The Canadian Entomologist

Vol. LXXXII **May 1950** **No. 5**

The Canadian Cixiidae (Homoptera: Fulgoroidea)[1]

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Eleven species of the family Cixiidae have been recorded from Canada (Metcalf, 1936, Gen. Cat. Hemip. 4 (2)). Ten of these are represented in the Canadian National Collection. In addition, ten other species are represented by Canadian specimens. Three of these are previously undescribed. The following are descriptions of the new species, keys to the genera and species known to occur in Canada, and distributional notes on the species from specimens in the collection. External characters are used in the keys. These are not always reliable in determining the males of some closely allied species, because of the frequent absence of dark elytral markings in that sex. The male genitalia show good specific characters, and figures of these are given for the species difficult to determine reliably on external characters.

Representatives of this family do not appear to have been collected intensively in Canada, and there is little doubt that additional species will be found here. Some of the Californian species of *Oliarus* are likely to occur in British Columbia. Species of *Myndus* may have been overlooked in Canada, perhaps because they may be largely subterranean in habits. On the basis of their distributions, it is improbable that any of the known North American species of *Pintalia* or *Psudoliarus* inhabit Canada. The genus *Cixius* is well represented and it is unlikely that any other of the known North American species of this genus will be found in Canada.

Key to Canadian Genera of Cixiidae

1. Posterior tibia with 2 or 3 conspicuous spines 2
   Posterior tibia without spines ..... *Myndus*
2. Mesonotum with 3 carinae; vertex roundly concave at base ..... *Cixius*
   Mesonotum with 5 carinae; vertex angularly excavate at base ..... *Oliarus*

Key to Canadian Species of *Oliarus*

1. Elytra partly or entirely suffused deep brown or blackish 2
   Elytra hyaline, sometimes with darker markings 3
2. Elytron dark smoky brown throughout, stigma and costal margin pale; larger species, 6 mm. or more in length ..... *cinnamomeus* Prov.
   Apical third of elytron suffused brownish, remainder hyaline or relatively so; stigma and costal margin not pale; smaller species, under 6 mm. in length ..... *humilis* (Say)
3. Vertex nearly twice as long as wide (Fig. 8); elytra entirely hyaline, sometimes ochreous-tinged; more slender, smaller species, length 5 mm. or less 4
   Vertex obviously less than twice as long as wide (Figs. 9 and 10); elytra usually with fuscous markings; broader, larger species, over 5 mm. in length 5
4. Lateral carinae of vertex wholly pale. (Western) ..... *franciscanus* (Stal)
   Lateral carinae of vertex each with a pale spot at middle of eye, and with its posterior end pale ..... *ecologus* Caldwell
5. Vertex rounded in front (Fig. 10), brown with pale carinae but without obvious pale spots next the eyes; smaller species, ♂ 5 mm. in length. (Western) ..... *artemisiae* n. sp.

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Vertex obtusely pointed in front (Fig. 9), brown with a pale spot on each side next the eye; larger species, over 6.25 mm. in length. (Eastern)..... 6

6. Front unicolorous or with only faint light areas on each side of frons next to base of clypeus; smaller species, 6.25 to 7.5 mm. in length..... *quinquelineata* (Say)

Frons with distinct whitish area on each side next to base of clypeus; larger species, 7.5 to 10 mm. in length..... *placitus* Van D.

***Oliarus cinnamomeus* Prov.**

Oliarus cinnamomeus Provancher, 1889, Pet. Faune Ent. Can.: 223.

Ontario: Eldorado, in sphagnum bog (G. S. Walley). Provancher described the species from Vancouver.

***Oliarus humilis* (Say)**

Flata humilis Say, 1830, J. Acad. Nat. Sci. Phil. 6: 241.

Quebec: Queen's Park, Aylmer (C. B. Hutchings, A. R. Graham), St. Eustache; Ontario: Gananoque, Pt. Pelee, and Constance Bay (G. S. Walley), Harwich (G. M. Stirrett), Strathroy (H. F. Hudson), Mer Bleue (W. J. Brown, O. Peck), Grand Bend (G. E. Shewell), Vineland (W. L. Putman), Jordan (W. A. Ross), St. Thomas (H. G. D.); Saskatchewan: Estevan (N. Criddle). It has been recorded previously from Ontario.

***Oliarus franciscanus* (Stal)**

Cixius franciscanus Stal, 1859, Freg. Eugenies Resa: 273.

A series of 15 specimens in the Collection appears to be of this species, which has been confused with *O. ecologus* (see below). British Columbia: Seton Lake (J. McDunnough).

***Oliarus ecologus* Caldwell**

Oliarus ecologus Caldwell, 1947, Ohio J. Sci. 47: 76.

In the past this species was misidentified as *O. franciscanus*, which is a western species. *O. ecologus* may be a synonym of *O. complectus* Ball (1902, Can. Ent. 34: 152). *O. franciscanus* is a slightly larger insect than *O. ecologus*, and has the lateral carinae of the vertex wholly pale. The two species are easily distinguished by characters of the male genitalia (Figs. 1, 2, 3, and 6), notably by the shapes of the styles and of the anal appendage. Nova Scotia: Baddeck, swept from *Chamaedaphne* sp. (J. McDunnough); Ontario: Mer Bleue (W. J. Brown, G. S. Walley, F. Ide, R. Ozburn, L. J. Milne).

***Oliarus placitus* Van Duzee**

Oliarus placitus Van Duzee, 1912, Buffalo Soc. Nat. Sci. Bull. 10: 493.

This species is easily distinguished from *O. quinquelineata* by characters of the male genitalia (Figs. 4 and 5). Ontario: Pelee Is. (G. S. Walley).

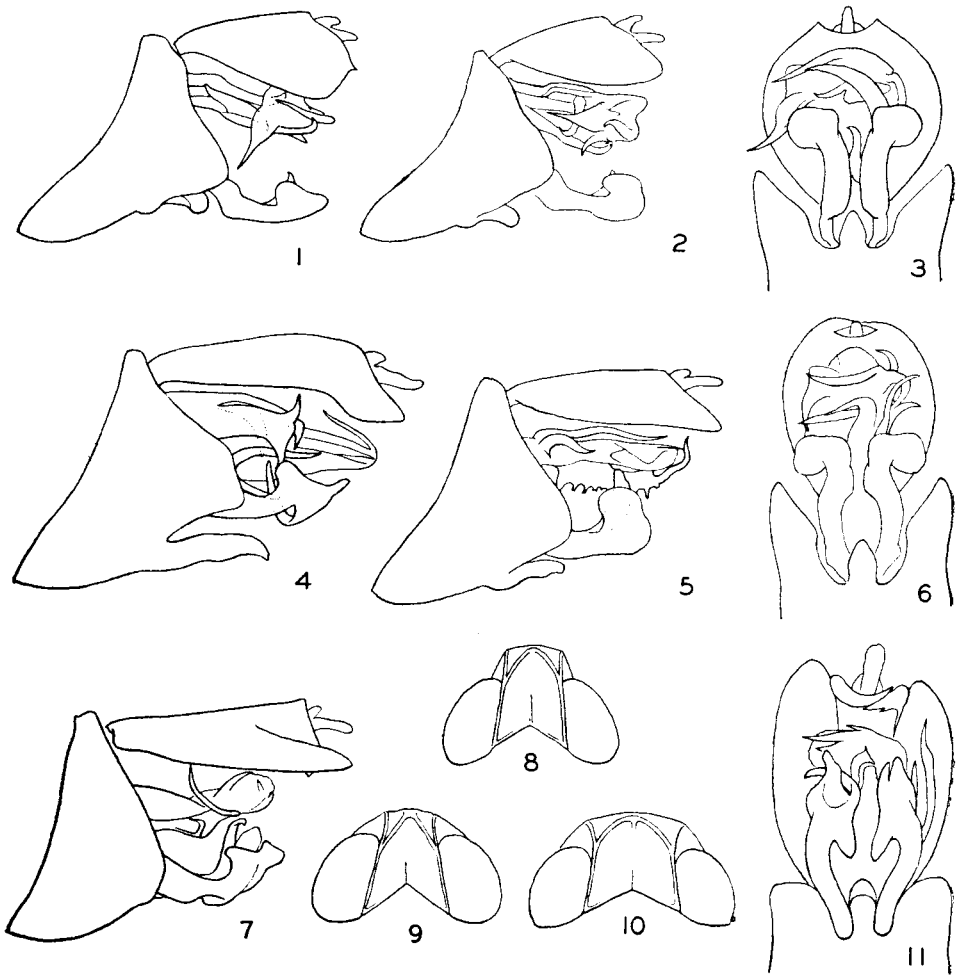
***Oliarus quinquelineata* (Say)**

Flata quinquelineata Say, 1830, J. Acad. Nat. Sci. Phil. 6: 241.

This is a variable species; in some specimens the elytra are almost entirely hyaline, and in other specimens they are variously banded and spotted with fuscous. Nova Scotia: Petite Riviere (J. McDunnough); Quebec: Aylmer (C. H. Curran), Hemmingford (C. E. Petch), Knowlton (L. J. Milne, G. S. Walley); Ontario: Trenton (Evans), Go Home Bay, Lyn, Parry Sound, and Bala (G. S. Walley). It has been recorded previously from Ontario.

***Oliarus artemisiae* n. sp.**

Form and structure of the genus. Vertex (Fig. 6) as long as broad, rounded in front, black with pale carinae. Front black with pale carinae and with a small pale spot at each outer lower angle of the frons. Pronotum black with the carinae broadly pale. Mesonotum black, the posterior margin narrowly



Figs. 1 to 11. *Oliarus* spp. 1. ♂ genitalia, lateral view of *O. franciscanus;* 2. ♂ genitalia, lateral view, of *O. ecologus;* 3. ♂ genitalia, ventral view, of *O. franciscanus;* 4. ♂genitalia, lateral view, of *O. placitus;* 5. ♂ genitalia, lateral view, of *O. quinquelineata;* 6. ♂ genitalia, ventral view, of *O. ecologus;* 7. ♂ genitalia, lateral view, of *O. artemisiae;* 8. Head of *O. ecologus;* 9. Head of *O. quinquelineata;* 10. Head of *O. artemisiae;* 11 ♂ genitalia, ventral view of *O. artemisiae.*

pale. Abdomen and underside of thorax black, the abdominal segments pale-margined laterally. Coxae and femora darkened; tibiae darkened externally, the ridges pale; tarsi pale; tips of tarsal and tibial apical spines black. Elytra milky hyaline; the longitudinal veins yellowish, darkened at their apices, with white bristles and dotted with fuscous; apical cross veins fuscous; three faint fuscous spots in the costal cell; a fuscous suffusion at apex of termen; stigma fuscous, broadly banded with white. Male genitalia (Figs. 7 and 11) asymmetrical, the asymmetry including the styles and the anal appendage; median tooth as long as the pygofers, expanded apically; left style with internal appendage in the form of a long, outwardly curved spine; right style with internal appendage in the form of a flattened, obtusely pointed plate; left side of aedoeagus with a short, broad, flattened projection and a long, slender, upwardly curved spine; right side of aedoeagus with two long, curving spines; dorsal side of aedoeagus with two shorter, curved spines; left side of anal appendage produced posteriorly

beyond the right, with the inward projection longer, broader, and more curved. Length: ♂ 5.0 to 5.25 mm.

This species appears to resemble *O. exoptatus* Van Duzee (1917, Proc. Calif. Acad. Sci. 7: 308), but differs in characters of the male genitalia.

Holotype-♂, Seton Lake, Lillooet, British Columbia, on sagebrush, June 30, 1926. (J. McDunnough); No. 5876 in the Canadian National Collection, Ottawa.

Paratype-♂, same data as holotype.

Myndus sordipennis Stal

Myndus sordipennis Stal, 1862, Berliner Ent. Zeit. 6: 308.

Myndus impunctatus Van Duzee, 1890, Psyche 5: 390.

This species is not represented in the Collection. It has been recorded from Ottawa.

Key to Canadian Species of *Cixius*

1. Vertex longer than its basal width (Fig. 14); more slender species; usually under 5 mm. in length 2
   Vertex not longer than its basal width (Figs. 15 and 16); broader species; usually over 5 mm. in length 3
2. Elytral veins dark-spotted, not infuscated ..... *cultus* Ball
   Elytral veins not dark-spotted, the cross veins and the apices of all veins suffused with fuscous ..... *praecox* Van D.
3. Vertex as long as broad, distinctly triangular (Fig. 15); clypeus not paler than frons 4
   Vertex distinctly broader than long, more or less rounded in front (Fig. 16); clypeus usually paler than frons 5
4. Elytra white with black or dark-brown basal band, otherwise without dark markings; clypeus black, frons sometimes paler ..... *stigmata* (Say)
   Elytra without distinct dark basal band, tinged fuscous throughout, usually with a transverse fuscous band at ⅓ and the cross veins marked with fuscous; frons and clypeus unicolorous ..... *misellus* Van D.
5. Basal two-thirds of elytron dark-brown, with a clear patch at base of costa; apical third hyaline, with numerous brown spots ..... *apicalis* Metcalf
   Elytra not as above 6
6. Frons and clypeus unicolorous, black or dark-brown; elytron usually marked with fuscous, frequently with a basal band, a broken transverse band at ⅓, and suffused cross veins, and sometimes with a broad band at ⅔ ..... *angustatus* Caldwell
   Clypeus paler than frons 7
7. Elytra tinged fulvous or fuscous throughout 8
   Elytra not tinged fulvous, more or less hyaline, often marked with fuscous 11
8. Larger species, 6 mm. or more in length; elytra almost uniformly deep brown or fuscous 9
   Smaller species, under 6 mm. in length; elytra suffused fulvous 10
9. Veins brown; elytron deep brown with a clear patch at base of costa; costa white, black-spotted; stigma white anteriorly ..... *umbrosus* Walley
   Veins white with dark spots; elytron fuscous, without clear patch at base of costa ..... *meridionalis* n. sp. var.
10. Elytra lighter fulvous, without definite fuscous markings; vertex rounded in front ..... *pini* Fitch
    Elytra darker fulvous, suffused fuscous to a variable extent apically and with a transverse fuscous band at ⅓; vertex obtusely pointed in front ..... *fulvus* n. sp.

11. Elytra greyish, each with a broad, irregular, brown longitudinal band from base along claval margin to apex ..... *guttulatus* Walley
Elytra without brown longitudinal bands 12

12. Smaller species, not over 5 mm. in length; elytra tinged whitish, without dark basal band, usually with two brown spots in clavus, the posterior forming part of a broken transverse band, the cross veins suffused brownish, sometimes forming a transverse band along the apical cross veins ..... *coloepium* Fitch
Larger species, over 5.75 mm. in length; elytra not tinged whitish, frequently with a brown or blackish basal band 13

13. Elytron usually with distinct black or dark-brown basal band and often with a fuscous transverse band, sometimes broken, at ⅓, and broken, fuscous transverse bands at the stigma and at the apical cross veins (if these bands are distinct then the dark basal band is always present) ..... *basalis* Van D.
Elytron without distinct dark basal band but with distinct transverse band, sometimes broken, at ⅓ and broken, irregular transverse bands at stigma and at apical cross veins ..... *meridionalis* n. sp.

Cixius praecox Van Duzee

Cixius praecox Van Duzee, 1925, Proc. Calif. Acad. Sci., 4, 14: 405.

This is readily distinguished from other Canadian species of the genus by the absence of the darker punctation on the elytral veins (see remarks below under *C. cultus*). British Columbia: Armstrong (W. Downes), Kamloops (N. Criddle), Vernon (I. J. Ward), Vernon, on alfalfa (D. G. Gillespie). It has been recorded previously from British Columbia.

Cixius cultus Ball

Cixius cultus Ball, 1902, Can. Ent. 34: 151.

This species resembles *C. praecox* in size and shape and in the form of the vertex (Fig. 14), but is easily distinguished by the dark spots on the elytral veins. Some confusion has arisen between the two species, as Ball did not mention this character directly in his original description. He indicated the character indirectly in that when contrasting the species with *C. stigmata*, which has well marked punctation, he did not give absence of punctation as a distinguishing feature of *C. cultus*. In his key to the species of *Cixius*, Van Duzee (1907, Proc. Acad. Nat. Sci. Phil., 1907: 488) gave "maculation longitudinal" as a character of *C. cultus*. Dozier's key (1928, Miss. Agr. Expt. Sta. Tech. Bull. 14: 70) was adapted from that of Van Duzee and gave the same character. Evidently misled by Ball's description, Metcalf (1923, J. Elisha Mitchell Sci. Soc. 38: 161) gave "veins impunctate" as a distinguishing character in his key; this is a character of *C. praecox*. A further character given by Van Duzee for distinguishing *C. cultus* from *C. praecox* is that in the former species the outer sector of the corium is forked farther from the base than is the inner, whereas in the latter species the two are forked on the same line. Although often reliable, this character varies in both species. There appears to be no significant difference in the male genitalia of the two species. *C. praecox* is apparently confined to regions west of the Rocky Mountains, whereas *C. cultus* is apparently an inhabitant of the prairies. Saskatchewan: Swift Current (A. R. Brooks); Alberta: Brooks, on alfalfa blossom (H. E. Gray), Lethbridge, Stirling, Mountain View, Welling, Raymond, and Magrath (H. L. Seamans).

Cixius stigmata (Say)

Flata stigmata Say, 1825, J. Acad. Nat. Sci. Phil. 4: 336.
Cixius lepidus Van Duzee, 1910, Trans. Am. Ent. Soc. 36: 87.

The whitish elytra with the blackish basal band distinguish the species. Ontario: Pt. Pelee (G. S. Walley), Chatham (W. E. Lindsay). It has been recorded previously from Canada.

Cixius misellus Van Duzee

Cixius stigmatus Van Duzee (*nec* Say), 1906, Can. Ent. 38: 408.
Cixius misellus Van Duzee, 1916, Check List Hemip. Amer.: 79. *Nom. nov.* for *C. stigmatus* Van Duzee.

For many years this species was misidentified as *C. stigmata* (Say), which it resembles in the form of the vertex (Fig. 15). The two species may be distinguished by the characters given in the key, as well as by the male genitalia (figured by Osborn, 1938, Ohio Biol. Surv. Bull. 38: 305). Newfoundland: Mileage 349, on *Picea glauca* (Moench) Voss (Forest Insect Survey); Nova Scotia: Grand R., on *Abies balsamea* (L.) Mill. (C. C. Smith); Quebec: Laniel (H. S. Fleming), Trinity Bay and Mt. Lyall, 1500 ft. (W. J. Brown), Kingsmere (R. N. Chrystal), Kazubazua (G. S. Walley, F. P. Ide). It has been recorded previously from Quebec, Ontario, and British Columbia. Confirmation of the British Columbia record is desirable.

Cixius basalis Van Duzee

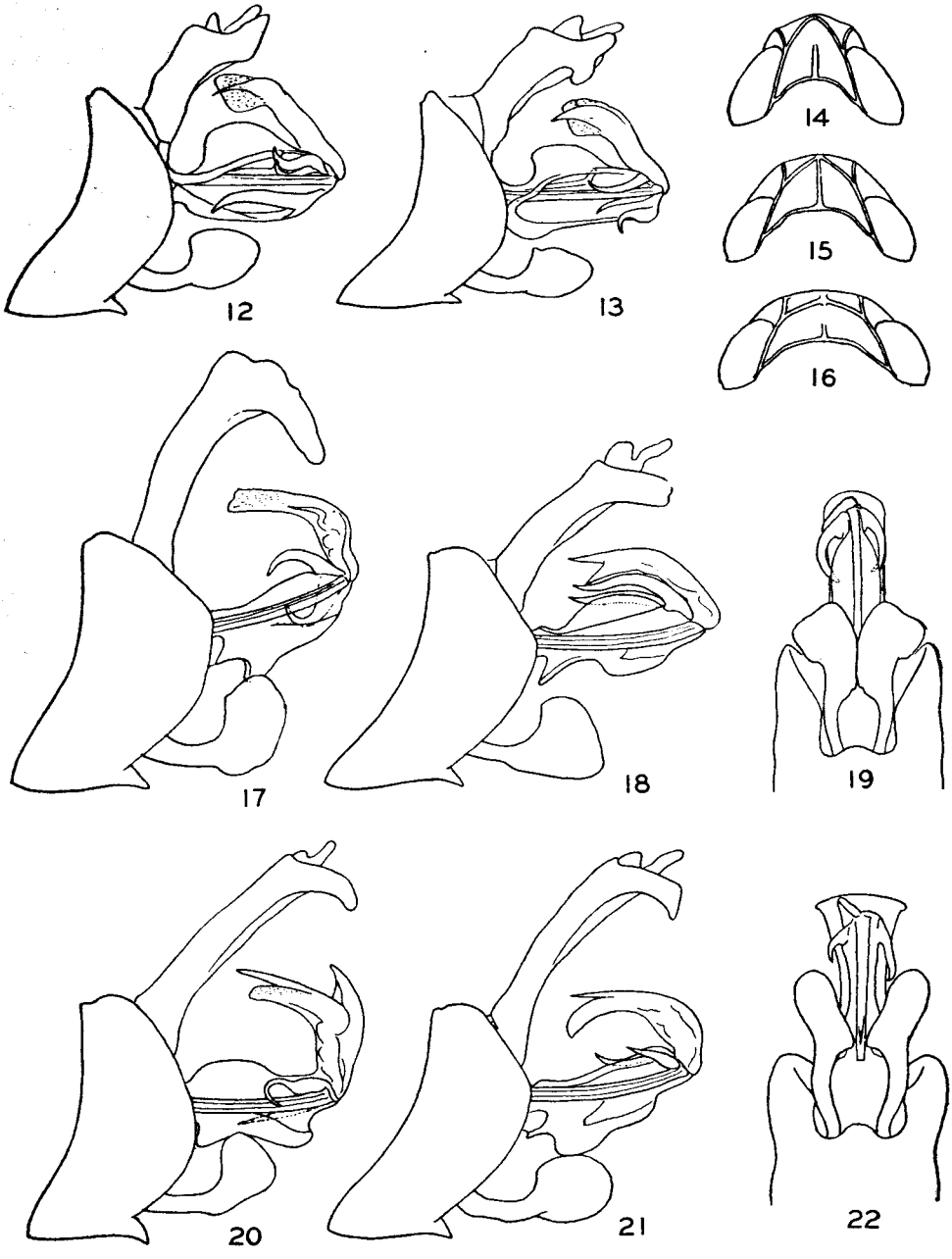
Cixius basalis Van Duzee, 1908, Proc. Acad. Nat. Sci. Phil. 1907: 489.

This is a variable species in the degree of development of the elytral markings and in size. There is also some variation in the male genitalia. In some specimens the spine on the left side of the aedoeagus is curved sharply upward (Fig. 17); in others it is longer, stouter, and nearly straight. Both types of genitalia are represented in series taken in the same locality on the same date. There appear to be no external differences corresponding with the genitalic differences. There is some intergrading between the two types of genitalia. This is a common transcontinental species. Newfoundland: Indian Bay, on *Picea mariana* (Mill.) (Forest Insect Survey), Sandy Lake, on *Abies balsamea* (Forest Insect Survey); Nova Scotia: Baddeck (T. N. Freeman), Kentville (R. P. Gorham); New Brunswick: Bathurst (J. N. Knull); Quebec: Cascapedia R. (C. C. Smith), Knowlton (G. S. Walley, J. A. Adams), Mt. Lyall, 1500 ft. (W. J. Brown), Hull and Wakefield (G. S. Walley), Aylmer; Ontario: Bobcaygeon, Minaki, and Norway Point, Lake of Bays (J. McDunnough), Galetta, Leamington, Jordan, Parry Sound, and Smoky Falls, Mattagami R. (G. S. Walley), Britannia (L. J. Milne), Grand Bend (G. E. Shewell), Trenton (Evans), Burke Falls (F. P. Ide); British Columbia: Agassiz (R. Glendenning), Canim Lake (J. K. Jacob), Seton Lake, Lillooet, on sagebrush (J. McDunnough), Saanich district (W. Downes). It has been recorded previously from Quebec, Ontario, and British Columbia.

Cixius meridionalis n. sp.

Form and structure of the genus. Vertex short, rounded in front, twice as wide at base as its median length, dark-brown with a whitish spot on each side next the eye. Frons dark-brown to black, the carinae yellow or pale brown. Clypeus somewhat tumid, yellow to brown, paler than the frons. Pronotum yellowish or light-brownish. Mesonotum black, the carinae sometimes paler. Thorax blackish beneath. Abdomen black. Coxae and femora blackish; tibiae pale, usually partly suffused blackish; tarsi pale. Elytron greyish hyaline, occasionally suffused brownish; veins white, strongly and closely dotted with fuscous, with black bristles; costa white, dotted and marked with fuscous; stigma fuscous, its anterior third white; a fuscous suffusion at base of each elytron; a broad fuscous band from costa at $\frac{1}{3}$ to middle of claval margin, broken and less distinct at the claval suture but unbroken between the costa and the inner sector, two

fuscous costal blotches between it and the stigma; a fuscous suffusion forming an indefinite transverse band at the apical cross veins; some faint fuscous spots in the apical cells. Male genitalia (Figs. 18 and 19) with two long, curving, anteriorly directed spines from aedoeagus; aedoeagus forked at apex; anal appendage relatively short. Length 5.5 to 6.5 mm.



Figs. 12 to 22. *Cixius* spp. 12. ♂ genitalia, lateral view, of *C. coloepium;* 13. ♂ genitalia, lateral view of *C. angustatus;* 14. Head of *C. praecox;* 15. Head of *C. misellus;* 16. Head of *C. basalis;* 17. ♂ genitalia, lateral view, of *C. basalis;* 18. ♂ genitalia, lateral view, of *C. meridionalis;* 19. ♂ genitalia, ventral view, of *C. meridionalis;* 20. ♂ genitalia, lateral view, of *C. pini;* 21. ♂ genitalia, lateral view, of *C. fulvus; 22.* ♂ genitalia, ventral view, of *C. fulvus.*

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This species is quite distinct on a basis of characters of the male genitalia. Characteristic features include the shape of the aedoeagus, in lateral view, its two approximately equal-sized spines, and its forked apex. In Metcalf's key (1923, op. cit.: 161) the species runs to *C. basalis*, which it resembles externally but from which it is easily distinguished by the male genitalia (Figs. 17, 18, and 19). It also differs from that species in the less distinctly defined dark basal band on the elytron. In specimens of *basalis* in which other dark markings of the elytron are well developed the basal band is distinct. The transverse elytral band at $\frac{1}{3}$ is usually unbroken in *meridionalis* from the costa to the inner sector, whereas in *basalis* it is usually broken on the outer sector. In lateral view the clypeus of *meridionalis* usually is more tumid than that of *basalis*.

Holotype- ♂, Goose Bay, Labrador, August 16, 1948 (H. C. Friesen). No. 5877 in the Canadian National Collection, Ottawa.

Allotype- ♀, Waskesiu Lake, Saskatchewan, July 26, 1939 (A. R. Brooks).

Paratypes- ♂, Pelissier, Quebec, on spruce, August 21, 1939 (O. Servant); Waskesiu Lake, Saskatchewan, July 26, 1939 (A. R. Brooks) (two specimens); Cameron Bay, Great Bear Lake, Northwest Territories, July 27 and 28, 1937 (T. N. Freeman) (two specimens); Whitehorse, Yukon Territory, August 7, 1948 (M. T. Hughes); Carnaby, British Columbia, September 22, 1939 (Forest Insect Survey) (two specimens); 1 ♀, Fort Wrigley, McKenzie River, Northwest Territories, July 17, 1922 (C. H. Crickmay).

Cixius coloepium Fitch

Cixius coloepium Fitch, 1856, Third Rept. Insects New York: 452.

Ontario: Jordan and Niagara Glen (G. S. Walley). These specimens agree with the description of the species, and the male genitalia resemble Metcalf's figure (1923, op. cit.: Fig. 581). In lateral view the male genitalia differ in some respects from the figure given by Osborn (1938, op. cit.: 305). The species has been recorded previously from Quebec, Ontario, and British Columbia. Confirmation of the British Columbia record is desirable; it may refer to *C. meridionalis*.

Cixius angustatus Caldwell

Cixius angustatus Caldwell, 1938, Ohio J. Sci. 38: 45.

This species is easily distinguished from *C. coloepium* by the male genitalia (Figs. 12 and 13). Quebec: Aylmer (J. McDunnough, H. L. Viereck, and W. J. Brown), Knowlton (G. S. Walley); Ontario: Niagara Glen and Go Home Bay (G. S. Walley).

Cixius fulvus n. sp.

Form and structure of the genus. Vertex very short, about three times as wide as its median length, distinctly carinated, obtusely pointed with the anterior margins almost straight, brown with the carinae lighter and with a pale spot on each side next the eye; frons brown or reddish-brown; clypeus and carinae light-brown or fulvous. Prothorax light-brown to brown; metathorax brown. Abdomen black, the segments margined fulvous laterally. Legs fulvous. Elytron suffused fulvous throughout; costa and veins white, dotted dark fuscous, the veins becoming fuscous at apex; stigma dark fuscous, white anteriorly; base of elytron sometimes suffused fuscous, apical third suffused fuscous, and an irregular transverse band from costa at $\frac{1}{3}$. Male genitalia (Figs. 21 and 22) with the styles rounded, diverging; aedoeagus expanded beneath, left side with a short, curving spine, right side with a longer, curving spine, apex with a prominent spine above; anal appendage rather long, produced at apex to two blunt lateral points. Length 5 to 5.75 mm.

This species runs to *basalis* or *pini* in Metcalf's key (1923, op. cit.: 161). It resembles the latter species in size and form and in the fulvous elytra, but is a much darker insect, with the elytra marked with fuscous. It is quite distinct on a basis of characters of the male genitalia, notably in the shape of the aedoeagus, in lateral view, and of the anal appendage.

Holotype-♂, Cascapedia, Quebec, July 9, 1933 (W. J. Brown). No. 5878 in the Canadian National Collection, Ottawa.

Allotype-♀, Alberton, Prince Edward Island, July 15, 1940 (G. S. Walley).

Paratypes-1 ♂, Alberton, Prince Edward Island, July 15, 1940 (G. S. Walley); 1 ♀, Baddeck, Nova Scotia, July 23, 1936 (T. N. Freeman); 6 ♀, Alberton, Prince Edward Island, July 15, 1940 (G. S. Walley).

Cixius pini Fitch

Cixius pini Fitch, 1851, Cat. Homop.: 45.

This species might be confused with *C. fulvus*, but is easily distinguished by the male genitalia (Fig. 20) and by the characters given in the key. Quebec: Knowlton (L. J. Milne), Cascapedia (W. J. Brown), Rupert House (E. J. LeRoux), Kazubazua and Wolf Lake (G. S. Walley); Ontario: Mer Bleue and Bobcaygeon (G. S. Walley), Ottawa. It has been recorded previously from Quebec and Ontario.

Cixius umbrosus Walley

Cixius umbrosus Walley, 1932, Can. Ent. 64: 22.

Ontario: Burke's Falls (F. P. Ide) (holotype).

Cixius guttulatus Walley

Cixius guttulatus Walley, 1932, Can. Ent. 64: 21.

Quebec: Potton Springs (J. A. Adams) (holotype); Ontario: Prince Edward Co. (Brimley).

Cixius apicalis Metcalf

Cixius apicalis Metcalf, 1923, J. Elisha Mitchell Sci. Soc. 38: 182.

Ontario: Delhi (G. S. Walley).