth length of segment; spatulate process short, about as long as basal width, produced beyond posterior margin, sides parallel, apex bifid. (Fig. 83.)

Distribution.—Rather rare; occurs only in Colorado and Utah. Specimens are at hand from *Colorado*: Leadville, Trinidad; *Utah*: Brighton, Providence.

Collection dates.—In August at 9,000-foot elevation in Colorado.

Host plants.—Unknown.

Type.—The male holotype, "Col. Act. No. 1744," collected from Leadville, Colo., on August 23, 1895, is in the United States National Museum.

Remarks.—Examined 4 specimens; of these, 2 males were dissected.

Many years ago Gillette changed the labels on some of his type specimens. A label on the type of *citrinifrons* bore the inscription "Colo. 1394," but it did not conform to the catalog records kept by Gillette. A careful check revealed the correct number to be 1744, which agreed with the data given in the original description. This number was placed with the holotype specimen.

From *waldanus* to which it is similar, *citrinifrons* can be distinguished by its caudoventral margin of the pygofer produced posteriorly to a convex lobe and the gonopore situated distad of the midlength of the aedeagal shaft.

Colladonus atriflavus Downes

(Figs. 41 and 88)

Colladonus atriflavus Downes, 1952, *Canad. Ent.* 84: 253.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave about middle, caudal margin truncate, dorsal margin with distal portion convex; pygofer spine well developed, extremely long, straight, lanceolate, arising nearly ventrally from caudal margin, projecting posterodorsally. (Fig. 41c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short, narrow, about twice as long as basal width, with sides parallel, apex truncate; stylar spine apical, long, sharply pointed, projecting laterally. (Fig. 41a.)

Female seventh sternum about $1\frac{1}{2}$ times as wide as long, anterolateral margins parallel, posterolateral portion

curved mesally, posterior margin strongly convex on each side of median spatulate process; median emargination U-shaped, shallow, about $1\frac{1}{2}$ times as long as basal width, produced somewhat before posterior margin, sides not parallel, broader basally, converging apically, apex truncate. (Fig. 88.)

Distribution.—Appears to be restricted to the Pacific coast of the United States and Canada. *Oregon*: Mount Hood; *British Columbia*: Malahat, Vancouver.

Collection dates.—September 9 to 19.

Host plant.—Downes (16) reported it from *Spiraea douglasii* Hook., which is presumably the host. It is apparently a rare species.

Type.—The female holotype is in the personal collection of W. Downes, Victoria, British Columbia.

Remarks.—Examined 6 specimens; of these, 5 were females and 1 was a male.

This species is similar to *montanus montanus*, but it can be distinguished by its extremely long lanceolate pygofer spine, lack of the transverse band on the pronotum, and absence of the spot on the clavi of the forewings. No illustration of the aedeagus of *atriflavus* is given in this bulletin, because this structure was damaged on the only specimen available.

Colladonus januatus (Ball)

(Figs. 42 and 85)

Thamnotettix januata Ball, 1914, *Canad. Ent.* 46: 213.

Thamnotettix januatus, Van Duzee, 1916, Check List of the Hemiptera (Excepting the Aphididae, Aleurodidae and Coccidae) of America, North of Mexico, p. 74.

Conodonus januata, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Colladonus januatus, DeLong and Knull, 1945, *Ohio State Univ. Biol. Sci. Ser.* 1, p. 57.

Head with rounded anterior margin; pronotum without transverse band; forewings without spot on clavi; similar

to *flavocapitatus* in habitus and to *geminatus* in genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin slightly concave at middle, caudal margin truncate or nearly so, dorsal margin with distal portion convex; pygofer spine well developed, straight, lanceolate, arising from middle of caudal margin, projecting dorsally; caudoventral submarginal area below pygofer spine with many minute setae; caudo-dorsal and dorsal submarginal areas with many long setae. (Fig. 42c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short, narrow, about twice as long as basal width, sides parallel, apex truncate; stylar spine apical, long, projecting laterally, curved slightly anteriorly at apex; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus distad of midlength of shaft. (Fig. 42a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin truncate on each side of median spatulate process; median emargination V-shaped, very shallow, less than one-fourth length of segment; spatulate process short, about as long as basal width, produced considerably beyond posterior margin, sides not parallel, broader basally, converging apically to truncate apex. (Fig. 85.)

Distribution.—*California:* Alameda County, Lompoc, Monterey, Pacific Grove, Palo Alto, San Andreas, San Francisco.

Collection dates.—From June 15 to September 25.

Host plants.—Unknown.

Type.—A male cotype specimen from San Francisco, Calif., collected in June 1908 by E. D. Ball, here designated lectotype, is in the United States National Museum.

Remarks.—Examined 56 specimens; of these, 8 were males, all of which were dissected.

From *flavocapitatus* to which it is similar, *jannatus* can be separated by the gonopore situated distad of the midlength of the aedeagal shaft in lateral aspect, the narrower stylar shaft, and the shorter pygofer spine. It can be separated from *geminatus* simply

by the absence of spots on the anterior margin of the crown.

Colladonus setaceus, new species

(Figs. 43 and 84)

Head with anterior margin rounded; pronotum without transverse band; forewings with faint indistinct pale ivory spot on clavi of females only; general color ochrous; similar to *eburatus* in habitus but lacks the distinct spot on the clavi of the forewings.

Length of male 5.53 mm., female 6.00 mm.

Head slightly narrower than pronotum, crown about one-fourth longer at middle than along mesal margin of eye; pronotum with lateral angles convex, curved mesally, meeting truncate posterior margin; forewings long and narrow, with costal area hyaline; clypeus slightly tumid, lateral sides expanded medially below antennal sockets, converging to broad truncate apex; clypeus with sides nearly parallel; male valve typically triangular, apex rounded; plates together long, spoon shaped, with numerous long fine white setae on lateral and apical margins.

Crown deep flavous, immaculate; eyes pale flavogriseous; pronotum and scutellum ochrous; forewings transparent, tinged with ochre, costal area hyaline; entire face flavous; legs pale flavous; abdomen and connexivum flavous below, black above; color varies from yellowish ivory to deep ochrous.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin slightly concave at middle, caudal margin convex; pygofer spine well developed, long, straight, lanceolate, arising caudoventrally, projecting posterodorsally; many long fine setae scattered about entire lateral surface of pygofer; many minute spines on caudoventral margin below pygofer spine. (Fig. 43c.)

Style in dorsal aspect nearly twice as long as connective; stylar shaft long, narrow, about 4 times as long as basal width, curved slightly posterolaterally, sides parallel, apex truncate; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 43a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin slightly concave on each side of median spatulate process; median emargination U-shaped, deep, almost one-half length of segment; spatulate process long, about twice as long

as basal width, produced slightly beyond posterior margin, sides parallel, apex slightly bifid. (Fig. 84.)

Host plants.—Unknown.

Types.—Male holotype, Long Lake, N. Y., July 28, 1946, L. D. Beamer; female allotype, Long Lake, N. Y., July 28, 1946, R. H. Beamer; 1 male paratype, Center Harbor, N. H., July 1951, P. B. Lawson; in the Snow collection of the University of Kansas. Additional paratypes, 1 male, Orono, Maine, August 1, 1913, 2 females (No. 2696), Webster, N. H., and Mt. Katahdin (650 feet), Maine, August 23, 1913, Fiske, in the United States National Museum; 4 males, Trinity Bay, Quebec, August 18, 1929, W. J. Brown; Lac Mondor, Ste. Flore, Prince Quebec, July 25, 1951, E. G. Monroe; Lac Mondor, Ste. Flore, Prince Quebec, July 28, 1951, (at light), E. G. Munroe; 3 females, Trinity Bay, Quebec, August 18, 1929, W. J. Brown; Lac Mondor, Ste. Flore, Prince Quebec, September 21, 1951, E. G. Munroe; in the collection of the Museum at Ottawa, Canada; 2 males, Aylmer, Quebec, July 18, 1924, C. H. Curran; Long Lake, N. Y., July 28, 1946, R. H. Beamer; 2 females, Boston, N. Y., August 1, 1909, E. P. Van Duzee; Long Lake, N. Y., July 28, 1946, L. D. Beamer; in the collection of the author.

Remarks.—From *eburatus* to which it is similar in habitus, *setaceus* can be distinguished by its forewings lacking the distinct spot on the clavi, the lateral surface of the pygofer with numerous long fine setae, and the aedeagus with bifurcate processes one-half as long as the aedeagal shaft in lateral aspect.

***Colladonus incertus*
(Gillette and Baker)**

Entettix incerta Gillette and Baker, 1895, Colo. Agr. Expt. Sta. Bul. 31, Tech. Ser. 1, p. 100.

Colladonus incertus, DeLong and Knoll, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 57.

Body somewhat robust; head narrower than pronotum, anterior margin rounded; pronotum without transverse band; forewings without spot on clavi; resembles *waldanus* superficially.

This species is represented only by the female holotype, the genitalia of which are described as follows:

Seventh sternum in ventral aspect about twice as wide as long, lateral margins parallel, posterior margin convex on each side of median spatulate process; median emargination somewhat V-shaped, deep, about one-third length of segment; spatulate process about twice as long as basal width, produced slightly beyond posterior margin, with sides parallel, apex truncate.

Distribution.—Manitou, Colo.

Collection date.—July 1895.

Host plants.—Unknown.

Type.—The female holotype collected in July from Manitou, Colo., at 6,620-foot elevation by E. S. Tucker is in the United States National Museum.

Remarks.—This species was placed in *Colladonus* by DeLong and Caldwell (13) and by Oman (34), presumably on the basis of the presence of the spatulate process on the female seventh sternum. Until males are known, it seems best to treat this species as *incertae sedis*.

***Colladonus waldanus* (Ball)**

(Figs. 44 and 86)

Thamnotettix waldana Ball, 1903, Canad. Ent. 35: 229.

Thamnotettix waldanus, Van Duzee, 1916, Check List of the Hemiptera (Excepting the Aphididae, Aleurodidae and Coccidae) of America, North of Mexico, p. 74.

Colladonus waldanus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 47.

Head obtusely angled, apex rounded; pronotum without transverse band; forewings without spot on clavi; similar to *citrimifrons* in habitus and to *flavocapitatus* in certain genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave about middle, caudal margin slightly convex, dorsal margin with distal portion convex; pygofer spine well developed, long, lanceolate, arising caudoventrally, projecting posterodorsally; caudoventral marginal area below pygofer spine with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 44c.)

Style in dorsal aspect about twice as long as connective; stylar shaft short, narrow, about twice as long as basal width, curved posterolaterally, sides nearly parallel, apex truncate; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, sharply pointed apically; gonopore of aedeagus at midlength of shaft. (Fig. 44a, b.)

Female seventh sternum slightly more than twice as wide as long, lateral margins parallel, posterior margin curved anteromesally on either side of median spatulate process; median emargination U-shaped, shallow, very broad, less than one-half length of segment; spatulate process long, broad, about twice as long as basal width, produced beyond posterior marginal extremity, with sides parallel, apex convex. (Fig. 86.)

Distribution.—Parts of the United States and central Canada; however, it is apparently not too common. Specimens are at hand from *Colorado*: Creede, North Park, Rico; *Wyoming*: Yellowstone National Park; *Northwest Territories*: Yellowknife; *Ontario*: Lake Temagami, Mer Bleue; *Saskatchewan*: Rutland.

Collection dates.—From August 2 to September 25.

Host plants.—Unknown.

Type.—A male cotype specimen from Rico, Colo., collected on August 2, 1900, by E. D. Ball, here designated lectotype, is in the United States National Museum.

Remarks.—Examined 45 specimens; of these, 18 were males, 16 of which were dissected.

From *flavocapitatus* to which it is similar, *waldanus* can be separated by its shorter pygofer spine

but more easily by the body being deeply testaceous, mottled, and larger.

Colladonus flavocapitatus (Van Duzee)

(Figs. 45 and 87)

Thamnotettix flavocapitatus Van Duzee, 1890, Ent. Amer. 6: 90.

Thamnotettix flavocapitatus, Van Duzee, 1892, Psyche 6: 306.

Conodonus flavocapitatus, Ball, 1936, Brooklyn Ent. Soc. Bul. 31, p. 58.

Colladonus flavocapitatus, DeLong and Knull, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 56.

Colladonus commissus, DeLong and Severin, 1948, Hilgardia, 18: 194.

Colladonus curekiae Bliven, 1954, Brooklyn Ent. Soc. Bul. 49, p. 117, (new synonymy).

Head obtusely angled, apex rounded; pronotum without transverse band; forewings without spot on clavi; similar to *holmesi* in habitus and to *waldanus* in genital characteristics.

Pygofer in lateral aspect slightly longer than wide, ventral margin concave at middle, caudal margin truncate, dorsal margin with distal portion convex; pygofer spine well developed, long, straight, lanceolate, arising caudoventrally, projecting posterodorsally; caudoventral marginal area with many minute setae; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 45c.)

Style in dorsal aspect about 1½ times as long as connective; stylar shaft short, narrow, about twice as long as basal width, curved slightly posterolaterally, sides parallel; stylar spine apical, long, pointed apically, projecting posterolaterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, tubular, narrowed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 45a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin nearly truncate on each side of median spatulate process; median emargination V-shaped, shallow, less than one-half length of segment; spatulate process short, subequal, produced to posterior margin, with sides parallel, apex bifid. (Fig. 87.)

Distribution.—America north of Mexico and west of the Rocky Mountains. Specimens are at hand from *California*: Berkeley, Eureka, Muir Woods, Salinas, San Francisco, Watsonville; *Colorado*;

Oregon: Hood River; *Utah*: Logan, Ogden, Providence, Willard; *Washington*: Everett; *Alaska*: Anchorage, Fairbanks, Palmer; *Alberta*; *British Columbia*: Kaslo, Saanich District, Vancouver.

Collection dates.—From June 17 to October 10; most abundant during September.

Host plants.—DeLong and Severin (15) reported it from gooseberry. Several specimens were trapped on peach in Utah by the author.

Type.—The male lectotype from California collected by D. W. Coquillett is in the collection of Iowa State College. The male lectotype was designated by Oman (33) in 1947.

Remarks.—Examined 73 specimens; of these, 21 were males, all of which were dissected.

From *holmesi* to which it is similar in habitus, *flavocapitatus* can be separated by the rounded anterior margin of the head and the pygofer having a truncate caudal margin.

Colladonus tahotus Ball

(Figs. 47 and 89)

Colladonus tahotus Ball, 1936, *Pan-Pacific Ent.* 12: 194.

Idiodonus uhleri Ball, 1937, *Brooklyn Ent. Soc. Bul.* 32, p. 28, (new synonymy).

Colladonus uhleri, Oman, 1949, *Wash. Ent. Soc. Mem.*, No. 3, p. 125.

Head with anterior margin rounded; pronotum without transverse band; forewings without spot on clavi; similar to *ponderosus* in habitus and male genital characteristics.

Pygofer in lateral aspect about 1½ times as long as wide, ventral margin slightly concave about middle, caudoventral margin produced strongly posteriorly to narrow lobe, dorsal margin with distal portion convex; pygofer spine well developed, long, robust, slightly curved, lanceolate, arising from apex of caudoventral lobe, projecting posterodorsally; caudodorsal submarginal area with several setae. (Fig. 47c.)

Style in dorsal aspect about 1½ times as long as connective; stylar shaft long, about 3 times as long as wide, with sides parallel, apex truncate; stylar spine apical, long, sharply pointed, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 47a, b.)

Female seventh sternum about twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin convex on each side of median spatulate process; median emargination V-shaped, shallow, less than one-half length of segment; spatulate process long, narrow, slightly more than twice as long as wide, produced beyond posterior margin, with sides parallel, apex bifid. (Fig. 89.)

Distribution.—United States and Canada west of the Rocky Mountains. Specimens are at hand from *Arizona*: Chiricahua Mountains; *California*: Chilcoot, Lemnoco, Pine Valley, Quincy, Tahoe, Weed; *Colorado*: Nederland; *Idaho*: Coeur d'Alene; *Oregon*: Corvallis; Kirby, La Grande, Mount Hood, The Dalles; *Washington*: Cliffdell, Mount Rainier; *British Columbia*: Merritt.

Collection dates.—From June 27 in California to November 4 in Oregon; most abundant in July.

Host plant.—Collected on ponderosa pine (*Pinus ponderosa* Laws.) in July 1953 at The Dalles, Oreg., by the author.

Types.—The female holotype of *tahotus* and the female holotype of *uhleri* are in the United States National Museum.

Remarks.—Examined 57 specimens; of these, 15 were males, all of which were dissected. The types of *tahotus* and *uhleri* were found to be morphologically equivalent, *tahotus* being the valid name through priority.

From *ponderosus* to which it is similar, *tahotus* can be separated by the location of the gonopore at the midlength of the shaft and the bifurcate processes one-half as long as the aedeagal shaft.

***Colladonus ponderosus* Ball**

(Figs. 46 and 90)

Colladonus ponderosus Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 31.

Head with anterior margin rounded; pronotum without transverse band; forewings without spot on clavi; allied to *tahotus* in habitus and genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave about middle, caudoventral margin produced posteriorly to distinct narrow lobe, dorsal margin with distal portion convex; pygofer spine long, lanceolate, arising from apex of caudoventral lobe, projecting posterodorsally; caudodorsal submarginal area with several long setae. (Fig. 46c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, about twice as long as basal width, with sides somewhat parallel, apex truncate; stylar spine apical, long, pointed apically, projecting laterally; aedeagus with bifurcate processes less than one-half as long as aedeagal shaft, flat and broad at midlength, pointed apically, crossing in dorsal aspect; gonopore of aedeagus distad of midlength of shaft. (Fig. 46a, b.)

Female seventh sternum twice as wide as long, anterolateral margins parallel, posterolateral portion curved mesally, posterior margin truncate on each side of median spatulate process; median emargination V-shaped, shallow, about one-fourth length of segment; spatulate process short, about as long as basal width, produced slightly beyond posterior margin, sides parallel, apex truncate. (Fig. 90.)

Distribution.—Specimens are at hand from *Arizona*: Chiricahua Mountains, Grand Canyon, Long Valley, Mount Graham, Oak Creek Canyon, San Francisco Mountains; *California*: Placer County.

Collection dates.—July and September.

Host plant.—This species was presumably collected from ponderosa pine (*Pinus ponderosa* Laws.) in mountainous regions.

Type.—The female holotype is in the United States National Museum.

Remarks.—Examined 34 specimens; of these, 10 were males, all of which were dissected.

This species is very closely related to *tahotus*, but its range is much more restricted, even though it occurs on the same host plant. From *tahotus* it can be distinguished by the aedeagus having shorter bifurcate processes and the gonopore being situated distad of the midlength of the aedeagal shaft in lateral aspect.

***Colladonus beameri* (Ball)**

(Figs. 48 and 75)

Idiadonus beameri Ball, 1937, Brooklyn Ent. Soc. Bul. 32, p. 28.*Colladonus beameri*, Oman, 1949, Wash. Ent. Soc. Mem., No. 3, p. 125.

Head with anterior margin rounded; pronotum without transverse band; forewings without spot on clavi; similar to *tahotus* in habitus but with unique genitalia.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin narrowly concave; basal of middle, remainder of margin straight, caudoventral margin truncate, with caudodorsal portion curved anteriorly; pygofer spine well developed, very long, straight, lanceolate, arising ventrally, projecting posterodorsally; caudodorsal submarginal area with many long setae. (Fig. 48c.)

Style in dorsal aspect slightly longer than connective; stylar shaft long, narrow, about 3 times as long as basal width, with sides parallel, apex convex; stylar spine apical, short, blunt, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, nearly tubular, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 48a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin uniformly truncate on each side of median emargination; median emargination V-shaped, narrow, shallow, less than one-half length of segment; spatulate process absent. (Fig. 75.)

Distribution.—Southwestern United States and Mexico. Specimens are at hand from *Arizona*: Chiricahua Mountains; *Mexico*: Caropan, Michoacán; Cruz Blanca, D. F.; Deserto des Leones, D. F.; La Guarda, D. F.; Puebla, Puebla; Río Frio, D. F.; Uruapan, Michoacán; Vera, D. F.; Zimapán,

Hidalgo; Zitácuaro, Michoacán.

Collection dates.—From September 11 in Arizona to October 26 in Mexico.

Host plant.—DeLong (12) reported numerous specimens from pine.

Type.—The female holotype from the Chiricahua Mountains, Ariz., is in the United States National Museum.

Remarks.—Examined 11 specimens; of these, 6 were males, all of which were dissected.

This species, which is similar to *tahotus*, can be separated easily by its extremely long pygofer spine, arising ventrally from the caudal margin of the pygofer, and the aedeagus with bifurcate processes less than one-half as long as the aedeagal shaft.

Colladonus youngi, new species

(Figs. 49 and 74)

Head with anterior margin obtusely angled, apex rounded; pronotum without transverse band; forewings without spot on clavi; general color fuscous; similar to *brunneus* in habitus but distinct from it in genital characteristics.

Length of male 5.24 mm., female 5.83 mm.

Head about as wide as pronotum, crown about one-third longer at middle than along mesal margin of eye; pronotum with lateral angles nearly straight, curved mesally, meeting truncate posterior margin; forewings long, narrow, without hyaline costal area; clypeus slightly tumid, lateral sutures nearly straight, converging to rather broad truncate apex; clypellus slightly constricted medially; male valve broadly triangular, apex convex; plates together spoon shaped, sharply attenuated apically, with many long fine white setae.

Crown ochrous, with 4 black spots on anterior margin, 2 larger approximate ones situated transversely on each side of extreme apex, 2 small ones below and next to eyes; just above antennal sockets black rather indefinite roughly sinuate band across crown between eyes; eyes fuscous; pronotum with broad testaceous band along anterior margin, paler below; scutellum ochrous, with transverse uneven black line at center; forewings lightly transparent, fuscogriseous, more deeply so along commissural line; clypeus och-

rous, with rows of black transverse uneven lines below each black spot, black areas below antennal sockets, along lateral margins of clypeus and clypellus; antennae ochrous; legs testaceous; abdomen black, connexivum ochrous; male valve black; plates ochrous basally, paler distally; color varies between sexes, more distinct, deeper in males.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave at middle, caudal margin convex, dorsal margin with distal portion convex; pygofer spine short, straight, lanceolate, arising from midlength of caudal margin projecting dorsally; caudoverventral marginal area below pygofer spine with many minute setae; caudodorsal submarginal area with many long setae. (Fig. 49c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft short, about twice as long as wide, sides nearly parallel, apex truncate; stylar spine apical, very small, projecting laterally; aedeagus with bifurcate processes short, less than one-half as long as aedeagal shaft, somewhat tubular, pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 49a, b.)

Female seventh sternum about twice as wide as long, lateral margins parallel, posterior margin sinuate on each side of median emargination; median emargination U-shaped, minute; spatulate process absent. (Fig. 74.)

Host plants.—Unknown.

Types.—Male holotype (No. 62754), Anchorage, Alaska, June 28, 1951, R. S. Bigelow; female allotype, Anchorage, Alaska, June 27, 1951, R. S. Bigelow; 1 male paratype, Anchorage, Alaska, May 28, 1948, N. Hoffman; in the United States National Museum. Additional paratypes, 1 male, Birch Hill, Fairbanks, Alaska, July 4, 1948, C. O. Esselbaugh; 5 females, Nenana, Alaska, June 13 and 16, 1948, R. I. Sailer; Fairbanks, Alaska, June 24, 1948, R. I. Sailer; Circle, Alaska, June 25, 1948, S. Lienk; Birch Hill, Fairbanks, Alaska, July 2, 1948, S. Lienk; in the collection of the Museum at Ottawa, Canada; 2 females, Nebesna, Alaska, July 3, 1948, R. I. Sailer, in the collection of Oregon State College; 1 male, Otter Creek Marsh, Fort

Richardson, Alaska, May 25, 1948, K. Sommerman; 3 females, Birch Hill, Fairbanks, Alaska, July 2, 1948, S. Lienk; 4 females, Nesbna, Alaska, July 3, 1948, R. I. Sailer; in the collection of the author.

Remarks.—This species is allied to *brunneus* in habitus, and it can be distinguished from it by the aedeagus having the bifurcate processes less than one-half as long as the aedeagal shaft and the pygofer spine arising from the midlength of the caudal margin of the pygofer.

This species is named for David A. Young, Jr., of the Entomology Research Branch.

***Colladonus geminatus*
(Van Duzee)**

(Figs. 50 and 91)

Thamnotettix geminata Van Duzee, 1890, Ent. Amer. 6: 79.

Thamnotettix geminatus, Van Duzee, 1892, Psyche 6: 306.

Thamnotettix lacta, Ashmead, 1904 in Harriman Alaska Expedition, 1899, v. 8, p. 133.

Idiodonus geminatus, DeLong and Caldwell, 1937, Check List of the Cicadellidae (Homoptera) of America, North of Mexico, p. 46.

Colladonus geminatus, DeLong and Knull, 1945, Ohio State Univ. Biol. Sci. Ser. 1, p. 57.

Head with anterior margin rounded; pronotum without transverse band; forewings without spot on clavi; similar to *vanduzeei* in habitus and to *montanus montanus* in certain genital characteristics.

Pygofer in lateral aspect about $1\frac{1}{2}$ times as long as wide, ventral margin concave about middle, caudal margin truncate, dorsal margin with distal portion convex; pygofer spine straight, lanceolate, arising caudoventrally, projecting posterodorsally; caudodorsal and dorsal submarginal areas with many long setae. (Fig. 50c.)

Style in dorsal aspect about $1\frac{1}{2}$ times as long as connective; stylar shaft long, slender, about $2\frac{1}{2}$ times as long as basal width, with sides parallel, apex truncate; stylar spine apical, long, narrow, pointed apically, projecting laterally; aedeagus with bifurcate processes about one-half as long as aedeagal shaft, flat and broad at midlength,

pointed apically, crossing in dorsal view; gonopore of aedeagus at midlength of shaft. (Fig. 50a, b.)

Female seventh sternum about $2\frac{1}{2}$ times as wide as long, lateral margins parallel, posterior margin truncate on each side of spatulate process; median emargination U-shaped, very shallow, less than one-fourth length of segment; spatulate process short, about as long as wide, produced beyond posterior margin, with sides parallel, apex convex. (Fig. 91.)

Distribution.—Common in arid regions of western North America. It is not known to occur east of the Rocky Mountains. Specimens are at hand from *California*: Berkeley, Guatay, La Jolla, Los Angeles, Monterey, Mount Diablo, Mount Shasta, Santa Cruz County, Solano County, Tahoe, Tahoe Lake, Tuolumne, Weed, Yosemite National Park; *Colorado*: Rocky Mountain National Park, Westcliffe; *Idaho*: Burley, Coeur d'Alene, Jerome, Moscow, Rexburg, Tuttle; *Montana*: DeBorgia, Drummond, Garrison, Silverbow; *Oregon*: Ashland, Bend, Dallas, Home, Hood River, La Grande, McMinnville, Medford, North Powder, Portland, The Dalles, Vale; *Utah*: Clearfield, Erda, Farmington, Hunter, Logan, Magna, Midvale, Provo, Springville, Wellsville; *Washington*: Cliffdell, Fort Lewis, Pullman, Toppenish, Walla Walla, Waverly, Wenatchee; *Wyoming*: Granger; *Alaska*: Shumagin Islands; *British Columbia*: Kelowna, Merritt, Penticton, Raleigh, Vancouver, Vernon, Victoria; *Mexico*: Baja California, Ensenada.

Collection dates.—From April to October, with peaks of abundance in May and September.

Host plants.—This species breeds on alfalfa, clover, delphinium, and antelope-brush. It has been reported from peach, cherry, chokecherry, carrot, aster, celery, and sugar beet.

Type.—The female holotype

(No. 616) is in the collection of Iowa State College.

Remarks.—Examined 632 specimens; of these, 35 males were dissected.

This species is similar to *van-duzcei* but can be separated from it by the round anterior margin

of the crown and the pygofer having a truncate caudal margin.

It is the most important vector of western X-disease of peach and western X-little-cherry virus of cherry. It is also a vector of yellow leaf roll of peach and California aster yellows.

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APPENDIX

A number of species from Mexico described by DeLong (12) in the genus *Idiodonus* were found referable to *Colladonus*. Upon dissection and study of the male allotypes, some discrepancies were discovered involving the synonymy and dissociation of the sexes. It seems best to treat these as species incertae sedis

until further material is collected and the proper sex associations are made. The following 12 species were described by DeLong and are new combinations: *Colladonus acus*, *albocinctus*, *anademus*, *bicinctus*, *clathrus*, *claustrus*, *dampfii*, *insculptus*, *nigridens*, *titulus*, *turpiter*, and *vercundus*.

INDEX TO COLLADONUS SPECIES

(Synonyms are in italics)

| | | | |
|--|----|---|----|
| <i>acus</i> (DeLong) | 51 | <i>commissus</i> (Van Duzee) | 13 |
| <i>albocinctus</i> (DeLong) | 51 | <i>dampfii</i> (DeLong) | 51 |
| <i>anademus</i> (DeLong) | 51 | <i>davisi</i> , new species | 26 |
| <i>arctostaphyli</i> Downes | 17 | <i>discrus</i> DeLong (See | |
| <i>arculus</i> Ball | 12 | <i>fasciaticollis</i> (Stål.) | |
| <i>atriflavus</i> Downes | 40 | <i>eburatus</i> (Van Duzee) | 31 |
| <i>atropunctatus</i> (Van Duzee) | 18 | <i>egenus</i> Ball | 17 |
| <i>aureolus</i> (Van Duzee) | 16 | <i>espinosus</i> , new species | 19 |
| <i>balli</i> , new species | 32 | <i>eurekae</i> Bliven (See | |
| <i>beameri</i> (Ball) | 45 | <i>flavocapitatus</i> (Van Duzee.) | |
| <i>belli</i> (Uhler) | 38 | <i>exquisitos</i> (Osborn) (See <i>collaris</i> | |
| <i>gillettei</i> (Van Duzee) | 38 | (Ball.) | |
| <i>semipullatus</i> (Van Duzee) | 38 | <i>fasciaticollis</i> (Stål) | 37 |
| <i>sonorae</i> (Gillette and Baker) | 38 | <i>discrus</i> DeLong | 37 |
| <i>bicinctus</i> (DeLong) | 51 | <i>tubulus</i> DeLong | 37 |
| <i>brunneus</i> (DeLong and Severin) | | <i>flavocapitatus</i> (Van Duzee) | 43 |
| (See <i>rupinatus</i> (Ball).) | | <i>eurekae</i> Bliven | 43 |
| <i>brunneus</i> (Osborn) | 36 | <i>furculatus</i> (Osborn) | 29 |
| <i>cachellus</i> Ball | 14 | <i>geminatus</i> (Van Duzee) | 47 |
| <i>citrinifrons</i> (Gillette and Baker) | 39 | <i>gillettei</i> (Van Duzee) (See <i>belli</i> | |
| <i>citronellus</i> (Provancher) | 21 | (Uhler.) | |
| <i>clathrus</i> (DeLong) | 51 | <i>holmesi</i> Bliven | 13 |
| <i>claustrus</i> (DeLong) | 51 | <i>incertus</i> (Gillette and Baker) | 42 |
| <i>clitellarius</i> (Say) | 30 | <i>insculptus</i> (DeLong) | 51 |
| <i>marcidus</i> Ball | 30 | <i>intricatus</i> (Ball) | 15 |
| <i>collaris</i> (Ball) | 28 | <i>januatus</i> (Ball) | 40 |
| <i>exquisitos</i> (Osborn) | 28 | | |

| | | | |
|--|----|--|----|
| kirkaldyi (Ball) | 25 | <i>brunneus</i> (DeLong and Severin) | 24 |
| <i>lineatus</i> , new species..... | 24 | <i>semipullatus</i> (Van Duzee) (<i>See belli</i> (Uhler).) | |
| <i>marcidus</i> Ball (<i>See chitellarius</i> (Say).) | | <i>setaceus</i> , new species..... | 41 |
| <i>mendicus</i> (Ball) | 23 | <i>sonorae</i> (Gillette and Baker) (<i>See belli</i> (Uhler).) | |
| <i>montanus</i> (Van Duzee)..... | 34 | <i>tahotus</i> Ball | 44 |
| <i>mulsus</i> Ball | 33 | <i>uhleri</i> (Ball) | 44 |
| <i>reductus</i> (Van Duzee)..... | 35 | <i>titulus</i> (DeLong) | 51 |
| <i>mulsus</i> Ball (<i>See montanus mulsus</i> Ball.) | | <i>torneellus</i> (Zetterstedt) | 27 |
| <i>nigridens</i> (DeLong) | 51 | <i>oxalidis</i> (Fieber) | 27 |
| <i>nugax</i> (Van Duzee)..... | 11 | <i>truncatus</i> , new species..... | 22 |
| <i>omani</i> , new species..... | 27 | <i>tubulus</i> DeLong (<i>See fasciaticollis</i> (Stål).) | |
| <i>oxalidis</i> (Fieber) (<i>See torneellus</i> (Zetterstedt).) | | <i>turpiter</i> (DeLong) | 51 |
| <i>ponderosus</i> Ball | 45 | <i>uhleri</i> (Ball) (<i>See tahotus</i> Ball.) | |
| <i>reductus</i> (Van Duzee) (<i>See montanus reductus</i> (Van Duzee).) | | <i>vanduzeei</i> , new species..... | 21 |
| <i>robustus</i> , new species..... | 19 | <i>verecundus</i> (DeLong) | 51 |
| <i>rupinatus</i> (Ball) | 24 | <i>waldanus</i> (Ball) | 42 |
| | | <i>youngi</i> , new species..... | 46 |



FIG. 1 HEAD AND PRONOTUM



FIG. 2 HEAD AND PRONOTUM

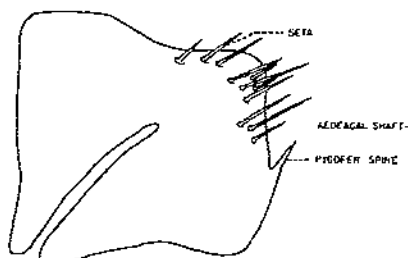


FIG. 3 PYGOFER

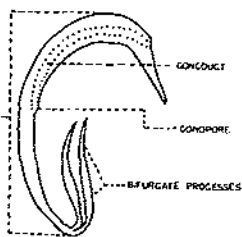


FIG. 4 AEDEAGUS

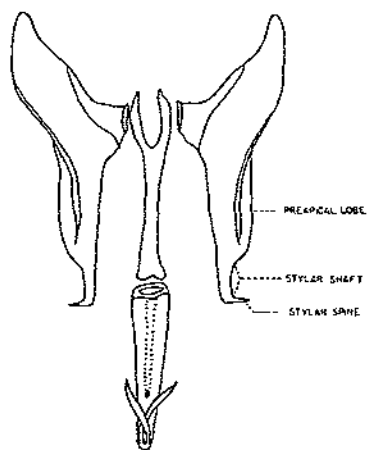


FIG. 5 STYLES, CONNECTIVE, AND AEDEAGUS

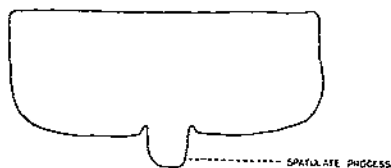


FIG. 6 FEMALE SEVENTH STERNUM

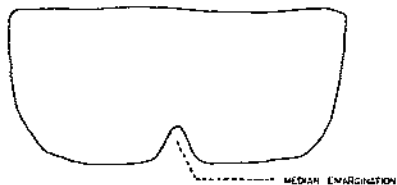


FIG. 7 FEMALE SEVENTH STERNUM

Crown, dorsal aspect, of *Colladonus intricatus* (fig. 1) and *tahotus* (fig. 2); male genitalia, lateral aspect (figs. 3 and 4) and dorsal aspect (fig. 5), of *geminatus*; female genitalia, ventral aspect, of *geminatus* (fig. 6) and *beameri* (fig. 7). X 75.

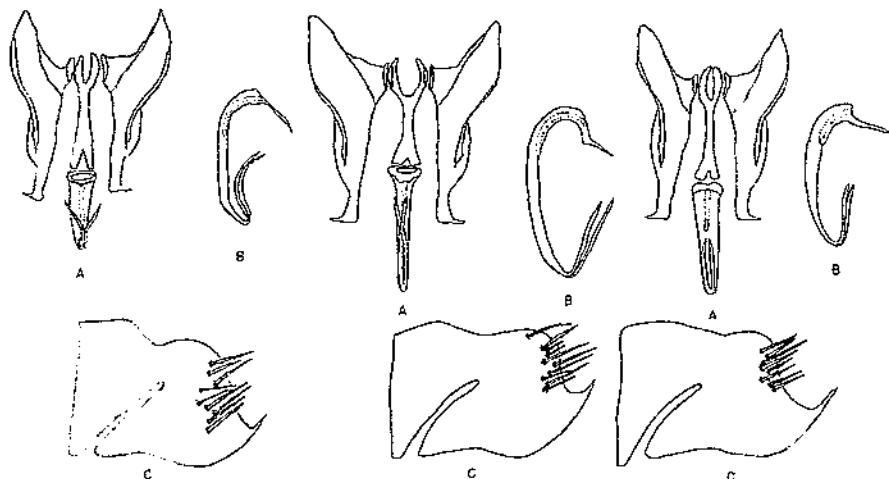


FIG. 8 NUGAX

FIG. 9 ARCULUS

FIG. 10 HOLMESI

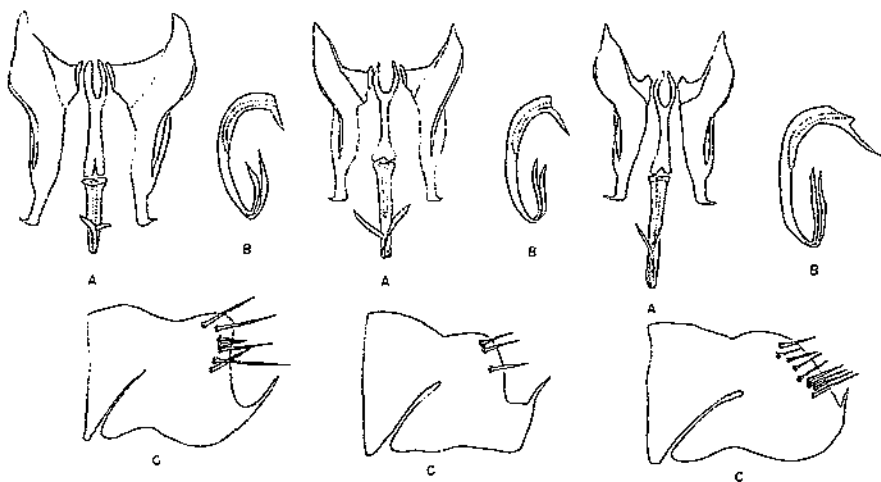


FIG. 11 COMMISSUS

FIG. 12 CACHELLUS

FIG. 13 INTRICATUS

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladozus*. (Figs. 8 and 12, paratypes; fig. 9, topotypic paratype; fig. 11, allotype; fig. 13, lectotype.) X 150.

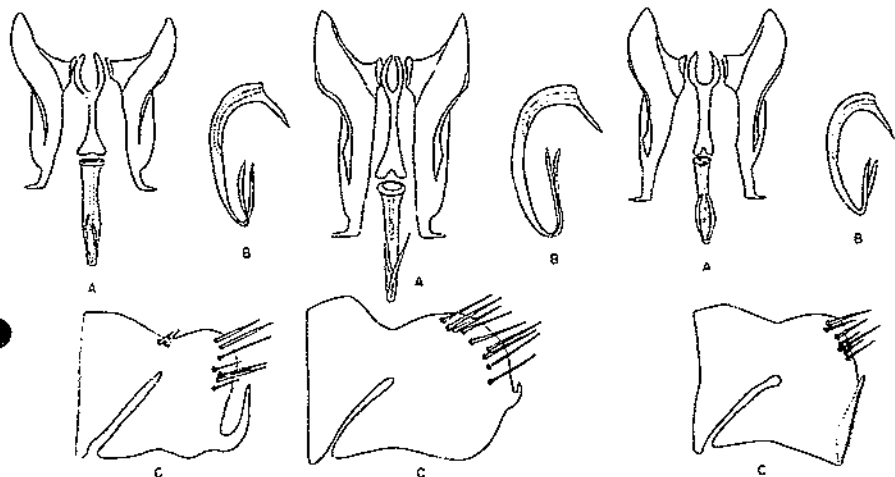


FIG. 14 AUREOLUS

FIG. 15 EGENUS

FIG. 16 ARCTOSTAPHYLI

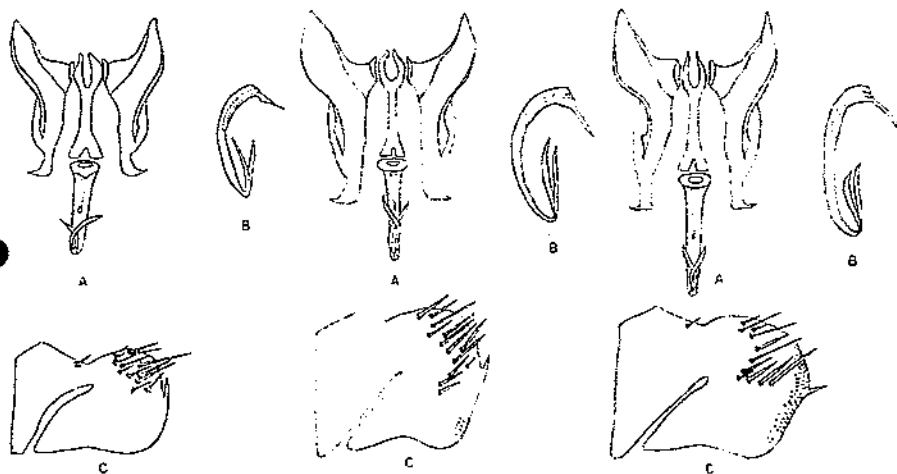


FIG. 17 ATROPUNCTATUS

FIG. 18 ROBUSTUS

FIG. 19 ESPINOSUS

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladonus*. (Fig. 16, topotype; figs. 18 and 19, holotypes.) X 150.

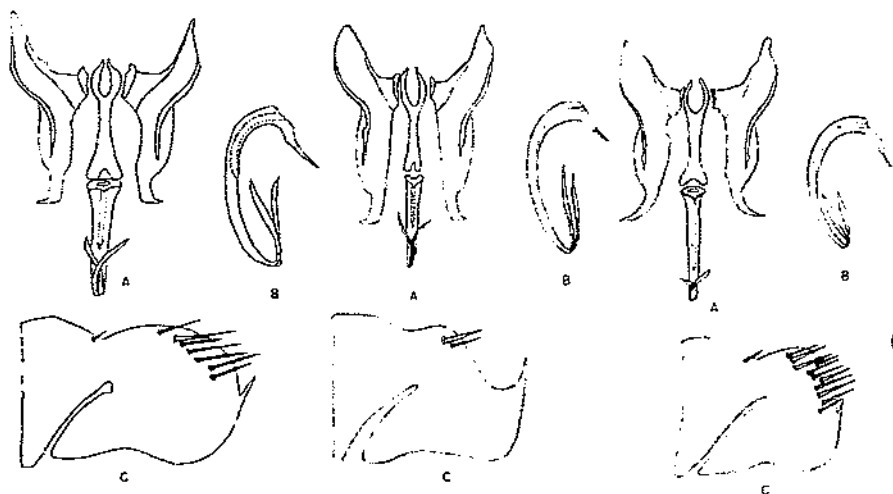


FIG. 20 VANDUZEEI

FIG. 21 TRUNCATUS

FIG. 22 MENDICUS

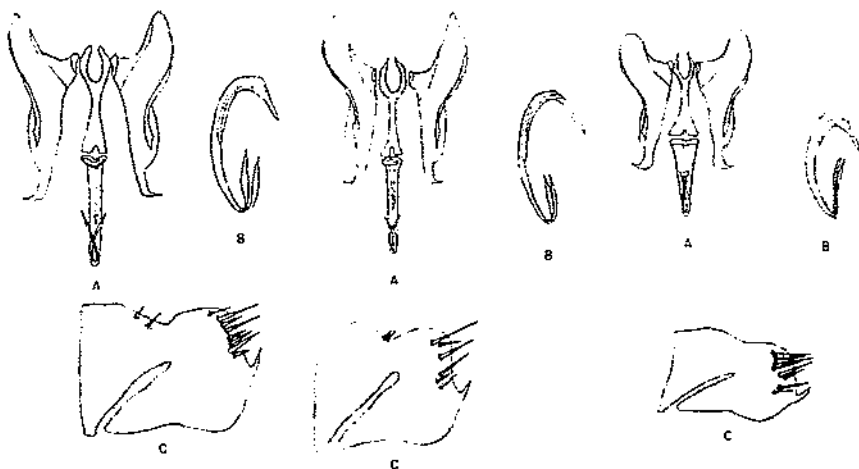


FIG. 23 RUPINATUS

FIG. 24 LINEATUS

FIG. 25 KIRKALDYI

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladonus*. (Figs. 20, 21, and 24, holotypes; fig. 22, lectotype; figs. 23 and 25, cotypes.) X 150.

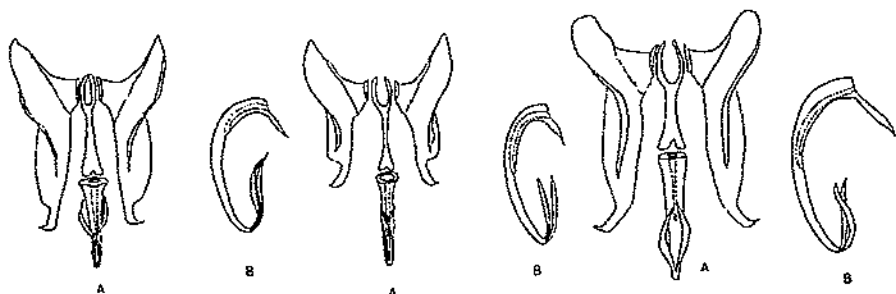


FIG. 26 DAVISI

FIG. 27 TORNEELLUS

FIG. 28 OMANI

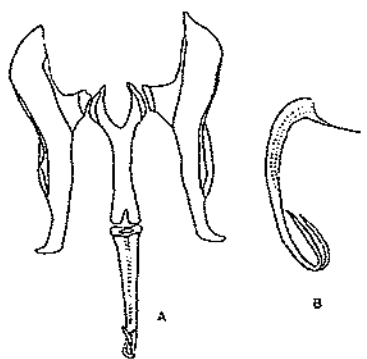
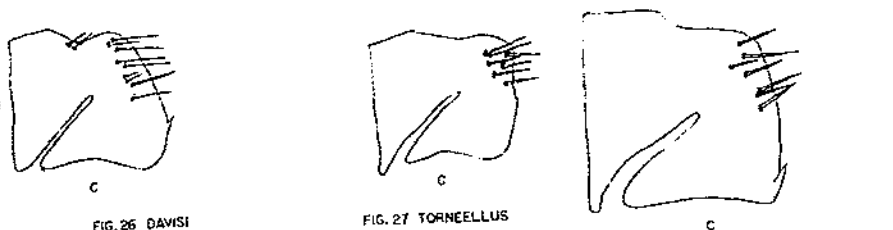


FIG. 29 COLLARIS

FIG. 30 FURCULATUS

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladonus*. (Figs. 26 and 28, holotypes; fig. 27, neotype.) X 150.

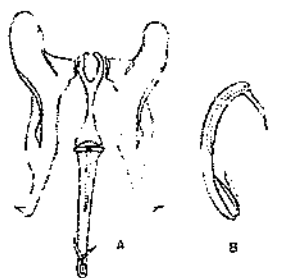


FIG. 31 CLITELLARIUS

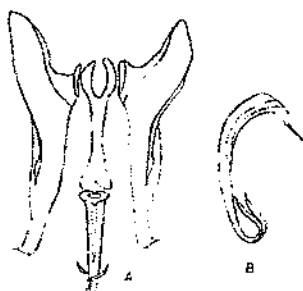


FIG. 32 EBURATUS



FIG. 33 BALLI



FIG. 34 MONTANUS MULSUS



FIG. 35 MONTANUS MONTANUS



FIG. 36 MONTANUS REDUCTUS

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladonus*. (Fig. 33, holotype; fig. 34, homotype; figs. 35 and 36, paratypes.) X 150.

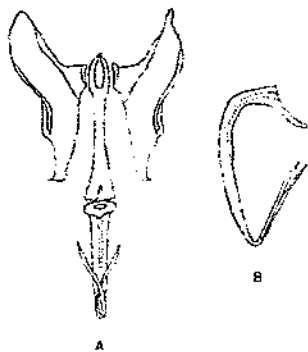


FIG. 37 BRUNNEUS

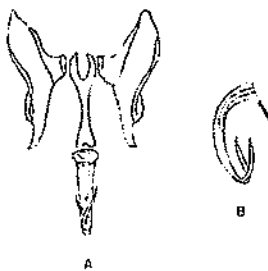


FIG. 38 FASCIATICOLLIS

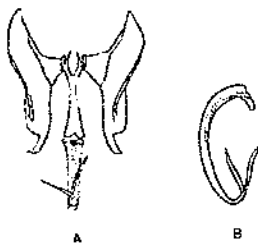


FIG. 39 BELLI

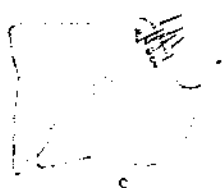


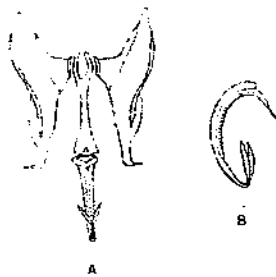
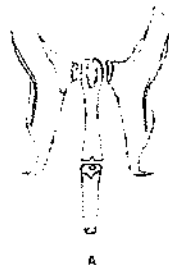
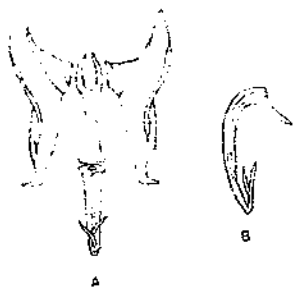
FIG. 40 CITRINIFRONS



FIG. 41 ATRIFLAVUS



FIG. 42 JANUATUS



A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladonus*. (Fig. 40, holotype; fig. 41, topotypic paratype; fig. 42, lectotype.) X 150.

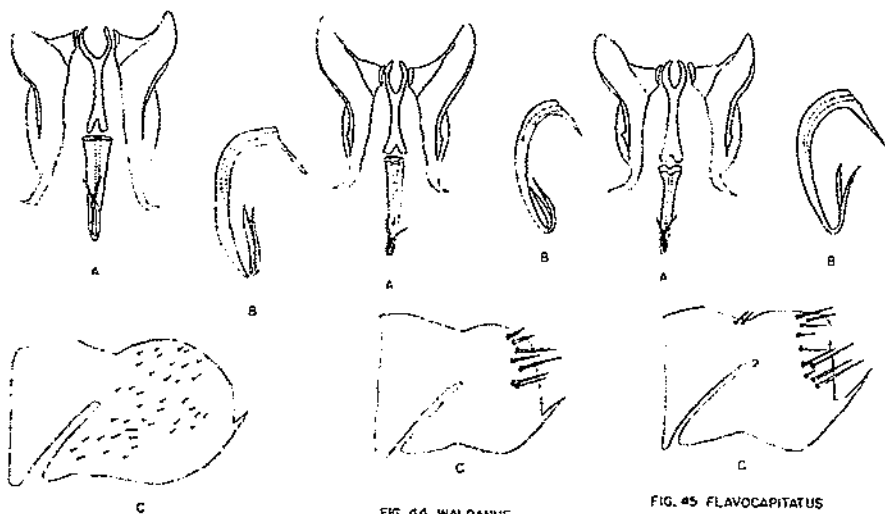


FIG. 43 SETACEUS

FIG. 44 WALDANUS

FIG. 45 FLAVOCAPITATUS

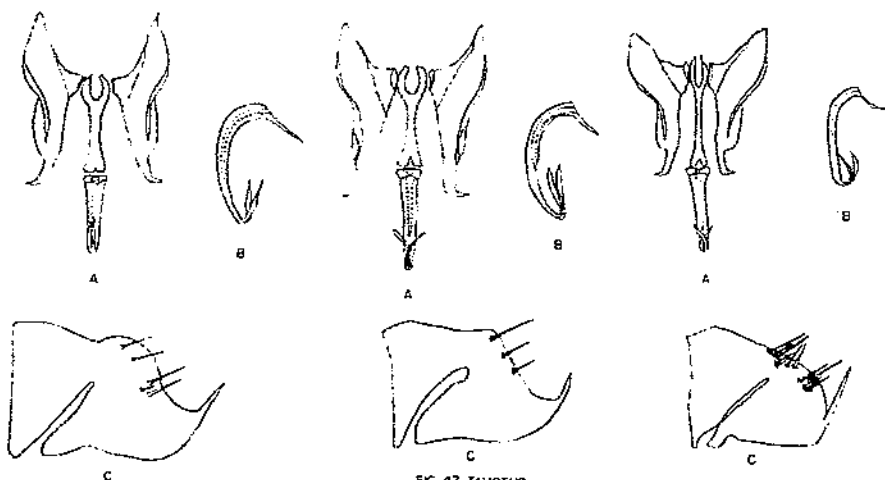


FIG. 46 PONDEROSUS

FIG. 47 TAHOTUS

FIG. 48 BEAMERI

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of various species of *Colladonus*. (Fig. 43, holotype; figs. 44 and 45, cotypes; figs. 47 and 48, paratypes.) X 150.

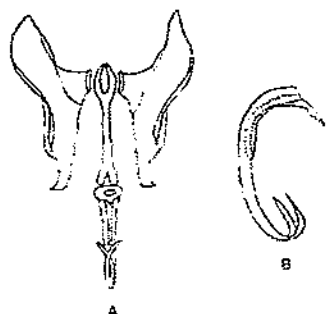


FIG. 49 YOUNG:

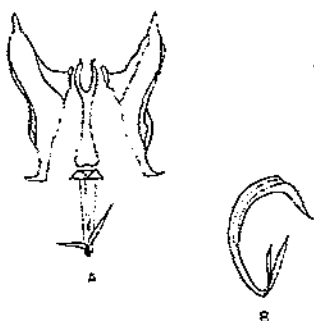


FIG. 50 GEMINATUS



FIG. 51 ESPINOSUS



FIG. 52 NUGAX

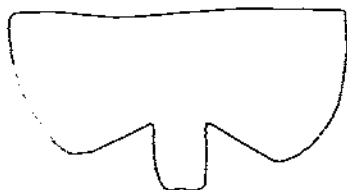


FIG. 53 ROBUSTUS

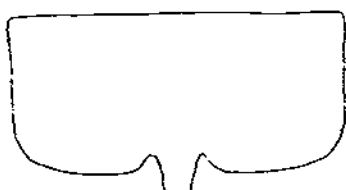


FIG. 54 ATROPUNCTATUS

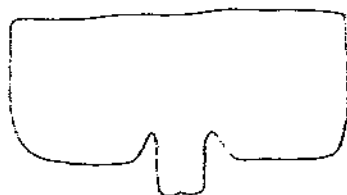


FIG. 55 EGENUS



FIG. 56 ARCULUS

A, Right and left style, connective, and aedeagus, dorsal aspect; B, aedeagus, lateral aspect; C, pygofer, lateral aspect, of *Colladonus youngi*, holotype, (fig. 49) and *geminatus* (fig. 50); and seventh sternum of female, ventral aspect, of various *Colladonus* species (figs. 51-56). X 150.

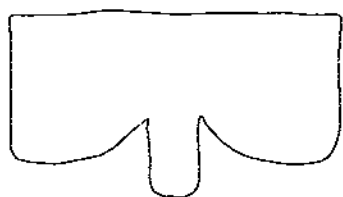


FIG. 57 ARCTOSTAPHYLI

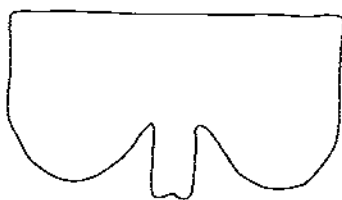


FIG. 58 INTRICATUS



FIG. 59 CACHELLUS



FIG. 60 HOLMES.

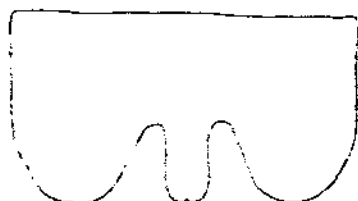


FIG. 61 COMMISSUS

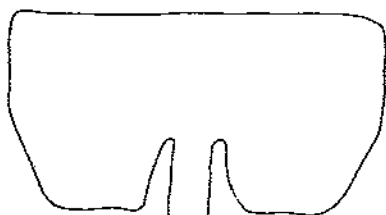


FIG. 62 AUREOLUS

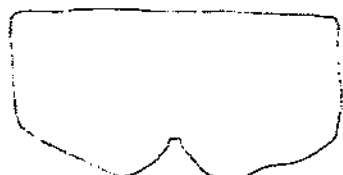


FIG. 63 TORNEELLUS

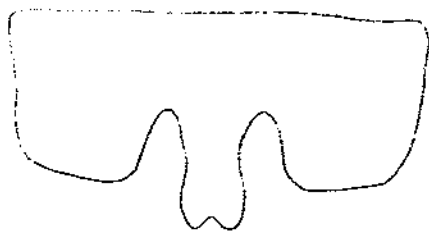


FIG. 64 OMANI

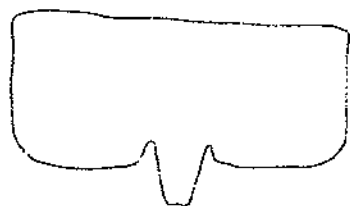


FIG. 65 MENDICUS

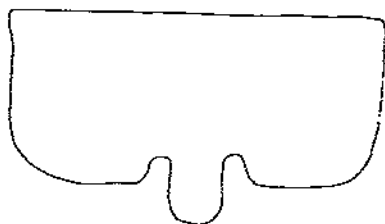


FIG. 66 RUPINATUS

Seventh sternum of female, ventral aspect, of various species of *Colladonus*.
X 150.



FIG. 67 COLLARIS

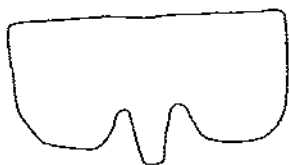


FIG. 69 LINEATUS



FIG. 71 FASCIATICOLLIS



FIG. 73 BELLI

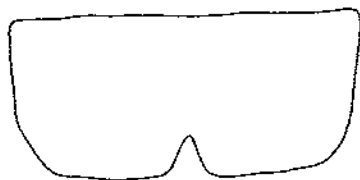


FIG. 75 BEAMERI

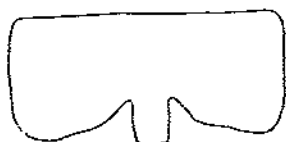


FIG. 68 KIRKALDYI

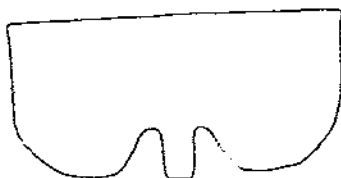


FIG. 70 TRUNCATUS



FIG. 72 BRUNNEUS



FIG. 74 YOUNG

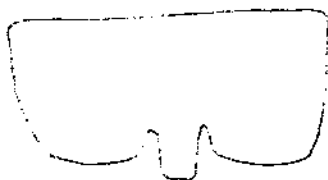


FIG. 76 MONTANUS MONTANUS

Seventh sternum of female, ventral aspect, of various species of *Colladonus*.
X 150.

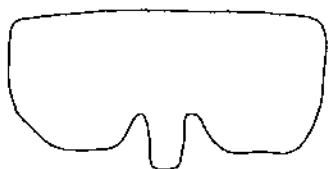


FIG. 77 MONTANUS REDUCTUS

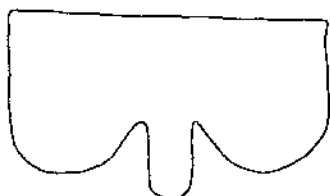


FIG. 78 MONTANUS MULSUS

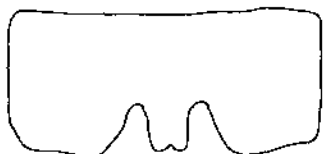


FIG. 79 BALLI

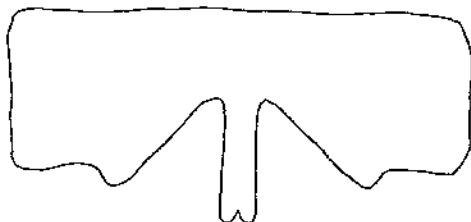


FIG. 80 FURCULATUS

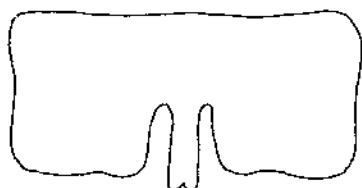


FIG. 81 CLITELLARIUS

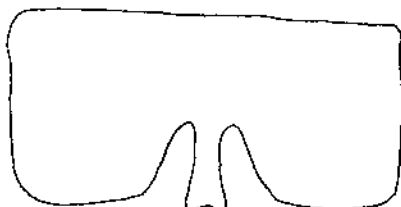


FIG. 82 EBURATUS

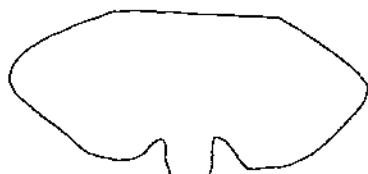


FIG. 83 CITRINIFRONS

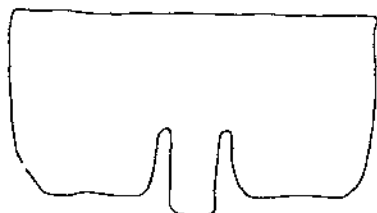


FIG. 84 SETACEUS

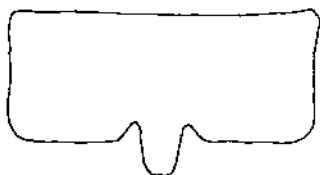


FIG. 85 JANUATUS

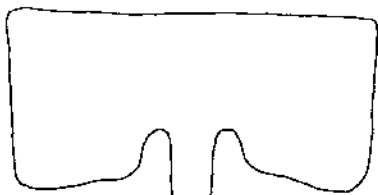


FIG. 86 WALDANUS

Seventh sternum of female, ventral aspect, of various species of *Colladonus*.
X 150.

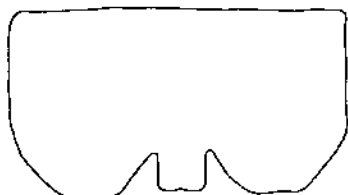


FIG. 87 FLAVOCAPITATUS

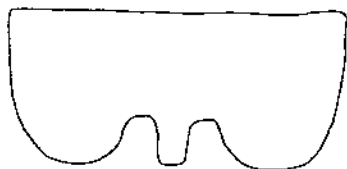


FIG. 88 ATRIFLAVUS

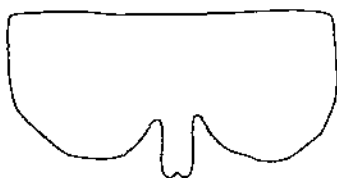


FIG. 89 TAHOTUS

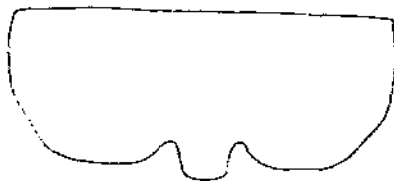


FIG. 90 PONDEROSUS

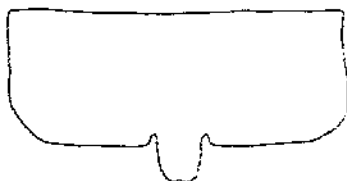


FIG. 91 GEMINATUS

Seventh sternum of female, ventral aspect, of various species of *Calladonus*.
X 150.

END