

The double complex

$$a + i b + j c$$

is related to points in three-fold space in the same way that the plane complex

$$a + i b$$

is related to points in a plane, and in the form

$$(a + i b) \left(1 + j \frac{c}{\sqrt{a^2 + b^2}} \right),$$

or in the general forms

$$(a + i b) (c + j d), e^{r + i a + j b},$$

it may be treated as an ordinary algebraic quantity.

Kansas City University.

1899

A REVIEW OF THE CERCOPIDÆ OF NORTH AMERICA NORTH OF MEXICO.

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The family cercopidæ, though of world-wide distribution, has comparatively few representatives within our borders, and those few have been but imperfectly known, the literature on the subject being scattered and fragmentary, the generic references often incorrect, and the specific determinations, owing to the extreme variability in color of some species, and the striking similarity of color between others, rendered very questionable. Scarcely one of the more common forms but what has been referred to under at least four different genera and several have more than that number of specific names.

This paper recognizes twenty species as included within our fauna, of which Say described six, Fitch three, Germar one, Uhler four, two were introduced from Europe, and four are here described as new; besides these there have been twenty more described, which have been referred to the first twenty as synonyms or varieties.

Except for the isolated descriptions and a few lists, the first systematic work done on the American species was Uhler's article on the family in the *Standard Nat. Hist.* (1884).

In 1889 Provancher, in his *Hemip. du Canada*, published the first synopsis of the group; he divided the family into

three genera (omitting the Issidæ) which were correctly used except that he included *L. 4-angularis* under *Aphrophora*; in his recognition of species he was less fortunate, as all three of his species of *Philænus* were varieties of *spumarius*.

In 1892 Dr. Goding published a synopsis of the genera, together with a bibliographical and synonymical catalogue of the described species; the characterization of the family was simply a translation of Stal's in Hemip. Africana, and the synopsis of the subfamilies and genera an adaptation from the same work. Under the subfamily *Cercopinae*, he recognized five genera, although Stal himself, the next year after the publication of that synopsis, united four of these genera, and later (Hemip. Mex.), all five; aside from that, however, the only excuse for inserting the fifth genus (*Rhinaulax*) was a MS. note by Dr. Fitch, placing the fabrician species *coccinea* there, while A. & Serv., the authors of all five genera, placed it in the first (*Tomaspis*). Under the *Aphrophorinae* he separated six genera, although of one (*Clovina*) he made no reference in the catalogue, and of another (*Ptyelus*), he left only two undetermined species of Walker's, one of which was a *Philænus*, and the other a *Lepyronia*, while the genus *Ptyelus*, as characterized by him (from Stal), has not been recognized outside of Africa.

Fowler, in the *Biologia*, describes a number of new genera and species of Cercopidæ, and has worked out considerable synonymy, of which only the following affects our species: *T. fasciaticollis* Stal=*simulans* Walk. and *bicincta* Say=*rubra* Linn. The first appears to be correct; the second is not, as can be readily seen by comparing *bicincta* with his figures, when it will be seen that it equals *simulans* and not *rubra*, and, being the first described, takes precedence. He also described a number of new species of *Clastoptera* without recognizing *xanthocephala*, *proteus* or *delicata*, specimens of all of which have been examined from Orizaba and other Mexican points, including several varieties, so that no doubt most of his species will fall as synonyms.

In 1896 the author published a revision of the *Clastoptera*, which, with the present paper, completes the family. While working on that paper *P. lineatus* and *bilineatus* were recognized as distinct and attention was called to the generic difference, the venation of each species being figured on the generic plate.

In 1897 Baker, in Notes on the genus *Philænus*, recognized the four species, separated the bibliography of *lineatus* and *bilineatus* and tried to restrict the latter to the west, while he described the eastern representatives as a distinct species *americanus*; an examination of a type and other eastern material shows no grounds, however, for the separation.

During the prosecution of this work I have been placed under special obligations to Mr. Otto Heideman for the loan of a large series of both eastern and western forms, among them the largest collection of eastern *Clastoptera* and of western *Aphrophora* that I have seen; to Professor Bruner for the loan of Nebraska, California, and Mexican material, and to Professors Piper, Gillette, Lintner, Fernald, Morse, C. M. Weed and H. E. Weed, for examination of material from their respective localities; to Professor Uhler for helpful suggestions, and especially to Professor Osborn, under whose supervision the work was originally planned, for the use of his own, the Iowa Agricultural college and V. D. collections, all of them extensive, and (later) the Ohio material; and to Professor Summers for the continuation of the same favors.

Besides the above, my own collection has furnished me with large series from Iowa, the Pacific coast, the West Indies and Mexico.

FAMILY CERCOPIDÆ A. & S.

Body stout, compact; general form oval or elongate; head in nearly same plane as the body; vertex nearly flat, anterior margin rounding or angulate; ocelli, two, placed near the posterior margin; front convex, more or less inflated, transversely ribbed, nearly flat dorsally where it forms a subquadrate insertion in the anterior field of the vertex, from which it is separated by a distinct suture (this portion of the front is considered as part of the vertex and referred to hereafter as the tylus); antennæ short, placed in front of and between the eyes under the margin of the vertex, the two basal joints bead-like, the remainder setaceous, pronotum large, anterior margin straight or angularly rounded, posterior margin short, often deeply emarginate; elytra longer than the abdomen, coriaceous, irregularly reticulated or with two long discoid cells and five or more apical cells; wings with a broad margin beyond the intramarginal vein; posterior coxæ and femora short and stout, posterior tibiæ scarcely longer than the others, round at the base, spatulate at the apex, armed on the outer margin with two stout spurs, the second twice the length of the first; tibiæ and two basal joints of the tarsi terminated with crescent-shaped rows of spines.

The members of this family are readily recognized by the two spurs on the cylindrical hind tibiæ. Some Fulgoridæ

have similar spurs, but the tibiæ are in that case angulate and the antennæ are below instead of between the eyes. All of the N. A. representatives fall in the first two subfamilies of Stål, which may be separated as follows:

SYNOPSIS OF THE SUBFAMILIES.

- A. Anterior margin of the pronotum straight; head narrower than pronotum; ocelli placed close together; eyes small, rounded; elytra broad, irregularly rounded at apex. *Cercopinæ* Stål.
- AA. Anterior margin of pronotum angulate or rounded; ocelli farther apart, eyes oblong or angulate; head equalling, or almost equalling, the pronotum in width; elytra compressed behind, rarely reticulate. *Aphrophorinæ* Stål.

SUBFAMILY CERCOPINÆ.

This subfamily includes large, showy forms in black, red and yellow and is well represented in the tropics. The N. A. forms all belong to a single genus and only a single species occurs north of the Mexican border, and it is more abundant farther south.

GENUS TOMASPIS A. & S.

Tomaspis A. & S. His. des. Hemip. p. 561, 1843

Triecphora A. & S. His. des. Hemip. p. 561, 1843.

Monocphora A. & S. His. des. Hemip. p. 562, 1843.

Sphenorhina A. & S. His. des. Hemip. p. 562, 1843.

Head small, much narrower than the humeral angles of the pronotum; front strongly inflated, anteriorly produced, usually beyond the vertex to which it rounds back, transversely ribbed and usually medially carinate; rostrum short, two jointed, scarcely reaching the middle coxæ; vertex much shorter than the pronotum, obtusely angulate, tylus large, eyes small, nearly round; ocelli twice farther from eyes than from each other; pronotum large, anterior margin straight, lateral margins long and strongly oblique, posterior margin straight or emarginate; elytra coriaceous, somewhat flaring, wider than the pronotum, apex rounding equally from both sides, venation obscure, apically reticulate; wings with the intramarginal vein entire, third longitudinal vein forked.

TOMASPIS BICINCTA Say.

Cercopis bicincta Say. Jour. Acad. Nat. Sci. Phil. VI, 303, 1831.

Cercopis ignipecta Harr. (MSS.) Cat. Ins. Mass. — 1833.

Monocphora bifascia Walk. List Hom. B. M. p. 679, 1851.

Monocphora angusta Walk. List Hom. B. M. p. 680, 1851.

Monocphora neglecta Walk. List Hom. B. M. p. 683, 1851.

Monocphora ignipecta Fitch. (Descrip.) 3d Rep. Ins. N. Y. p. 71, 1856.

Monocphora inferans Walk. List Hom. B. M. Sup. p. 176, 1858.

Sphenorhina simulans Walk. List Hom. B. M. Sup. p. 183, 1858.

Tomaspis fasciaticollis Stål. Stett. Ent. Zeit. XXV, p. 63, 1864.

Tomaspis rubra Fowler. Biol. Cent. Amer., p. 183 (in part).

Tomaspis simulans Fowler. Biol. Cent. Amer. p. 185

Broadly oval, with a narrow, angulate head; deep brown to black with the margins of the vertex, a transverse band across the middle of the pronotum and two across the elytra, red or orange, length 8-10 mm.; width on elytra 5 mm.; vertex broad, depressed two-thirds the length of the pronotum, obtusely angulate, disc sloping, depressed either side the longitudinal carina; front inflated, nearly right angled with the vertex, a single strong median carina; rostrum short, scarcely as long as the front; pronotum, disc convex, one-third wider than long, anterior margin straight, posterior margin roundly emarginate; elytra convex, coriaceous, over twice longer than wide, much broader than pronotum, outer margins curved, apex broadly rounding; venation obscure, apically reticulate.

Color, dark-chestnut brown to black; a narrow margin all round the vertex and along the median carina, the eyes and ocelli and the lateral margins of the pronotum red; a narrow transverse band across the humeral angles of the pronotum and two slightly wider ones parallel with this, dividing the elytra into three equal portions, red or orange.

Habitat: Specimens are at hand from New York, Massachusetts, Connecticut, Maryland, District of Columbia, North Carolina West Virginia, Florida, Louisiana, Texas, Kansas, and Iowa within our territory, and from Cuba and Mexico from without. It has been reported from Pennsylvania, Arkansas, and Georgia, and from Mexico, Jamaica, and several Central American states. It is a very common species in collections from Mexico and the West Indies. In the United States it occurs along the Atlantic slope from New York and Massachusetts south, throughout the gulf states and up the Mississippi valley as far as central Iowa, where it is extremely rare.

This is a somewhat variable species in size, and extremely so in color markings. These forms intergrade and can only be roughly divided as follows:

Form *bicincta*, the typical one, is dark brown with narrow, red bands.

Var. *ignipecta* Fitch, is the dark form where the bands are partly or entirely wanting.

Var. *simulans* Walk., has the bands broader, and creamy yellow in color.

Fowler was evidently misled in placing this species, by Say's remark that *bicincta* resembled *rubra* and *sororia*. It is very likely that those were the only two species that Say was acquainted with, or, at least, the nearest to his species of any that he knew; at any rate, the difference in the front, as shown by Fowler's figures, at once places it with *simulans* and not with *rubra*, and verifies Stal's observation that *fasciaticollis* was "close" to *bicincta*. Walker says of *inferans* that it closely resembles, and may be a local variety of *neglecta*.

Fowler places it as a synonym of *bifascia*, along with *angusta*. The latter was described from Georgia and is an undoubted synonym of *bicincta*, and if Fowler is correct in uniting the three forms, as it seems, then all four species fall as synonyms of *bicincta*.

SUBFAMILY APHROPHORINÆ Stal.

In this subfamily the species are smaller, more elongate, and, as a rule, rather somber colored. The group is well represented in our territory in both genera and species. Two of the species are European and probably introduced, while many of them are widely distributed, and several extend beyond our borders to the southward.

SYNOPSIS OF THE GENERA.

- A. Apex of clavus acute, corium without a terminal membrane.
- B. Anterior margin of the pronotum angulate, ocelli nearer each other than eyes; rostrum long; exceeding the hind coxæ, with three visible segments, the terminal one much the longest.
Aphrophora Germ.
- BB. Anterior margin of pronotum rounded, ocelli nearly equally distant from eyes and each other; rostrum short, not exceeding middle coxæ; composed of two equal visible segments.
- C. Anterior margin of vertex between front and eyes sharp; whole upper surface densely pubescent, almost hiding sculpturing and venation; submarginal vein of wing interrupted between second and third sectors.
Lepyronia A. & S.
- CC. Anterior margin of vertex between front and eyes sulcate.
- D. Elytra irregularly reticuled apically. *Philuronia* n. g.
- DD. Elytra with about five apical cells. *Philænus* Stal.
- AA. Apex of clavus broadly rounded, corium with a broad terminal membrane; submarginal vein of wing interrupted at apex. (Small globose forms.) **Clastoptera* Germ.

GENUS APHROPHORA Germ.

Vertex obtuse or rectangulate, the apex rounding, anterior margin between the eyes and tylus sharp, ocelli placed close to the posterior margin, nearly twice farther from the eyes than from each other; head with the eyes scarcely as wide as the posterior angles of the pronotum, the anterior and posterior margins nearly parallel, the latter with a median triangular notch between the ocelli, into which fits a slight projection of the pronotum; front convex, inflated, transversely wrinkled except on the median line; rostrum long, with three visible segments, the last one much the longest, extending beyond the hind coxæ; pronotum large, about one-half longer than the vertex, anterior margin distinctly angulate, medially produced into the notched vertex; a distinct median carina extending

*For a synopsis of the *Clastoptera* see Ia. Acad. Sci. Proc. Vol. III, p. 182.

across both vertex and pronotum; elytra coriaceous, about twice longer than wide, without an appendix, the apex rounding, both veins of corium forking before the middle, forming two long discoid cells; apical cells irregular, usually about five; wings with the third vein from the marginal vein forked and forming a closed apical cell; entire dorsal aspect of insect coarsely and irregularly punctate; male valve wanting.

The members of this genus are all of moderate size, varying from 8 to 12mm. in length, and are strikingly uniform in color and pattern of marking, being grayish or brownish, with two irregular, oblique, dark-margined light bands on the elytra, sometimes obscure and sometimes broken up into spots.

The variation in color and marking is not sufficient to enable one to readily recognize the different species and they are only accurately separated by reference to structural characters, the three most important being the degree of inflation of the front with the corresponding variation of the facial angle, the shape of the terminal ventral segment of the male abdomen and the shape of the male plates, the latter character alone enabling one to readily separate that sex of all our species.

In distribution this genus seems to be limited to the northern hemisphere, and the greater number, if not all the species, occur in the temperate zone. Europe has three species, all of which are widely distributed, while this paper recognizes eight species occurring in the United States and Canada, and Fowler has recently described three new species from Mexico in the *Biologia*. These latter are all small and are apparently closely related to *4-notata*, the only one of our species that has been taken as far south as our southern border.

Of the species under consideration *4-notata* has the greatest known range, occurring from Ontario to Florida, and west to North Dakota and Iowa. Next to it comes *permutata*, which has been found from Vancouver's island south to central California and eastward to Colorado. Of the others, *parallela* is the only one that has as yet been recorded from widely separated localities, and it is very probable that some of its western records were based on other species.

SYNOPSIS OF THE SPECIES.

- A. Elytra very broad, angulate behind, the outer margin strongly curved and with two more or less distinct hyaline areas; general color light-gray or brown; head and pronotum nearly flat, front but slightly inflated, acutely angulate with vertex.

- B. Hyaline areas distinct, outer discoid cell its own width from margin. *4-notata* Say.
- BB. Hyaline areas indistinct, outer discoid cell not more than half its width from costal margin. *angulata* n. sp.
- AA. Elytra elongate, rounding behind, the outer margin broadly curved, without trace of hyaline costal areas; usually with front inflated and the pronotum elevated.
- B. Front inflated and produced, meeting the vertex in nearly a right angle; elytra strongly convex, species large, dark.
- C. Front much produced, extending distinctly beyond the tylus, to which it rounds back; ovipositor long. *parallela* Say.
- CC. Front not extending beyond the vertex, pygofers and ovipositor short, the latter scarcely exerted.
- D. Front meeting the vertex at a right angle; plates attinent, finger-like. *permutata* Uhl.
- DD. Front meeting vertex at a slightly acute angle; plates broad and short, divergent. *irrorata* n. sp.
- BB. Front moderately flat, meeting the vertex at an acute angle; species smaller, narrower, lighter colored.
- C. A broad, white median stripe on vertex and pronotum; face and vertex making an angle of about 50 degrees; pygofers long, narrow, ovipositor exerted; plates short, consisting of two rounding lobes *saratogensis* Fh.
- CC. At most a narrow, light stripe on vertex, not extending on to pronotum, face and vertex making an angle greater than 50 degrees; pygofers short, ovipositor scarcely longer; plates acute, divergent.
- D. Pronotum and elytra strongly maculate, plates divergent from base, suddenly narrowed before the apex. *annulata* n. sp.
- DD. Pronotum and elytra nearly unicolorous; plates attingent at base, divergent before the apex, regularly narrowing *signoretii* Fh.

APHROPHORA QUADRINOTATA Say.

A. quadrinotata Say. Jour. Acad. Nat. Sci. Phil. VII, p. 304, 1831.

Dark grayish-brown, with two large hyaline areas on the costal margin of each elytron; closely resembling the European *A. alni* in color and marking, but much smaller and with a longer vertex; length 7-8mm., *width 3-3.5mm.

Vertex nearly flat, one-half longer on middle than at eye, anterior margin rounding, the edge sharp, posterior margin broadly angulate with a distinct notch, median carina distinct; front scarcely inflated, the inflation being about half the length of the long diameter of the eye, forming an acute angle with the vertex; pronotum rather flat, median carina sharp; elytra broad, the costal margin flaring before the middle; whole upper surface of insect coarsely and irregularly punctate.

*Width is always given across the widest part of the elytra when folded.

Color: Vertex, grayish-brown, anterior margin of tylus black-lined, rest of margin light, except against the dark eyes; ocelli red; median carina light; pronotum grayish, the carina and a spot on either side before the middle pale; elytra with the claval areas pale, grayish, corium darker, an oblique hyaline band before the middle, extending from the costal margin to the inner sector, sharply margined behind, fading out in front, behind the middle is an elongate hyaline spot; between these spots is an irregular, dark-brown area, and in well marked specimens another appears in front of the band and a third behind the spot.

Genitalia: Female pygofer about one-third longer than wide, slightly exceeded by the ovipositor; two last segments of the male abdomen elongate narrowed; plates small, twice longer than wide, separated at the base by their own width, their inner margins parallel, outer rounding.

This is the most abundant of the eastern species and is readily recognized by its small size and white markings. A series of several hundred examples show little variation in size or color.

Habitat: Examples have been examined from Ontario, New York, New Hampshire, District of Columbia, Maryland, West Virginia, Georgia, Florida, Iowa and Nebraska, and it has been reported from Ontario, Maine, Massachusetts, Ohio, Illinois, and North Dakota.

APHROPHORA ANGULATA n. sp.

A. angulata Uhl. Mss.

Pale, nearly uniform grayish-brown, two obscure hyaline spots along the costa; larger and more obscurely marked than *A. notata*; length 10mm., width 4mm.

Vertex flat, scarcely longer on middle than next to eye, anterior margin sharp as far as the tylus, which is slightly produced upon the front; median carina weak on the tylus, becoming strong on the posterior margin of the vertex; front weakly inflated, forming an acute angle with the vertex as in *A. notata*; pronotum, anterior third depressed, finely punctate, with a strong median carina, behind this, elevated and coarsely pitted, with the carina weak; elytra very broad in the center, roundly angulate behind; the costal area attaining the center of the corium at the angle of the first sector.

Color: Grayish-brown; vertex and anterior third of pronotum brown, with the fine punctures black, median carina light, rest of pronotum light, with dark pitting; scutellum light-gray; elytra, ground color light, coarsely pitted with brown, becoming darker on the middle of the costa, either side of which there is a large subhyaline area, nervures mostly dark margined and distinct.

Genitalia: Female pygofer scarcely half longer than wide, moderately exceeded by the short ovipositor.

Described from a single female labeled "Cal.," received from Professor Bruner. Other examples have been examined, one of which bore Uhler's MSS. name as above. This species is similar in structure and color to *4-notata*, but readily separated by its shorter vertex, larger size and more uniform coloring.

APHROPHORA PARALLELA Say.

Cercopis parallela Say. Narr. Long's Exped. II, 304, 1824.

Ptyelus cribratus Walk. Homop. B. M. 712, 20 (fide Fitch).

Dusky reddish-brown, with two narrow, oblique, light bands on the elytra; body broad and deep, vertex long and the front much inflated; length 9-10mm., width 4-4.25mm.

Vertex, flat or slightly transversely depressed behind the tylus, fully one-half longer on middle than at eye, anterior margin thick, nearly straight to the tylus, tylus produced and rounded in front, its length equaling two-thirds of its width; front strongly inflated and produced, extending slightly beyond the vertex, its greatest inflation being nearly one-half greater than the long diameter of the eye; pronotum depressed on the anterior half, suddenly elevated and rounded on the posterior portion, the lateral margins long and sharply carinate, exceeding in length the distance between the ocelli; elytra broad and convex, narrowing behind; costal area very broad, but not reaching the center of the corium.

Color: Tawny, punctured with dark-brown; vertex, reddish-brown, finely punctured, the anterior margin shining black, interrupted on margin of tylus, median carina broadly white behind tylus; pronotum light-gray, heavily punctured with light tawny-brown; elytra grayish, heavily overcast with tawny, an interrupted light band running from the apex of scutellum to the center of costa and another starting in a spot on the inner margin at the apex of the clavus and running forward to meet the other on the costa; these bands are often reduced to white bars on the nervures, and are usually margined with darker.

Genitalia: Female pygofer, long and narrow, exceeded a full millimeter by the ovipositor; ultimate ventral segment of male short, its length about equaling its basal breadth, narrowing apically, the margins curving up and the lateral angles produced in the forms of style like appendages as long as the plates; plates nearly square, the posterior angles rounded.

Habitat: Specimens are at hand from Ontario, New York, Pennsylvania, Vermont, Massachusetts, Maryland, West Virginia, Michigan, and it has been reported from Nova Scotia, Ontario, Michigan, Illinois, Missouri, and Arkansas. The last two references probably refer to some other species, leaving it with a known distribution from Canada south to New Jersey, and west to Michigan and Illinois.

APHROPHORA IRRORATA n. sp.

Dark rusty-brown, flecked with lighter, very closely resembling *permutata*; longer and narrower than *parallela*, with a much shorter vertex and a less swollen front; length 11-12mm., width 3.5-4mm.

Vertex short, transversely depressed, only slightly longer on middle than at eye, anterior margin thin, tylus broad and short, nearly twice wider than long, median carina obscure, front moderately inflated, outline a regular curve from clypeus to vertex, angle with vertex acute, inflation of front less than the long diameter of the eye; pronotum transversely depressed before the middle, posterior disc elevated, carina weak except across the depressions, lateral margins short, their length less than the distance between the ocelli; elytra, long and narrow, much exceeding the abdomen, but little widened at center of costa: costal margins scarcely reflexed; costal area narrow, no more than one-half wider at the angle of the first sector than at the discoid cells.

Color: Vertex, dark rusty-brown, median carina and a spot either side the tylus, light; anterior half of the pronotum light, with few dark punctures except along the carina, posterior half densely punctured darker; elytra tawny, interrupted by numerous small circles of white, often inclosing a single dark puncture, these somewhat irregularly arranged, but usually showing three light areas, separated by two darker ones along the costa; an oblique light band from the center of scutellum to the center of the corium; a light spot before the apex of the clavus and another behind.

Genitalia: Female pygofers short and convex, exceeded by the short ovipositor by a distance of less than one-half their width; ultimate ventral segment of male abdomen longer than wide, narrowing behind, convex, shining; plates broad, parallel margined, inner posterior angles excavated, leaving a rounded notch nearly half their depth, outer posterior angles produced, acutely pointed.

Described from several examples received from Professor Bruner, taken in Sioux county, Nebraska (War-Bonnet Cañon), and others taken in Rist Cañon (Ft. Collins), Colo.

This species resembles *parallela* quite closely in color and marking, and was probably the one referred to by Say as occurring in Missouri and Arkansas. It is quite distinct structurally and may be readily separated by the short vertex, longer elytra and the striking differences in front and genitalia.

APHROPHORA PERMUTATA Uhl.

A. permutata Uhl. List Hemip. Colo. and N. Mex., p. 472, 1872 (Mss.).

A. permutata Uhl. List Hemip. West Miss. Riv., p. 345, 1876 (Descrip.).

A. permutata Uhl. Stand. Nat. Hist., p. 243, 1884 (Distribution).

Varying from dark rusty-brown to brownish-yellow, with two oblique dark-margined, light bands on the elytra; resembling *irrorata*, but with a more inflated front, and longer, narrower male plates; length 9-12mm., width 3.5mm.

Vertex, sloping or transversely depressed, about one-fourth longer on middle than at eye, anterior margin moderately thick, nearly straight to the tylus; tylus moderately produced and rounded, fully twice wider than long; front moderately inflated, the inflation equaling the long diameter of the eye, produced anteriorly, forming a right angle with the vertex; pronotum somewhat depressed before the middle, disc elevated, the lateral margins about equaling in length the distance between the ocelli; elytra long and narrow, exceeding the abdomen; costal area less than one-half wider at the angle of sector than opposite the discoid cells.

Color: Vertex tawny, punctured with darker, carina light; pronotum grayish, coarsely punctate with tawny or rusty-brown; elytra tawny or grayish-brown, coarsely punctate with darker; an oblique, light band from the scutellum to the center of the corium, another from before the apex of clavus, running transversely on to the corium, then obliquely back to the costa, both bands broadly dark margined, the anterior one emphasized on the costa.

Genitalia: Female pygofer and ovipositor short and compact, thickly set with coarse hairs; ultimate ventral segment of male abdomen longer than its basal width, narrowing apically; plates in the form of long, tapering, finger-like processes, attingent until just before the black tip, where they narrow slightly and diverge.

Habitat: Specimens are at hand from Vancouver's island, Washington, Oregon, California, Idaho, Montana, and Colorado, and Uhler reports it from Utah.

APHROPHORA SARATOGENSIS Fitch.

Lepyronia saratogensis Fitch. Cat. Hom. N. Y., p. 53, 1851.

Ptyelus detritus Walk. List Hom. B. M., p. 713, 1851.

Ptyelus gelidus Walk. Hom. B. M., p. 714, 1851.

Fulvous or grayish-brown, a broad, median light stripe across head and pronotum, and oblique, light bands on the elytra; smaller than either *parallela* or *permutata*, and with a less inflated front; length 3.5-10mm., width 3-3.5mm.

Vertex, nearly flat, anterior margin thin, confluent with that of the tylus, which is also carinate anteriorly, making the entire anterior margin of the head thin and rounding, parallel with the posterior margin; front small, outline a regular curve, inflation less than the long diameter of the eye; pronotum only slightly convex, transverse depression before the middle very slight, carina weak, except across the depression; elytra moderately long and narrow, slightly exceeding the ovipositor in the female, costal margin scarcely reflexed.

Color: Vertex, fulvous with a broad, median light stripe; pronotum fulvous in front, grayish behind the middle, a broad, median light stripe, creamy yellow in front, broader, paler and including a few dark punctures behind the middle; elytra fulvous or grayish-brown, with the oblique, light bands broad and indistinct, rarely margined with darker.

Genitalia: Female pygofer half longer than their basal width, exceeded about one millimeter by the ovipositor, which is scarcely

exceeded by the elytra; ultimate ventral segment of the male abdomen very short, nearly four times wider than long, convex, the posterior angles produced, style like; plates subquadrate, rounded behind.

Habitat: Specimens are at hand from Ontario, New York, New Hampshire, District of Columbia, Maryland, and West Virginia, and it has been reported from Ontario, and Walker's species were from Nova Scotia and Florida.

Readily separated from *parallela* by its shorter vertex and smaller front, as well as its smaller size and lighter color; from *signoretii*, which it more closely resembles, by the light stripe and the male genitalia.

APHROPHORA ANNULATA n. sp.

Light ochraceous-brown, irregularly maculated with chestnut, lighter colored and more heavily marked than *saratogensis*, with a shorter female ovipositor and narrower, divergent male plates; length 10-11mm., width 3.5-4mm.

Vertex, flat, sloping, strongly angularly emarginate behind, roundly angulate in front, scarcely longer in the middle than against eyes, anterior margin very thin either side tylus, tylus very broad and short; front moderately inflated, about equaling long diameter of eye, slightly anteriorly produced, forming very nearly a right angle with the vertex; pronotum strongly depressed on the anterior half, then suddenly elevated and rounded on the disc, the lateral margins short, sharp and oblique, scarcely as long as the distance between the ocelli, elytra moderately long, somewhat inflated, the costal margin reflexed anteriorly.

Color: Vertex, ochraceous, with a faint, median light line, bordered by two broad chestnut ones; pronotum pale, ochraceous, a chestnut stripe arising just before the middle on either side the carina and running backward, and then obliquely outward and broadening to the claval margin; disc of scutellum chestnut, the margins pale, elytra pale, ochraceous, an area at the base, an oblique band from the scutellum, broadening to just before the middle of the costa, another before the apex of the clavus and the nerve at the base of the apical cells, deep chestnut.

Genitalia: Female pygofers convex, scarcely longer than wide, ovipositor short and stout; ultimate ventral segment of the male abdomen nearly twice wider than long, subcylindrical; plates broad at the base, the outer margins flaring, inner margin cut off obliquely nearly to the base, slightly sinuate, leaving two widely divergent, black-tipped points.

Described from sixteen examples labeled "Wasatch, Utah, 6-27-91," received through the kindness of Mr. Otto Heide-mann. Easily separated from *permutata*, which occurs in the same region, by the lighter color and heavier marking, as well as by the very distinct genitalia.

APHROPHORA SIGNORETHI Fitch.

A. signorethi Fitch. Third Report Ins. N. Y., p. 70, 1856.

Tawny-brown, varying to pale ochraceous, line on vertex and pronotum and marking of elytra almost obsolete; slightly smaller than *saratogensis*, with a shorter, blunter vertex and stronger front; length 8.5-10mm., width 3.5mm.

Vertex, sloping or depressed, very obtusely angulate, anterior and posterior margins parallel, anterior margin sharp to the tylus, tylus distinct, slightly elevated; front moderately inflated, about equaling the long diameter of the eye, not produced anteriorly, forming an acute angle with the vertex; pronotum rather strongly depressed before the middle, but only slightly elevated behind, leaving it rather flat, side margins distinctly shorter than the distance between the ocelli; elytra moderately long, the costal margin reflexed anteriorly.

Color: Vertex, tawny, darkest on the tylus, carina obscurely marked; pronotum tawny-brown, scarcely a trace of gray on the elevated disc, anterior depressed portion lighter, scutellum lighter on the disc; elytra varying from tawny to ochraceous, light bands, not very prominent, the anterior one arising well back of the scutellum and not attaining the costa, the posterior one arising near the apex of clavus and running nearly transversely to the costa.

Genitalia: Female pygofers convex, moderately long, exceeded by the ovipositor, which does not reach the tips of the elytra; ultimate ventral segment of the male abdomen nearly twice longer than penultimate, one-half longer than its basal width, narrowing apically, disc convex; plates stout, forcep-like, black-tipped, their outer margins rounding, the inner ones obliquely divergent.

Habitat: Specimens are at hand from New York and Ontario, Canada.

This species has been confused with *saratogensis* to such an extent that it is impossible to separate the references; it may be readily distinguished, however, by the forcep-like male plates, while in *saratogensis* they are nearly quadrate discs.

GENUS LEPYRONIA A. & S.

Vertex, together with the eyes, as wide as the pronotum, angularly rounding anteriorly, the margin sharp, disc nearly flat, without carina, tylus large, parallel margined; ocelli about midway between tylus and pronotum, nearly as far from each other as from eyes; front broad, moderately inflated, coarsely ribbed, except along a median band; rostrum, two-jointed, reaching the middle coxæ; pronotum about three times as wide as its length on middle, anterior margin slightly rounding, lateral margins nearly parallel, sharply carinate, shorter than the long diameter of the eye, posterior margin deeply, roundly emarginate, disc but slightly convex; elytra coriaceous, broad and rather short, outer margin broadly and regularly rounding to the acutely angulate apex; venation of the

normal pattern, often slightly irregular, obscured by the coriaceous structure and the dense pubescence; wings, with the third sector from the marginal one, forked, the intramarginal vein interrupted between the third and fourth sectors; legs short and stout, hind tibia armed with two stout spurs and a large crescent of spines; whole dorsal surface covered with a dense prostrate pubescence.

Our representatives of this genus are all grayish or brownish-cinereous, with traces of oblique fuscous-markings on the elytra; in size they range all the way from that of a *Clastoptera* up to the largest *Aphrophora*, but are always easily recognized by their globose forms and hairy covering.

SYNOPSIS OF THE SPECIES.

- A. Margins of the vertex regularly rounding to the obtuse tip; elytra slightly angularly inflated, nearly twice longer than their combined width (folded), grayish, testaceous, with a distinct V on each elytron. *4-angularis* Say.
- AA. Margins of vertex straight or concave, the tip slightly produced; elytra inflated, no more than one-half longer than their combined width (folded).
 - B. Small, testaceous, rather narrow; the vertex broad and short; shorter, or only equaling the pronotum in length; apex of elytra broadly subhyaline. *angulifera* Uhl.
 - BB. Large, nearly uniform grayish; general form globose; vertex longer than pronotum. *gibbosa* n. sp.

LEPYRONIA QUADRANGULARIS Say.

Cercopis quadrangularis Say. Jour. Acad. Nat. Sci. Phil., VI, p. 305, 1825.

Grayish or tawny-brown, with a fuscous spot at the base, another at the apex, and a V on the center of each elytron; margins of vertex convex; elytra only slightly inflated; length ♀ 7-8.5mm., ♂ 6.5-8mm., width 3mm.

Vertex, flat or depressed, length and width about equal, slightly longer than the pronotum, margins rounding to the blunt apex; tylus large, parallel margined, nearly one-half the length of the vertex; pronotum flat, twice wider than long, slightly rounding in front, with a transverse row of impressions behind the margin, lateral margins nearly parallel, longer than the short diameter of the eye; elytra about twice longer than wide, outer margin rounding, the apex angulate.

Color: Vertex and pronotum uniform testaceous, brown; elytra grayish or tawny-brown, a patch at the base, another at the apex, an oblique band from the tip of the scutellum to a point beyond the middle of the costa, another from the point of the clavus, meeting this on the costa and forming a V on each elytron, brownish fuscous.

Genitalia: Ultimate ventral segment in the female consisting of a narrow plate in each corner, pygofer and ovipositor short, elevated so that

the tip touches the elytra; male plates two and one-half times longer than wide, inner margins straight, outer narrowing slightly to just before the tip, where they are cut off obliquely, together forming a V-shaped trough, inclined slightly upwards.

Habitat: Specimens are at hand from Ontario, New Hampshire, New York, Pennsylvania, Connecticut, District of Columbia, Maryland, West Virginia, Georgia, Florida, Mississippi, Ohio, Iowa, South Dakota, Nebraska, Colorado and Texas.

LEPYRONIA ANGULIFERA Uhler.

Lepyronia angulifera Uhler. List Hemip. West Miss. Riv., p. 348, 1876.

Deep testaceous, with grayish-golden pubescence, the tips of the elytra broadly grayish, subhyaline; margin of vertex nearly straight, the tip produced; length ♀ 6mm., ♂ 5mm.; width 2.5mm.

Vertex sloping, disc convex, broader than long, about equaling the pronotum, margins slightly carinate, straight or sinuate, the apex produced; tylus narrow, parallel margined, one-half the length of the vertex; face moderately inflated, forming an acute angle with the vertex; pronotum more than twice wider than long, the anterior margin gently curving, back of which there is a series of depressions; lateral margins distinctly oblique; elytra coriaceous, distinctly angulate along the claval suture, the disc of the corium inflated, outer margin broadly rounding, apex roundly angulate; width of apex of hind tibia one-third its length.

Color: Testaceous, elytra beyond clavus grayish sub-hyaline, the nervures darker, another light band across the middle, this latter often reduced to two spots on the centers of the costal margins; whole upper surface slightly grayish, iridescent from the pubescence.

Genitalia: In the female, similar to *4-angularis*, the ovipositor longer, exserted; male plates broad and convex at base, rapidly narrowing one-third their width, then nearly parallel margined to the rounding apex, about twice longer than their middle width, convex, inner margins attingent.

Habitat: Specimens are at hand from Jacksonville, Crescent City, Indian reservation, and Duval county, Florida, and Uhler reports it from Maryland and New Jersey.

The smaller size, narrower form and sloping, pointed vertex, as well as the subhyaline apex of the elytra, readily distinguish this species.

LEPYRONIA GIBBOSA n. sp.

Large; light-grayish brown, broader and more inflated than *4-angularis* or even the European *coleopterata*; vertex long, sloping, the margins concave; length ♀ 8-10mm., ♂ 6-7mm.; width ♀ 4-5mm., ♂ 3.5-4mm.

Vertex sloping, disc convex, longer than the pronotum, nearly as long as the width between the eyes, margins strongly concave in the male, slightly so in the female; tylus broad and distinct, the anterior margin elevated; front broadly inflated, the inflation being greater than the long diameter of the eye; pronotum only slightly rounded in front, behind which there is a transverse row of impressed spots, the lateral margins slightly oblique, as long as the eye, posterior margin short, deeply roundly emarginate; elytra much broader than the pronotum, convex, sutural margin shorter than the greatest width, costal margin extending much below the level of the pronotum, broadly rounding, reflexed on the margin before the middle, behind which the disc is convex, apex bluntly roundly angulate, whole upper surface covered with a dense, prostrate, golden pubescence.

Color: Grayish or fuscous-brown, with indistinct, darker markings on the elytra, as follows: A faint band from the point of the clavus, deepening into a spot behind the middle of the costa, sometimes traces of a band from here to the apex of the scutellum, forming an indistinct, fuscous V, a spot on the costa midway between the first and the apex.

Genitalia: Female pygofer and ovipositor as broad as long, inclined upwards, ultimate ventral segment only appearing as a long, triangular piece in each corner; male plates convex, nearly vertical, outer margins slightly narrowing, then rounding to the acute apex.

Described from two females and seven males, from the following localities: Little Rock, Iowa (O. & B.), Squaw Cañon, Sioux county; Sand Hills and Dismal River, Neb. (Bruner).

This species has several times been mistaken for *L. sordida* and is probably the one referred to as from Illinois under that species, in Goding's catalogue, as the true *sordida* has not yet been taken this side the Mexican boundary, or very close to it on the other side. The much larger size, lighter color and long, sloping vertex will at once distinguish it from *sordida* or the two preceding species.

GENUS PHILARONIA n. g.

Stout, heavy-set, somewhat globose forms of moderate size, having the form and dense hairy covering of a *Lapyronia* together with the sulcate vertex of a *Philænus* and a ramose venation, which is quite distinct from the type of either genus.

Vertex nearly rectangular in front, roundly emarginate behind, distinctly longer on middle than against eye, nearly as long as the pronotum, anterior margin between eyes and tylus deeply sulcate, ocelli near the posterior margin, somewhat nearer each other than eyes, front strongly inflated and coarsely ribbed, except for a narrow median zone, rostrum short and stout, reaching only to the middle pair of coxæ, composed of two equal segments, head with the eyes scarcely as wide as the pronotum; pronotum rather small, scarcely elevated, the anterior margin

broadly rounded, side margins short, oblique, carinate, distinctly shorter than distance between ocelli, claval margin long, posterior margin deeply, narrowly emarginate; elytra coriaceous, slightly more than twice longer than wide, convex and inflated, widest across the discoid cells, costal margin sinuated and strongly reflexed just before the middle, venation irregular, ramose, the two veins on the corium forking to form discoid cells, which are broken up posteriorly to form an irregular network, which occupies the entire apical portion of the elytra, the entire venation obscured by a dense covering of fine hair.

This genus includes two rather anomalous species; from the ramose venation they might be placed next the *Cercopince*, while in other characters they fall between *Lepyronia* and *Philcenus*; from *Philcenus* and *Aphrophora* they may be readily separated by the dense prostrate pubescence and the venation, and from *Lepyronia* by the sulcate vertex. The genus is apparently confined to this continent and probably to the temperate zone, within which they are quite widely distributed.

The two species are still more remarkable in that they bear almost exactly the same relation to each other that the two species of *Philcenus* do, *spumarius* and *abjectus* each possessing convex elytra and the forked wing vein, while *lineatus* and *bilineatus* are elongate and nearly parallel margined, with the third vein of wing entire; in color the resemblance is still greater, *bilineatus* being almost a duplicate, on a larger scale, of *lineatus*, even the variation in color following the same lines; while *abjectus*, in some of its lighter shades, exhibits traces of the maculation of a typical *spumarius*, and the darker ones differ by scarcely a shade from its darker varieties.

SYNOPSIS OF THE SPECIES.

- A. Elytra convex, the costal margins strongly curved, much wider than across eyes, front not produced anteriorly, the outline a regular curve; third longitudinal vein of wing forked; color, reddish-brown. *abjectus* Uhl.
- AA. Elytra with the costal margins nearly parallel, very little wider than across eyes; front, anteriorly produced, rapidly rounding to the vertex; color, pale straw-yellow, sometimes heavily marked with fuscous, costal margins lined with white. *bilineatus* Say.

PHILARONIA ABJECTA Uhl.

Philcenus abjectus Uhl. List Hemip. West Miss. Riv., p. 346, 1876.

Lepyronia angulifera G. & B. Hemip. Colo., p. 71, 1895.

Form broad and convex, rapidly narrowing behind, *Lepyronia* like, head narrower than pronotum. Color reddish-brown; vertex and two spots on the costa lighter; length 5.5-6.5mm., width 2.5-3mm.

Vertex sloping, nearly rectangulate before, the sides rounded, sulcate, twice as long on middle as against the eye, length slightly more than half the width, posterior margin broadly rounding, the ocelli and suture between head and pronotum obscured by the heavy pubescence, ocelli equidistant from eyes and each other, nearer posterior margin than tylus; front moderately inflated, outline nearly straight, rostrum two-jointed scarcely equaling the front in length; pronotum with the anterior third depressed and on the same plane with the vertex, a row of pits along the posterior margin of the depressed area, side margins very short; elytra coriaceous, convex, the costal margin strongly curved, venation obscured, apically broken up and irregularly reticulate; legs very stout, spurs on hind tibia nearly twice as long as its width; whole dorsal surface densely pubescent.

Color: Reddish-brown; vertex and anterior part of pronotum often tawny, the pubescence golden, posterior part of pronotum and disc of the elytra dark reddish-brown, costal margin with a light spot on middle and a larger, obscure one towards the apex; front varying from creamy-yellow to tawny-brown.

Genitalia: Female pygofers very short and small, extending but little beyond the abdominal segments, strongly elevated, the ovipositor broad and short, nearly touching the suture; ultimate ventral segment of the male abdomen larger than penultimate, slightly convex, wedge-shaped; plates vertical, broad, wedge-shaped, the apex rounded, much larger and shorter than in *bilineatus*.

Habitat: Specimens are at hand from Colorado, Nebraska, South Dakota, and it is probable that Uhler's reference to *spumarius* from Utah, Dakota, Sitka, and Lake Winnipeg refer to this species.

PHILARONIA BILINEATA Say.

Aphrophora bilineata Say. Jour. Acad. Nat. Sci. Phil., VI, p. 804, 1831.

Philænus lineatus Uhl. List. Hem. West Miss. R., p. 347, 1876 (in part).

Philænus lineatus G. & B. Hemip. Colo., p. 70, 1895.

Philænus americanus Bak. Can. Ent., XXIX, V, p. 112, 1897.

Form stout sub-cylindrical, the costal margins as seen from above, nearly parallel, head equaling the pronotum in width, vertex long, color pale-straw, costal margins broadly light, margined internally with darker; length 5.5-7mm., width 2mm.

Vertex long, rectangulate or slightly acute, the sides sulcate, length on middle nearly two-thirds the width, over twice the length against eye, tylus half the length of the vertex, distinctly carinate, ocelli nearer the posterior margin and very slightly nearer each other than the eyes; front strongly inflated, anteriorly produced, outline strongly curved, the inflation equaling the long diameter of the eye; pronotum almost flat, on same plane as the vertex, a median longitudinal depression the whole length, and two depressed spots on either side of the disc; elytra long, nearly parallel margined, broadly rounding behind, venation obscure on the disc, broken up and irregular ramose back of the middle; legs rather

long and slender, spurs on hind tibia small, scarcely longer than its width, the apical crown of spines very large; whole dorsal surface covered with a coarse golden pubescence.

Color: Straw-yellow clouded with fuscous, margins of sulcus both above and below, dark brown; vertex, pronotum and scutellum pale straw color, with two longitudinal brownish fuscous stripes enclosing a narrow median light one; elytra straw-yellow, the costal margin broadly white; inside this is a dark stripe arising against the eye and running back across the lateral margin of the pronotum and along the elytra inside the first sector to well beyond the middle; sometimes in the female, often in the male, it spreads out inwardly and darkens up the disc on the anterior two-thirds; front, yellowish, ribbed with darker, a light stripe arises under the eye and runs back to join the costal stripe; legs, straw-yellow.

Genitalia; female pygofer, short, stout, strongly elevated so that the tip of the exerted ovipositor touches the sutural margin of the elytra; ultimate ventral segment of the male abdomen very large, strongly convex, shining, plates vertical, wedge-shaped, over twice longer than their basal width, their tips nearly touching the elytra at the suture.

Habitat: Specimens are at hand from Idaho, Wyoming, Montana, Colorado, Nebraska, South Dakota, Iowa, New Hampshire, Ontario and Connecticut; Uhler reports it (as *lineatus*) from the Yukon, Mackenzie and Red River countries, and Baker (as *americanus*) from Massachusetts and Connecticut.

This is a very common species on the plains and prairies and extends eastward to the Atlantic coast. An examination of a type of *americanus* proved it to be identical with the forms that have been examined from other eastern localities and cannot be separated from the western ones. The only point of separation given in the description is "the flatter face of *lineatus*," and that character can be readily duplicated in western specimens.

GENUS PHILÆNUS Stal.

Vertex with the anterior margin obtuse or slightly acutely angulate, posterior margin rounding or very slightly angulate, longer on middle than against the eyes, over half the length of the pronotum, anterior margin between the eyes and tylus deeply sulcate, tylus distinct, anterior margin rounding, polished, ocelli near the posterior margin, nearly as far from each other as from eyes, front moderately inflated, coarsely ribbed either side the median line, disc flattened, clothed with coarse hairs, rostrum short and stout, composed of two equal segments, not extending beyond the second pair of coxæ; head together with the eyes about equaling in width the posterior part of the pronotum; pronotum weakly convex without a median carina, rounding angulate in front, deeply emarginate behind, the lateral margin much shorter than the distance between the ocelli, carinate, claval margins long and slightly emarginate; elytra over twice longer than wide, convex or parallel margined, without an appendix;

venation simple, both veins of the corium forking and forming two elongate discoid cells, apical cells somewhat irregular, usually about five; wings with the third vein from the marginal vein either forked (*spumarius*) or entire (*lineatus*); legs short and stout, spurs and spines strong; whole dorsal surface of insect thickly, finely punctured and clothed with a short prostrate pubescence.

The members of this genus are all rather small compact forms from 4.5 to 6mm. in length and about half that in width, they are apparently confined to the North Temperate zone; seven species have been recognized in Europe, two of which range clear across that continent and along the eastern section of this one, being the only representative of the genus in this country. They are quite different in form and appearance, and are readily separated by reference to a few structural characters, although the variation in color of one species is almost without limit and includes in its variations one that simulates the constant color markings of the other species.

SYNOPSIS OF THE SPECIES.

- A. Vertex twice wider than long, tylus broad, occupying more than half the length of the vertex, elytra with the costal margin convex, much broader than across eyes; third vein of wing forked, forming a closed apical cell. *spumarius* Linn.
- AA. Length of vertex equaling two thirds of its width, tylus narrow, occupying half the length of the vertex; elytra with the costal margin nearly parallel, scarcely wider than across eyes; third vein of wing not forked. *lineatus* Linn.

PHILÆNUS SPUMARIUS Linn.

Cicada spumaria Linn. Faun. Suec., 240, 881, 1761.

Ptyelus albiceps Prov. Nat. Can. IV, 351, Hemip. du Can., 258.

Philænus lineatus Prov. Hemip. du Can., 258.

Broad and short, the elytra strongly convex, flaring on the margin; head broad and short, sloping; color very variable; length 5.5-6.5mm., width 2-2.5mm.

Vertex short, sloping, twice wider than long, a little over one-half the length of the pronotum, anterior margin obtusely angulate, tylus broader than long, longer than the vertex behind it, ocelli placed close to the posterior margin, equidistant from each other and eyes; front broad, with seven or eight coarse ribs, outline only slightly curved, forming an acute angle with the vertex, the apex blunt; rostrum reaching on to the middle coxæ, as long as the front; pronotum roundly angled in front, deeply pitted back of the margin; elytra broad, costal margin strongly convex, reflexed before the middle; venation simple, the outer vein forking just beyond the middle and forming an elongate discoid cell, fully five times as long as wide, angular at the fork; wings, with the third vein from the marginal one, forking before the apex.

Color: So variable that it can only be indicated under the varieties.

Genitalia: Female pygofer, broader than long, the ovipositor only slightly exerted; male plates broad at the base, gradually narrowing to the middle, beyond which they appear as tapering, finger-like processes.

Habitat: Europe, the New England states, Nova Scotia, and Ontario. Uhler records it from Utah, Dakota, Sitka, and Lake Winnipeg, but it seems probable that those references were to one or more of the other species, as it has not been found by anyone else in any of these localities, while both *bilineatus* and *abjectus* have.

In color this species is very variable; in Europe about fifteen varieties are recognized, ranging from pale, creamy-white, through variously spotted and lined forms, to a shining, jet black variety. These have not all been recognized in this country as yet, but as both the extreme, and several of the intermediate forms have, it has been thought best to give all the more strongly marked varieties indicating which ones are known to occur.

These varieties all intergrade, and no hard and fast lines can be drawn in regard to them, but nearly all the examples will fall readily in to one or another of the following ones, the greater number probably belonging to the first.

Var. *ustulatus* Fall. Grayish-brown or tawny, the vertex and anterior half of the pronotum light, a large, light spot before the middle of the costal margin, and another, slightly smaller, behind.

Var. *fasciatus* Fabr. Vertex and anterior half of the pronotum golden-yellow, the rest of pronotum and elytra dark-brown or black, with an oblique band from scutellum, broadening to just before the middle of costa, and a spot behind the middle, sometimes extending to a spot at apex of clavus, white.

Var. *marginellus* Fab. Black; vertex and anterior half of the pronotum and a stripe on the costal margin of the elytra, yellowish-white.

Var. *leucocephalus* Linn. Dark-brown or black, vertex and anterior half of the pronotum yellow.

Var. *lateralis* Linn. Black; a broad, light stripe on costa.

Var. *leucophthalmus* Linn. Entirely dark-brown or black.

Var. *lineatus* Fab. Yellowish-white; a median black stripe arising, sometimes on the point of the vertex, sometimes on the pronotum, and extending to the apex of clavus, often enclosing a narrow, light line; a dark stripe on the corium, parallel with the first.

Var. *pullidus* Sch. Pale yellowish-white.

Whatever its color, it may be readily separated from *lineatus* by the broader, convex form, and the short, obtuse vertex.

PHILÆNUS LINEATUS Linn.

Cicada lineata Linn. Faun. Suec., 241, 888, 1761.

Ptyelus basivitta Walk. List Homop. B. M., 718, 1851.

Pale creamy-yellow with a light stripe along the costa inside of which may be a dark stripe. Smaller and narrower than *spumarius*, with the elytra nearly parallel margined, the head long and angular; length 4.5-6.5mm., width 1.5-2mm.

Vertex, flat, nearly right-angled before, the sides rounding, length equal to two-thirds of the width, almost as long as the pronotum, a faint median carina; tylus narrow, longer than width at base, about equal to the rest of the vertex; ocelli equidistant from tylus and pronotum and also from eyes and each other; front broad, strongly ribbed, making an acute angle with the vertex; rostrum short and stout scarcely reaching the middle coxæ, shorter than the front; pronotum small, flat, broadly rounded in front, usually three or four longitudinal depressions on the anterior portion of the disc; elytra nearly parallel margined, the costal margin curved inward on the middle, venation simple, normal, the outer sector of corium forking near the middle of the posterior half of the elytra, forming a broad discoid cell scarcely three times longer than wide, rounding at the fork; wings with the third vein from the costal vein entire.

Color: Above, pale creamy-yellow with a short prostrate, golden pubescence covering the entire surface, costal area of the elytra pale creamy-white becoming yellowish posteriorly, a dark stripe runs back from either eye crossing the pronotum below the carinate lateral margins, then on to the elytra where they follow the outer sector, fading out posteriorly, a dark spot on the suture just beyond the apex of clavus, sometimes continued as a dark margin around the apex of elytra. In some males the dark stripe spreads out inwardly and covers nearly the whole of the elytra inside the white margins. Front and below darker with a pale longitudinal stripe on either side just below the eyes.

Genitalia: Female pygofers no longer than their basal width, narrowing apically, exceeded by the long ovipositer, more than half their length; male plates broad at the base curving upward at nearly right angles to the abdomen, their inner margins straight, attingent, outer margins parallel or slightly narrowing to beyond the middle, then widening and forming an obtuse outward angle beyond which they are cut off obliquely, each plate three times longer than wide.

Habitat: (Europe). Specimens are at hand from St. Johns, N. B., New Hampshire, and New York, and it has been reported from Nova Scotia, Ontario and Maine. The reports from the middle and western states probably all refer to *bilineatus*, as that species is common in those sections, while *lineatus* has not been received from outside of the the eastern states. The specimens from New Brunswick are smaller and inclined to be tawny and answer the description of Walker's species (*basivitta*) from Hudson's Bay so well that there seems to be no doubt but what

ongs here.