

Beginning with *Cockerellia* and including the five following subgenera (*Procockerellia*, *Pentaperdita*, *Hexaperdita*, *Callomacrotera*, and *Xeromacrotera*) we pass to a congeries of closely related groups that evidently have been derived from a common ancestral stock, and that are more remotely related to all other groups of *Perdita* except possibly *Heteroperdita*. This congeries has the following common characters: an unusually copious tibial scopa and simple claws in female, and in the male a narrow, more or less densely pubescent medio-apical plate of the eighth ventral segment, which has a broad and bilobate articulating basal part (in contrast to almost all other *Perdita*, excepting *Heteroperdita*, which have the articulating base more or less narrow and the apical plate broad and variously shaped). In connection with the more copious scopa the female has the habit of collecting the pollen partly dry with some of the load carried by the hairs of the trochanters, femora, and basitarsi, but when the mass of pollen begins to extend beyond the tips of the scopal hairs, then additional layers are superimposed by a process of agglutination as in other *Perdita*.

The species of *Cockerellia* are rather large bees, up to about 9 mm. in length. Marginal cell ^{longer} shorter than first submarginal and extending about one-third, or a little less, of the distance from apex of stigma to apex of wing. Stigma moderately wide and usually about one-half as wide as marginal cell. Glossa moderately elongate, extending in repose to hind margin of head or a little beyond to reach the front coxae; glossa and galeae of nearly equal length. Maxillary palpi six-jointed, the joints nearly equal; ^{maxillary} palpi elongate, the first joint very long, the next three subequal and together less than half as long as the first.

Female.—Head usually about as long as wide, the clypeus more or less prominent. Mandibles very broadly dilated on inner margin, with the apical fourth abruptly bent inward and tapering to acute apex. Facial foveae well impressed, a little widened above and about two-thirds as long as the space between antennal sockets and anterior ocellus. Scopa dense for a *Perdita*, the hairs long, finely and closely crinkled, and sometimes minutely plumose. Claws simple, curved, and gradually thickened to base. Pygidial plate large, flat, and more or less broadly truncate at apex.

Male.—Head usually quadrate, with very broad cheeks that are abruptly narrowed and angulate anteriorly. Mandibles long, tapering, and acute. Pronotum deeply furrowed perpendicularly on the sides, the dorsal disk abbreviated, with the hind margin more or less ridged and prominent at outer ends. Abdomen oval, about twice as long as wide, subdepressed, and only slightly wider than thorax; apical tergite with a broad, nude medio-apical area, but not otherwise pygidiform, the apex obtuse or broadly truncate. Legs long, the hind tarsi slender and much longer than the hind tibiae; claws of hind tarsi simple as in female, those of front and middle tarsi bifid.

Caulis of aedeagus no longer than wide, with two blunt dorsal lobes, beneath the apical margin of which projects an acute spurlike process; parameral lobes broadly dilated at base and tapering to a more or less narrow or acute apex. Sagittae fused, moderately slender or slightly fusiform, the copulatory eversible sac emitted from a slit at apex. Volsellae about normal in size, the outer pair slender and curved, the inner pair dilated. Aedeagus in lateral view somewhat resembling a slipper with a high instep, the caulis forming the heel and the parameral lobe the toe.

KEY TO SPECIES

- 1. Females 2
- Males 30
- 2. Head and thorax mainly yellow 3
- Head and thorax mainly green 4
- 3. Head, thorax, and abdomen yellow, the lower half of pleura green; usual pair of dots on clypeus, facial foveae, and flagellum above blackish; mesonotum with short, dense, erect yellow hair *beata* Cockerell

♀ incana
(perhaps runs to *verbesina*)
see III: 383
♀ novaeboracensis
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- Similar to *beata* but with large, irregular, more or less broken green mark on frons and two narrow green stripes on mesoscutum. *signata*, n. sp., var. = *beata signata* (IV:130)
- 4. Large supraclypeal or subantennal marks present; propodeum or dorsum of thorax sometimes marked with yellow 5
- Face marks restricted to lateral and clypeal marks (except a vestigial supraclypeal mark sometimes present in *utahensis*); light marks of thorax restricted to pronotum. 7
- 5. Both supraclypeal and subantennal marks present. *not same* *tuculenta* 6
- No supraclypeal mark; lateral marks extending upward between foveae and eyes; face marks, scape of antennae, entire pronotum and legs, propodeum, part of metanotum, apical line on scutellum, and entire abdomen canary yellow; mesonotum minutely and densely punctate and hairy *pulchella*, n. sp.
- 6. Mesonotum shining, rather sparsely punctate, and thinly hairy; pronotum and legs dark with yellow markings; propodeum with a large yellow mark on each side behind; abdomen yellow, with five broad black bands; wings a little dusky, with dark nervures. *propodealis*, n. sp. - see *Suppl. II:12*
- Mesonotum finely and densely punctate and hairy; pronotum and legs partly dark to almost entirely yellow; yellow markings on thorax otherwise frequently absent, but small marks on posterior surface of propodeum, on metanotum, and scutellum, and two thin stripes on mesoscutum sometimes present; abdomen yellow, with five narrow black bands (for extreme end variation see couplet 3); wings milky hyaline with pallid nervures. *signata*, n. sp. = *beata signata* (IV:130)
- 7. Clypeus usually all yellow or white, except usual dots; lateral marks triangular, reaching level of antennae 8
- Face marks more restricted, the lateral marks more or less transverse and not extending above level of clypeus 13
- 8. Wings faintly dusky or yellowish, with pale brownish nervures. *not same as* *perpulchra* 9
- Wings milky hyaline, with pallid nervures and stigma. 12
- 9. Mesonotum minutely and densely punctate, the punctures not much more than their own diameter apart; supraclypeal area entirely dark. 10
- Mesonotum polished, with numerous fine punctures that are several times their own diameter apart; clypeus, triangular lateral marks, and often a vestigial supraclypeal mark yellowish white; pronotum, legs in large part and abdomen yellow, the latter with four black bands
utahensis Cockerell
- 10. Head and thorax brassy green, the mesonotum faintly tessellate and dullish between the punctures 11
- Head and thorax dark blue-green; mesonotum shining, the dense punctures very minute; base of mandibles, clypeus, lateral marks, pronotum and legs in large part, and abdomen yellowish white, the abdomen with five black bands; pubescence white. *baileyae* Cockerell
- 11. Clypeus and lateral marks white; pronotum and legs in large part and abdomen pale yellow or yellowish white; abdomen with five rather broad black bands and the basal declivity of tergite 1 black down the middle. *perpulchra perpulchra* Cockerell
- Similar, but light parts of thorax, legs, and abdomen bright yellow, and the first tergite entirely yellow, except for a narrow, apical dark band. *perpulchra flavidior* Timberlake
- 12. Brassy green; clypeus, lateral marks, and sometimes a small supraclypeal mark yellowish white; pronotum, legs, and abdomen in large part yellow, the dark bands of abdomen poorly developed; mesonotum very densely and minutely punctate, with very short, coarse, erect white hair *albihirta albihirta*, n. subsp.
- Similar, but more bluish green; femora dark, except broadly at apex; abdomen with dark bands and tergite 1 nearly all dark; clypeus with two dark spots on upper part of disk besides the usual pair of dots; mesonotum comparatively sparsely punctate
albihirta geraeae, n. subsp.
- 13. Frons dull or opaque, more or less obscurely punctured or impunctate. 14
- Frons at most merely dullish and distinctly, although minutely, punctured. 21
- 14. Wings dusky hyaline, the nervures and stigma pale brown or testaceous; hair of hind tibia more or less fuscous. 15
- Wings milky hyaline, the nervures pale yellowish or nearly colorless, the stigma frequently yellow or pale orange; hair of hind tibiae usually only slightly darkened. 16
- exc. *albihirta pallidipennis*

see
VII:19
for added
couplet
(CAS:281)
Suppl II:12

+ *P. punctata*
(II:329)

+ *imbellis*
Timb.
(scutal hairs)
long

perpulchra perpulchra
(II:329)

15. Wings pale fuliginous; the nervures and stigma pale brown; clypeus except two dark stripes that are abbreviated anteriorly and more or less widened above, transverse lateral marks, and a broad band on tergites 2 to 5, narrowly interrupted on 2 and 3, yellow

bequaerti bequaerti Viereck

Wings more faintly dusky, the nervures more testaceous; dark marks on clypeus often enclosing a median yellow stripe, which expands anteriorly. . . . *bequaerti indianensis* Cockerell

16. Frons obscurely punctured, dull but hardly opaque; abdomen entirely dark or with yellow bands that are usually interrupted (rarely entire on one or more segments) 17

Frons comparatively opaque and virtually impunctate; abdomen usually with broad, entire yellow bands 19

17. Clypeus more produced and prominent, the apical truncation hardly wider than length of the oblique sides to base of mandibles. 18

Clypeus less produced and prominent, the apical truncation considerably broader than length of the oblique sides to base of mandibles; small streak on middle of clypeus, thin transverse marks curved around anterior end of lateral plates of face, scape of antennae beneath, and rather narrow interrupted band on tergites 2 to 5 yellow. *fractinincta* Timberlake

18. Glossa and galeae hardly reaching beyond the proboscival fossa; mesonotum moderately closely punctured, the distance between contiguous punctures usually three or four times greater than their diameter; median streak on clypeus, narrowly transverse lateral marks, and bands on abdomen yellow; the latter sometimes entire on tergites 2 to 5, but usually more or less contracted or absent. *verbessinae* Cockerell

Glossa and galeae extending beyond proboscival fossa to base of front coxae; mesonotum more closely punctured, the punctures usually not much more than two or three times their own diameter apart; pubescence of mesonotum shorter, denser, coarser, and more ochreous; markings variable, but face marks very small or absent, and abdominal bands often absent, and usually interrupted, if present, on tergites 2 to 5. *heliophila* Cockerell

19. Face marks small or absent. 20

Clypeus, except triangular black mark on each side of upper part of disk, and lateral marks yellow; marks on pronotum and tubercles large; abdominal bands rather narrow, not quite reaching lateral margins and narrowly interrupted on tergites 2 and 3, or broader and entire in more southern localities. *lacteipennis pallidipennis* Graenicher

20. Median stripe on clypeus, transverse lateral marks, spot on tubercles, and two marks on pronotum yellow; abdominal bands broad, entire, and usually reaching lateral margins

lacteipennis lacteipennis Swenk and Cockerell

Face entirely dark; abdominal bands more or less interrupted in northern localities, and broad and entire southward. *lacteipennis canadensis* Crawford

(13) 21. Wings milky hyaline 22

Wings pale fuliginous, the nervures and stigma dark brown; clypeus, except black mark on each side of disk above, and transverse lateral marks yellowish white; four broad bands on abdomen yellow *obscuripennis*, n. sp.

22. Clypeus more produced and prominent, the lateral extensions strongly inflexed on each side of labrum and hardly visible in frontal aspect. 23

Clypeus less produced and prominent, the lateral extensions very broad except close to base of mandibles, nearly as wide opposite the apex as opposite the base of labrum, and not fully concealed in frontal aspect. 25

23. Frons minutely and delicately tessellate and minutely punctate; yellow bands on tergites 2 to 5 usually broad and a yellow spot or mark present on each side of disk of tergite 1. 24

Frons more strongly tessellate, more dullish, and more strongly punctate than in *albipennis*; tergites 1 and 5 immaculate, or sometimes two yellow spots present on 5, but these usually small and faint, a rather narrow yellow band, not reaching lateral margins, on tergites 2 to 4; otherwise like *albipennis*, but somewhat smaller. *tricincta* Timberlake

24. Dark olive green; clypeus and lateral face marks pale yellow, the clypeus with two dark blotches on upper half of disk, which usually outline a yellow T; abdominal bands broad and usually reaching lateral margins; hair of legs light, the scopal hair of hind tibiae pale yellowish *albipennis* Cresson

lingualis Cresson (1913)

+ Skimmers (II:326)

revised key to couplets 22-29 in Suppl:3 + pachygnatha (CAS:282)

= *albipennis heliophila*

= *albipennis pallidipennis*

= *albipennis* (VII:20)

= *albipennis canadensis*

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- Brassy green; clypeus usually black with a median pale yellow line; yellow bands of abdomen broad, even, and failing to reach lateral margins; legs, especially the middle and hind pair, with dark fuscous or blackish hair.....*scopata* Timberlake
25. Glossa and galeae not extending beyond the proboscival fossa; maxillary palpi unusually short, the first joint dilated and more than twice as broad as following joints; abdomen dark, with four broad yellow bands, nearly or quite reaching lateral margins.....26
Glossa and galeae reaching, or nearly reaching, front coxae; abdomen usually yellow, with more or less obsolescent dark markings, or sometimes mainly dark with enclosed yellow bands27
26. Frons rather distinctly tessellate and dullish, the punctures fine; yellow bands on tergites 2 to 5 even and entire, narrow on tergite 2 and increasingly wider on succeeding segments, that on tergite 5 subabbreviated.....*lepachidis lepachidis* Cockerell
Frons almost polished, the punctures very distinct; markings as in *lepachidis*, but bands on tergites 2 and 3 generally more or less notched medially behind and that on 2 sometimes interrupted*lepachidis levifrons* Timberlake
27. Abdomen yellow, with very narrow basal and subapical brown or fuscous bands, of which both may be reduced to a transverse oval spot on each side, with the basal pair lying close to lateral margins28
Abdomen fuscous or blackish, with an enclosed yellow band, more or less narrowed or acute at outer ends, on tergites 2 to 5; tergite 1 without a yellow spot on each side, but sometimes suffused with yellow at base.....*coreopsidis obscurior* Timberlake
28. Dark markings of abdomen restricted to tergites 1 to 3; legs more extensively yellow, the hind femora more yellow than dark.....29
Abdomen yellow, with four dark spots on tergites 1 to 4, a pair of basal spots on tergite 5, and the band between the spots usually at least partly developed; legs dark, with apex of femora and anterior side of front and middle tibiae yellow.....*coreopsidis coreopsidis* Cockerell
29. Subapical spots on tergites 1 to 3, especially on 2 and 3, hardly differentiated from the narrow band that connects them, the marking being faint on tergite 3; hind femora with a dark streak behind; flagellum fuscous above and yellowish brown beneath; pubescence and puncturation of mesonotum denser than in other races, the hair ochreous
coreopsidis collaris Cockerell
Dark markings of abdomen reduced to four small fuscous spots on tergite 1 and two small subapical spots on tergite 2; antennae yellow, the flagellum pale brown above
coreopsidis kansensis Timberlake
30. Face all, or nearly all, yellow below level of antennae, except usual dark spots on clypeus and sometimes the more or less dark sutures of subantennal plates.....31
Face usually much less than entirely yellow below level of antennae.....32
31. Lateral face marks ending broadly above at superior level of antennal sockets; pronotum dark, but continuously yellow on hind margin; yellow bands of abdomen more or less broken into spots*perpulchra* Cockerell
Lateral face marks oblique above, sometimes with a slender orbital spur to or above middle of frons, the green of frons always descending to upper, outer margins of subantennal plates; pronotum usually broadly yellow behind; abdominal bands sometimes interrupted, but the abdomen varying to nearly all yellow except at base.....*signata*, n. sp.²
32. Frons minutely granular-tessellate, almost opaque, and obscurely punctate.....33
Frons smoother, more shining, and more or less distinctly punctured.....37
33. Wings somewhat dusky hyaline.....34
Wings milky hyaline, with pallid nervures.....35
34. Face marks yellow, including a spot on each side of clypeus, sometimes a median stripe, and transverse lateral marks, which are sometimes divided into two small spots; thorax and legs dark, the abdomen with a small yellow spot on each side of tergite 2 and sometimes on tergite 3*bequaerti bequaerti* Viereck

+ *purpurascens*
(III: 372)

beata + *imbellus* Tru
(VII: 21)

+ n. sp. 2
bequaerti Viereck

² Couplet 31 is deplorably weak as the male of *perpulchra* is known to me only by description, and the unknown males of *beata*, *pulchella*, and *propodealis* may fall here.

* Not included
albipennis canadensis
albomaculata
autumnalis
fractilineata
IN CARA

luculentata
pachygnatha
perpulchra flavidior
propodealis
pulchella

shinnery

Similar but wings less dusky, the nervures pale ferruginous brown; markings similar, but lateral spots on tergites 2 and 3 lacking.....*bequaerti indianensis* Cockerell

25. Face marks obsolete or nearly so.....36

Anterior margin of clypeus and narrowly transverse, lateral marks yellow; scape of antennae usually more or less yellow beneath; yellow markings of abdomen usually restricted to small lateral spots on tergites 2 and 3.....*lacteipennis pallidipennis* Graenicher

36. Abdomen rather broad and dullish, the apical depression of tergites whitish subhyaline; traces of yellow markings sometimes present on face, especially a fine median line on clypeus; markings of abdomen evanescent, generally restricted to extreme lateral margins or to reflexed sides of tergites; length, 7-8 mm.*lacteipennis lacteipennis* Swenk and Cockerell

The male of *canadensis* Crawford not certainly distinguishable from *lacteipennis*.

Abdomen narrower and more shining; no yellow markings except on reflexed lateral margins of tergites; length, about 6.5-7 mm.*heliophila* Cockerell

37. Abdomen microscopically lineolate and comparatively shiny; apical depression of tergites usually conspicuously whitish hyaline.....38

Abdomen opaque black, with a minute granular sculpture, the apical depression of the tergites smoother and more shining but hardly lighter in color than disk; head and thorax somewhat brassy green; tarsi yellow and sometimes a small yellow spot on each side and at middle of clypeus and on each side of hind margin of pronotum.....*scopata*, n. sp.

38. Tongue comparatively long, the glossa and galeae reaching well beyond the proboscival fossa39

Glossa and galeae in repose hardly surpassing the proboscival fossa.....44

39. Larger and not at all brassy green species, with the frons more shining and distinctly punctured40

Smaller, brassy green species, with frons duller and rather obscurely punctured.....41

40. Frons tessellate, moderately shiny and moderately closely punctate; mandibles except tips, clypeus except a black patch on each side of upper part of disk, and transverse lateral marks yellow; pronotum dark except an interrupted yellow line on hind margin of notum; flagellum of antennae orange yellow beneath, more ferruginous above, or slightly darkened toward base, the scape yellow beneath; abdomen with evanescent yellow bands just in front of the apical depression of tergites.....*albipennis* Cresson

The var. *helianthi* Cockerell has the flagellum more or less blackish and the yellow bands of abdomen present, but never strongly developed.

Similar, but frons a little more strongly and closely punctured; flagellum orange yellow and hardly darkened above; abdomen duller and virtually without markings

tricincta Timberlake

41. Yellow markings of face, pronotum, and abdomen comparatively extensive.....42

A small yellow spot on lateral extensions of clypeus and a dot at anterior corners of face; tubercles and pronotum with only a trace of yellow; yellow bands of abdomen evanescent or absent; front and middle knees, anterior side of front and sometimes of middle tibiae yellow*coreopsidis obscurior* Timberlake

42. Clypeus yellow, with two black marks on upper part of disk, between which the yellow intrudes; lateral marks large and a yellow spot on cheeks at anterior end of eyes.....43

Clypeus with a large black mark, which usually reaches anterior margin of disk and sometimes encloses a thin median yellow line on upper part of disk; lateral marks generally small, or narrowly transverse*coreopsidis coreopsidis* Cockerell

43. Abdomen mainly yellow, with a black band at base of tergites 2 to 5, and a small, transverse dark spot subapically on each side of tergites 2 and 3; apex of femora and the tibiae yellow, except a small blotch on middle tibiae and most of posterior side of hind tibiae; antennae entirely yellow or orange yellow.....*coreopsidis kansensis* Timberlake

Abdomen black with preapical yellow bands, more or less interrupted on each side, especially on tergites 2 to 4, by a broad lobe projecting from the dark base; hind margin of pronotum yellow from one tubercle to the other; antennae yellow, with apex of scape, pedicel, and first flagellum joint fuscous above; hind femora except at apex and the hind tibiae dark

coreopsidis collaris Cockerell

purpurascens
II: 328

+ *luculella*

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The specie
Cockerellia v
Cockerell des
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is certainly d

Perdita beata
48:9, ♀.

This beaut
found at the

likely synonymous
Tachio. series has basically
all forms -28

- 351
44. Frons comparatively shiny and more distinctly punctured..... 45
 Frons dullish, with the punctures minute and rather obscure in some aspects; clypeus, except two large black marks on disk, and transverse lateral marks bright yellow; pronotum and tubercles usually dark; abdomen with narrow preapical yellow bands, which tend to be evanescent *verbesinae* Cockerell + *hilaris* (VII:21)
45. Brassy green species, with disk of clypeus partly dark..... 46
 More or less blue-green species, with clypeus all, or nearly all, light..... 48
46. Wings milky hyaline, with pallid nervures..... 47
 Wings subfuliginous, the nervures and stigma brown; clypeus except two dark marks, one on each side of upper part of disk, transverse lateral marks, two spots on hind margin of pronotum, spot on tubercles, and mark on each side of tergites 1 to 5 yellow; apical depression of tergites hardly lighter than the disk..... *obscuripennis*, n. sp.
47. Abdomen blackish, with evanescent yellow bands, the apical depression of tergites whitish subhyaline; mandibles except tips, labrum, clypeus except two large black marks narrowly separated on disk, and transversely linear lateral marks bright yellow; frons somewhat dullish, with numerous fine punctures..... *lepachidis lepachidis* Cockerell
 Similar, but frons more shining and more distinctly punctured
lepachidis levifrons Timberlake
48. Wings milky hyaline, with pallid nervures..... 49
 Wings faintly dusky, the margins of stigma and nervures enclosing marginal cell pale brownish; mandibles except tips, labrum, clypeus, and triangular lateral marks, as high as wide, bright yellow; abdomen with yellow subapical bands, broadly emarginate or interrupted on each side *utahensis* Cockerell + *novoleona* (Suppl:4)
49. Lateral face marks large, triangular, somewhat broader than high, but generally reaching level of antennae 50
 Lateral face marks transverse, reaching no higher than clypeus, except for a slender linear extension on orbits to level of antennae; mandibles except tips, labrum, clypeus, lateral marks, and small spot at anterior end of cheeks pale yellow; abdominal bands broad, yellowish white, usually emarginate or enclosing a dark spot on each side; mesoscutum with very fine close punctures *baileyae* Cockerell 394 p. *perpulchra* (II:325)
50. Mesoscutum closely punctate and with short mosslike white pubescence; face markings yellow, the lateral marks usually confluent with an oblique streak across subantennal plates to antennal sockets, or sometimes the subantennal plates entirely yellow as well as a transverse supraclypeal mark; yellow bands of abdomen broad, usually enclosing a fuscous spot on each side of tergites 2 and 3; femora more or less broadly yellow on anterior side
albihirta albihirta, n. subsp.
 Mesoscutum polished, moderately closely punctate and pubescent; face markings more or less creamy white, the subantennal plates and supraclypeal area dark; abdominal bands rather broad but often nearly interrupted on each side, or with a small enclosed black spot, the apical depression of tergites conspicuously whitish subhyaline; femora dark except at apex *albihirta geraeae*, n. subsp.

The species *P. sparsa* Fox and *P. aureovittata* Cockerell, whose position in *Cockerellia* was indicated by Cockerell, do not belong to this group. *P. pasonis* Cockerell described as a variety of *albipennis* (Proc. Acad. Sci., Phila., 48:105) is unknown to me. It is similar to *P. hyalina* Cresson, and because of its dull frons it is certainly distinct from *albipennis*.

Perdita beata Cockerell

Perdita beata Cockerell, 1895, Psyche 7, Suppl., 1:10; Cockerell, 1896, Proc. Acad. Sci., Phila., 48:9, ♀.

This beautiful bee was described from Las Cruces, New Mexico, where it was found at the flowers of *Verbesina encelioides*. The only specimen of this rare species