

**Distribution, Checklist and Key to Adult Tiger Beetles
(Coleoptera: Cicindelidae) of Indiana**

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Introduction

Early work on Indiana tiger beetles by Blatchley (1), Goldsmith (5), and Montgomery and Montgomery (7) gave information on the distribution of species in the State. Shelford (11, 12, 13) contributed much to the understanding of tiger beetle natural history from his studies of species of the Lake Michigan Dunes area. Recently, Knisley (6) surveyed tiger beetles from the dunes region and Munsee (8) and Schrock (9) sampled tiger beetles on unreclaimed coal stripmine spoil banks in western Indiana. Our intent with this paper is to provide a current review of this popular and widely collected group of insects in Indiana so that changes in distribution and abundance through habitat degradation or other factors might be studied. Results of this study are based on our recent collecting throughout the State and an examination of museum collection records. A checklist and taxonomic key for the species we think are present in the State are provided. The keys of Blatchley (1) and Willis (14) include different species and are not suitable.

Methods

Most museum and private collections expected to have a good representation of Indiana tiger beetles (see checklist legend) were examined. Museum specimens typically had older dates and indicated a decline in recent collecting. Most of the recent records were obtained from personal collections of Downie, Brzoska, and Knisley, the Munsee and Schrock surveys (8, 9, 10), and unpublished work of Knisley. Determinations of seasonal pattern of occurrence and habitat preference were based on our observations, collection records, and published information of these species.

Results and Discussion

Blatchley (1) lists 16 species and an additional variety of Cicindelidae from Indiana. He also speculated that *C. marginipennis* "very probably occurs along the streams of the southeastern portion of Indiana." Montgomery and Montgomery (7) added *C. celeripes* to the state list, although we consider this species to be *C. cursitans*, a morphologically similar species. *Cicindela celeripes* is common further west and probably does not occur in Indiana. The checklist of North and Central American species by Boyd (3) is a literature compilation of published records which includes for Indiana the species on Blatchley's list plus *C. limbalis* and *C. splendida*. Our checklist of 20 species includes several species name changes (following Boyd et al. 1982), the addition of three species (*C. marginipennis*, *C. splendida*, *C. cursitans*), and the deletion of *C. ancocisconensis*. The name changes are: *C. cuprascens macra*

to *C. macra*, *C. purpurea limbalis* to *C. limbalis*, *C. vulgaris* to *C. tranquebarica*, *C. generosa* to *C. formosa generosa*, and *C. lecontei* to *C. scutellaris lecontei*.

We have collected all of the species on our checklist except *C. splendida* and *C. limbalis*. These two species are taxonomically similar and may be the same species (Walter Johnson, personal communication). *Cicindela splendida* has been collected in southern Ohio (4) and we found suitable habitat in southern Indiana. *Cicindela limbalis* has been collected in northern Ohio (4) and near Chicago, but no suitable habitat was found during limited surveys in northern Indiana. We collected *C. cursitans* at one site in Posey County and *C. marginipennis* in three southeastern counties. We did not include *C. ancocisconensis* on our list because we did not find it during our collecting or in any of the collections which we examined. Blatchley (1) reported it from Fulton County along Bruce Lake on July 14, an unlikely habitat and date. Goldsmith (5) reported it from water edge sites in several counties and made some observations on it along the Jordan River in Bloomington. Since this species is easily confused with *C. repanda*, typically occurs along mountain streams, and is more eastern in distribution, these records are dubious.

The three types of life history patterns recognized by Shelford (12) as typical of tiger beetles are represented among the Indiana species. Adults of summer species appear in June and mate, oviposit, and die off by early fall. Fall-spring adults emerge about late August, feed for about six weeks, overwinter, and then re-emerged in spring to mate and reproduce. *Cicindela sexguttata* is the only spring species in Indiana. Adults appear in April and usually disappear by late June. We found very few individuals in late summer indicating little or no fall emergence as may occur for this species in the southeastern U.S. (13). The life history of *C. hirticollis*, a fall-spring species, is quite interesting because adults are present from late spring through fall. Shelford (12) indicates that this is because the new adults emerge about mid-July while overwintered adults from the previous brood are still present.

Examination of museum collections was made possible with the kind help of: Dr. Wallace LaBerge, Illinois Natural History Survey; Dr. George Byers, Snow Entomological Museum; Dr. W.P. McCafferty and A. Provonsha, Purdue University; Dr. Frank Young, Indiana University-Bloomington; and Dr. John Dustman, Indiana University-Gary. Dr. Gary Dunn provided records from the University of Michigan, Florida Division of Plant Industry, and other museum records. Knisley obtained records from collections, collected throughout the State, and revised much of the text. Brzoska confirmed many identifications, provided life history information and adapted the key from his work with Ohio tiger beetles (4). Schrock visited museums, solicited specimens, wrote the draft text and prepared range maps.

CHECKLIST OF ADULT TIGER BEETLES KNOWN FROM INDIANA

- BK = Barry Knisley collection
- DB = David Brzoska collection
- GD = Records from Gary Dunn
- IL = Illinois Natural History Survey
- ND = N.M. Downie collection
- ISU = Indiana State University
- IUG = Indiana University-Gary
- KU = Snow Entomological Museum, University of Kansas
- PU = Purdue University
- B = Blatchley (1)

G = Goldsmith (5)

K = Knisley (6)

M = Montgomery and Montgomery (7). Also includes records from Purdue Univ. and from personal collections of V.E. Shelford and A.B. Wolcott.

S = Munsee and Schrock (8, 9, 10)

1. *Megacephala virginica* (Linnaeus) B, M, GD, ND, ISU, PU
(= *Tetracha virginica*)
Summer species, found between June and September; habitat generalist; often found in fields; nocturnal and comes to lights where it feeds on insects; not clear if it is attracted by light or by the insects.
2. *Cicindela cuprascens* LeConte B, M, BK, DB, GD, ND, IL, IUG, PU
Summer species; known mainly from sand bars along rivers.
3. *Cicindela cursitans* LeConte M, BK, PU
Summer species; known only from southwest corner of state; runs rapidly, flightless; damp areas back from water edge.
4. *Cicindela duodecimguttata* Dejean B, M, BK, DB, GD, ISU, IUG, PU
Fall-spring species; found along the banks of creeks.
5. *Cicindela formosa generosa* Dejean B, G, K, M, BK, DB, ND, IL, ISU, PU
(= *C. generosa*)
Spring and fall populations; occurs in deep sand areas such as sand quarries.
6. *Cicindela hirticollis* Say B, K, M, BK, DB, ND, IL, PU
Fall-spring species but overlap results in presence during summer; common on wet areas in sand dunes, beaches, sand bars and rivers.
7. *Cicindela lepida* Dejean B, K, BK, DB, GD, ND, IUG, PU
Summer species; found only on fine white sand, mostly in Dunes area; can be collected at night with a light.
8. *Cicindela limbalis* Klug
(= *C. purpurea limbalis*)
Fall-spring species; may occur along northern border of state (occurs in IL, OH); habitat on vertical clay banks, roadcuts, washouts.
9. *Cicindela macra* LeConte K, BK, DB, ND, PU
(= *C. cuprascens macra* of Blatchley)
Summer species; abundant along Lake Michigan beaches.
10. *Cicindela marginipennis* Dejean BK, DB
Summer species; found on gravel bars on rivers; found only in southeast corner of State.
11. *Cicindela patruela* Dejean B, M, BK, DB, IL, IUG, KU, PU
Fall-spring species; paths in sandy forests.
12. *Cicindela punctulata* Olivier B, G, K, M, BK, DB, ND, ISU, PU
Summer species; common in wide range of habitats; found on barren acidic spoilbanks, attracted to lights.
13. *Cicindela purpurea* Olivier B, G, M, BK, PU
Fall-spring species; probably more widespread than indicated; occurs quite early in season (March and April).
14. *Cicindela repanda* Dejean B, G, K, M, BK, DB, ND, IL, ISU, IUG, PU
Fall-spring species; generalist but requires some moisture.
15. *Cicindela rufiventris* Dejean B, K, M, DB, GD, ND, ISU, IUG, PU
Summer species; prefers gravel areas, roadcuts, bare slopes.

16. *Cicindela sexguttata* Fabricius B, G, K, M, S, BK, DB, ND, IL, ISU, IUG, KU, PU
Spring species with little or no fall emergence; generally found in open woodlands; captured on stripmines in grassy and young wooded plots.
17. *Cicindela scutellaris lecontei* Haldemann B, K, M, BK, DB, ND, IL, ISU, PU
Fall-spring species; most frequently found on sparsely vegetated sandy areas, usually with *C. formosa generosa*.
18. *Cicindela splendida* Hentz
Fall-spring species; should be found in southern half of state (occurs in IL, OH); found on clay banks and open areas.
19. *Cicindela tranquebarica* Herbst B, G, M, BK, DB, ND, IL, ISU, IUG, PU
(= *C. vulgaris*)
Fall-spring species; generalist; sandy or clay areas.
20. *Cicindela unipunctata* Fabricius M, S, BK, GD, ND, IUG, KU, PU
Summer species; adult population peaks in June; crepuscular/nocturnal; moved onto newly wooded spoilbanks; weak flyer.

KEY TO SPECIES OF ADULT TIGER BEETLES OF INDIANA

(adapted from Brzoska (4) and Willis (14))

1. Anterior angles of pronotum more prominent than anterior margins of prosternum (Fig. 2B); third segment of maxillary palps longer than the fourth (Fig. 3B).....*Megacephala virginica* (Linnaeus)
- 1'. Anterior pronotal angles not more prominent than prosternal margin (Fig. 2A); third segment of maxillary palps shorter than fourth (Fig. 3A).....genus *Cicindela* 2
- 2(1') Front and middle trochanter without subapical setae (Fig. 4B); venter of abdomen reddish brown or testaceous 3
- 2'. Front and middle trochanter with one or two subapical setae (Fig. 4A); venter of abdomen metallic green or blue..... 4
- 3(2). Markings of elytra connected at margin; elytra not microsculptured; elytra dull green to olive brown *C. marginipennis* Dejean
- 3'. Markings of elytra not connected at margin (Fig. 14); elytra microsculptured; elytra dull black.....*C. rufiventris* Dejean
- 4(2') Clypeus densely to sparsely clothed with decumbent setae (Fig. 5B)... 5
- 4'. Clypeus glabrous or with a few erect setae (Fig. 5A)..... 7
- 5(4). Appendages without pigmentation (pale tan)..... *C. lepida* Dejean
- 5'. Appendages pigmented 6
- 6(5)' Elytra dull, shallowly punctate; female elytral apices acute *C. macra* LeConte
- 6'. Elytra shiny, deeply punctate; female elytral apices rounded.....*C. cuprascens* LeConte
- 7(4') Frons with supraorbital setae only (middle portion of frons glabrous) (Fig. 6A)..... 8
- 7'. Frons and/or vertex with setae (in addition to supraorbitals) (Fig 6B)..... 14
- 8(7). Small, less than 9mm in length 9
- 8'. Large, more than 9 mm in length 10
- 9(8). Elytra notably expanded in apical one-half, marking usually reduced, without complete marginal line; legs metallic green (this species probably does not occur in Indiana but is very similar to *C. cursitans*).....*C. celeripes* LeConte

- 9'. Elytra not notably expanded apically; usually with marginal line, legs light brown, only slightly metallic.....*C. cursitans* LeConte
- 10(8') Proepisternum with setae (only a few near coxal margin) (Fig. 7B).. 11
- 10'. Proepisternum glabrous (Fig. 7A) *C. unipunctata* Fabricius
- 11(10). 1st antennal segment with one sensory seta
(Fig. 8A).....*C. punctulata* Olivier
- 11'. 1st antennal segment with three or more sensory setae (Fig. 8B)... 12
- 12(11). 1st antennal segment with more than four sensory
setae (Fig. 12).....*C. scutellaris lecontei* Haldemann
- 12'. 1st antennal segment with three or four sensory setae..... 13
- 13(12') Elytra granulate; lateral margins of abdomen with sparse
decumbent setae; middle band usually complete *C. patruela* Dejean
- 13'. Elytra shallowly to deeply punctuate; abdomen glabrous laterally; middle
band usually broken into dots or absent*C. sexguttata* Dejean
- 14(7'). Genae with setae (Fig. 9B)..... 15
- 14'. Genae glabrous (Fig. 9A) 22
- 15(14). Labrum unidentate (Fig. 10A), or nondentate..... 16
- 15'. Labrum tridentate (Fig. 10B), or with more teeth..... 17
- 16(15). Pronotum narrow (proportions: 4 units long, 5 wide), front angles rounded
(Fig. 11A); humeral lunules usually complete and connected to or slightly
separated from marginal line (Fig. 11C)*C. repanda* Dejean
- 16'. Pronotum wide (proportions: 4 units long, 6 wide), front angles acute (Fig.
11B); humeral lunules usually broken and/or widely separated from marginal
line (Figs. 11D, 15).....*C. duodecimguttata* Dejean
- 17(15') Elytral markings broad and connected by complete marginal band (Fig.
16).....*C. formosa generosa* Dejean
- 17'. Elytral markings not connected by complete marginal band 18
- 18(17') Humeral lunule long and oblique, projecting strongly mesad, may or may
not be connected to the marginal markings (Figs. 13, 17)
.....*C. tranquebarica* Herbst
- 18'. Humeral lunule absent or short 19
- 19(18') Marginal line extending nearly to apical lunule, all lunules complete (Fig.
18).....*C. ancocisconensis* Harris
- 19'. Marginal line poorly developed or absent..... 20
- 20(19') Head and pronotum much differently colored from elytra, head and thorax
usually green or blue, elytra reddish (Fig. 19).....*C. splendida* Hentz
- 20'. Head, pronotum and elytra about the same color (may have contrasting
margins), reddish or rarely greenish..... 21
- 21(20') Humeral lunule absent, middle band narrow, nearly straight (Fig. 20)
.....*C. purpurea* Olivier
- 21'. Humeral lunule present, middle band wider, more sinuate (Fig. 22) ...
.....*C. limbalis* Klug
- 22(14') Humeral lunule long and oblique, projecting strongly mesad, may or may
not be connected to the marginal markings (Fig. 17).....
.....*C. tranquebarica* Herbst
- 22'. Humeral lunule not long and oblique 23
- 23(21') Elytral markings complete; middle band sinuate and extending nearly to
midline (Fig. 21).....*C. hirticollis* Say
- 23'. Elytral markings incomplete and variable, middle band represented as a
dot or triangular marking along margin reaching less than half way to
midline (Fig. 23).....*C. scutellaris lecontei* Haldemann

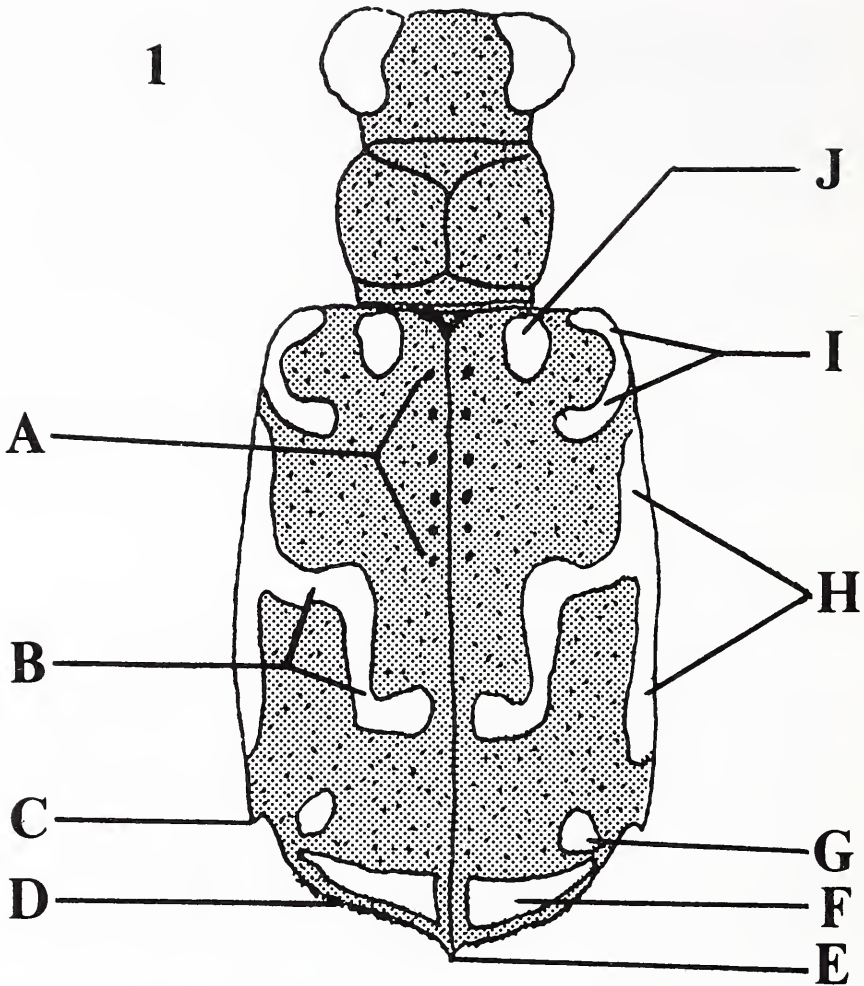


FIGURE 1. Hypothetical *Cicindela* species illustrating elytral characters: A) punctures along suture, B) middle band, C) posterior lateral emargination, D) serrulate apical margin, E) apical spine, F) apical lunule, G) apical dot, H) marginal line, I) humeral lunule, J) basal dot.

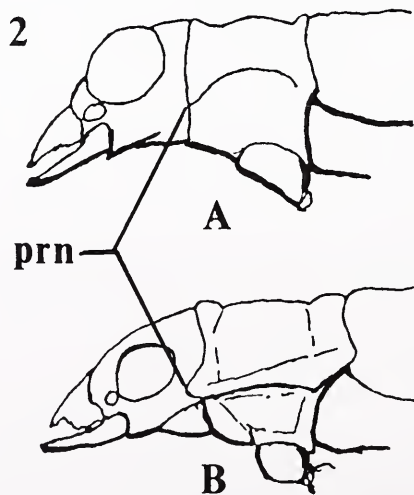


FIGURE 2. Anterior angles of pronotum (prn) of *Cicindela* (A) and *Megacephala* (B) in a lateral view of the head and thorax.

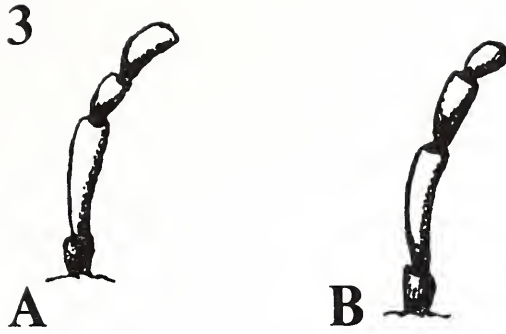


FIGURE 3. Maxillary palps of *Cicindela* (A) and *Megacephala* (B).

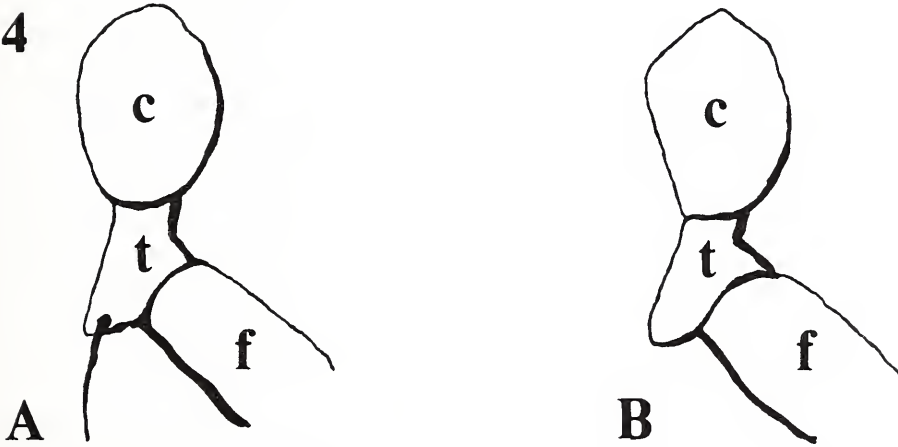


FIGURE 4. Ventral view of leg showing subapical sets on trochanter (A) and showing absence of subapical seta (B); c = coxa, t = trochanter, f = femur. (after Willis, 1968)

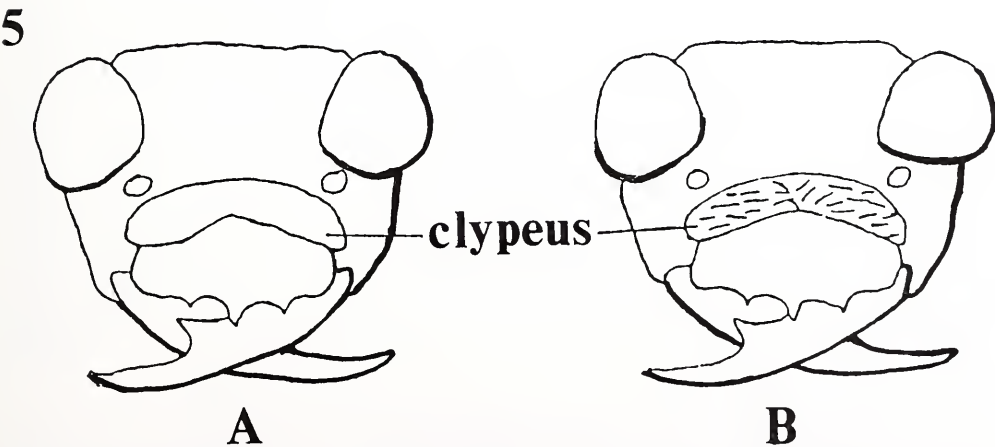


FIGURE 5. Frontal view of head showing clypeus—(A) glabrous (no setae); (B) clothed with decumbent setae.

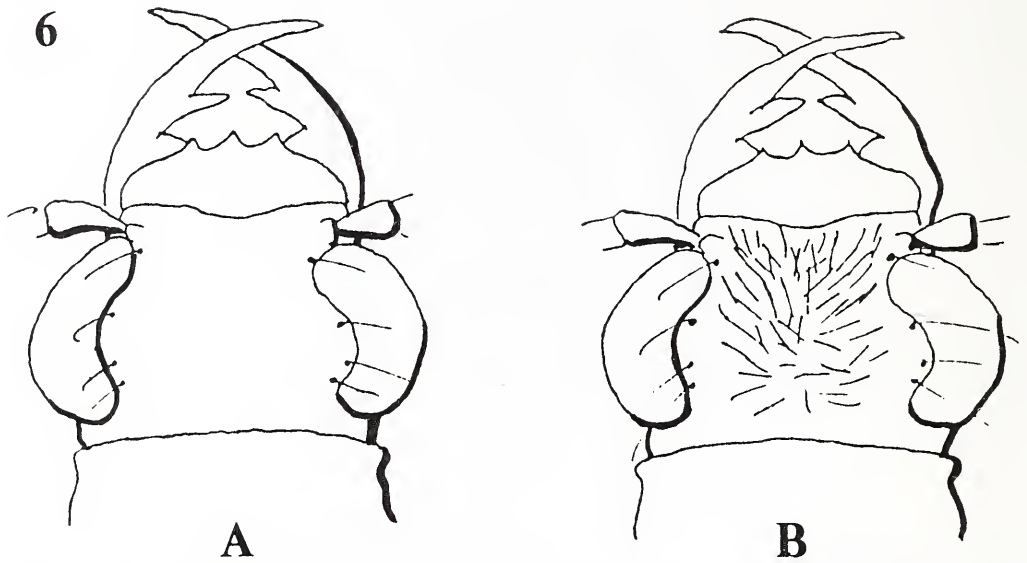


FIGURE 6. Dorsal view of head, frons—(A) glabrous with supraorbital setae only; (B) clothed with setae.

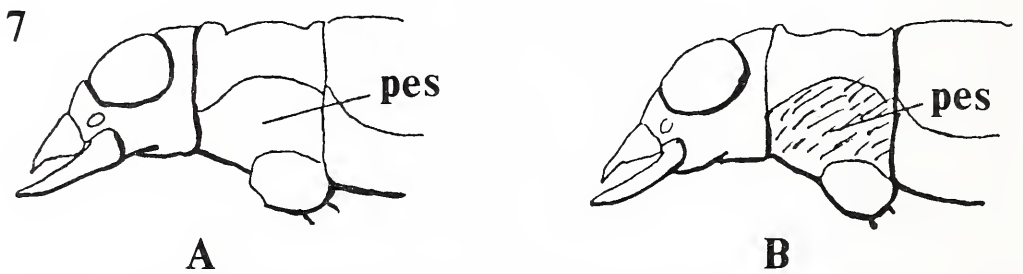


FIGURE 7. Lateral view of head and thorax showing character of proepisternum—(A) glabrous; (B) setose; pes = proepisternum.

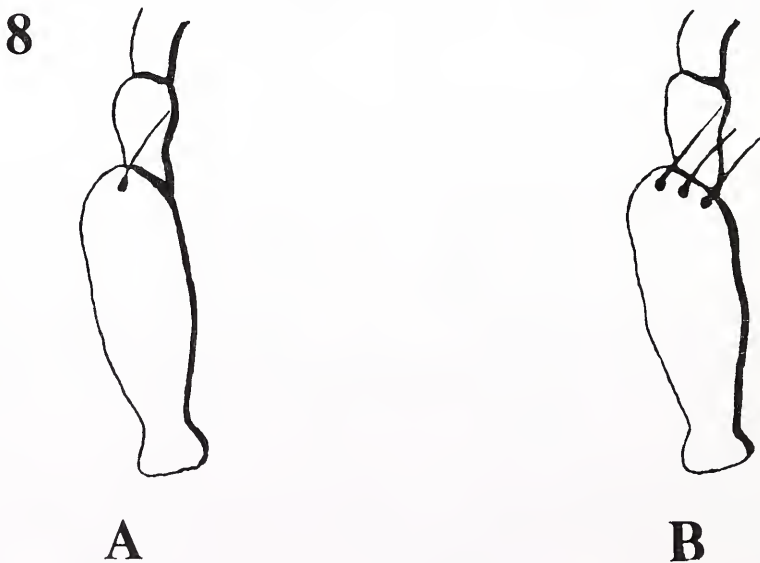


FIGURE 8. Mesal aspect of basal antennal segments showing the character of the setae on the first segment—(A) one sensory seta; (B) three or more sensory setae. (after Willis, 1968)

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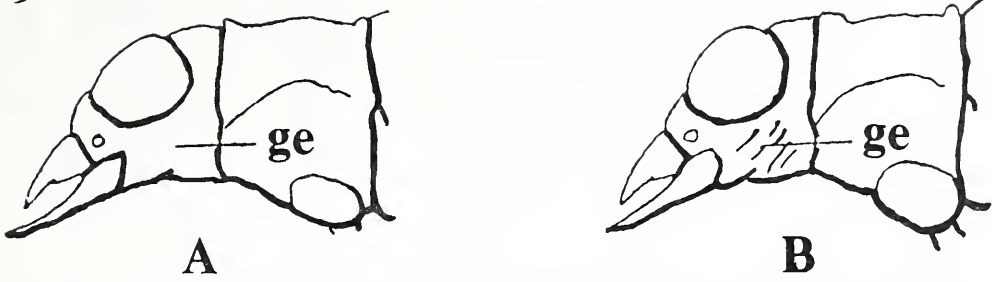


FIGURE 9. Lateral view of head and thorax showing character of gena—(A) glabrous; (B) with setae; ge = gena.

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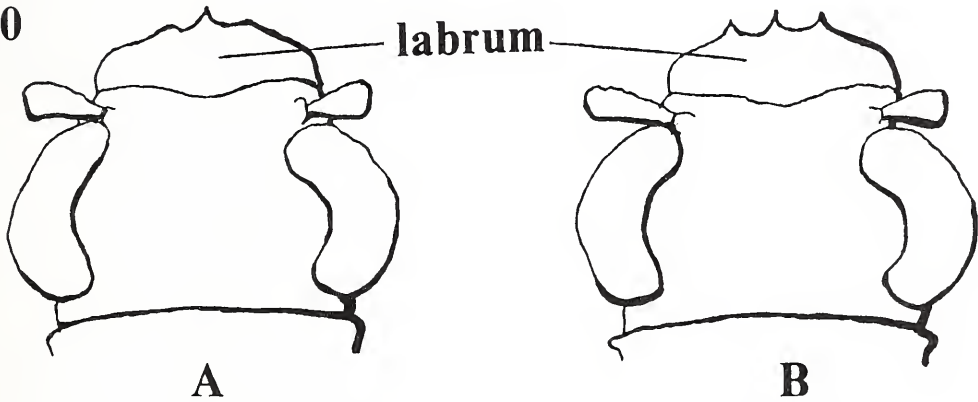


FIGURE 10. Dorsal view of head showing character of labrum—(A) unidentate (Note: rounded bulges are not considered teeth); (B) tridentate.

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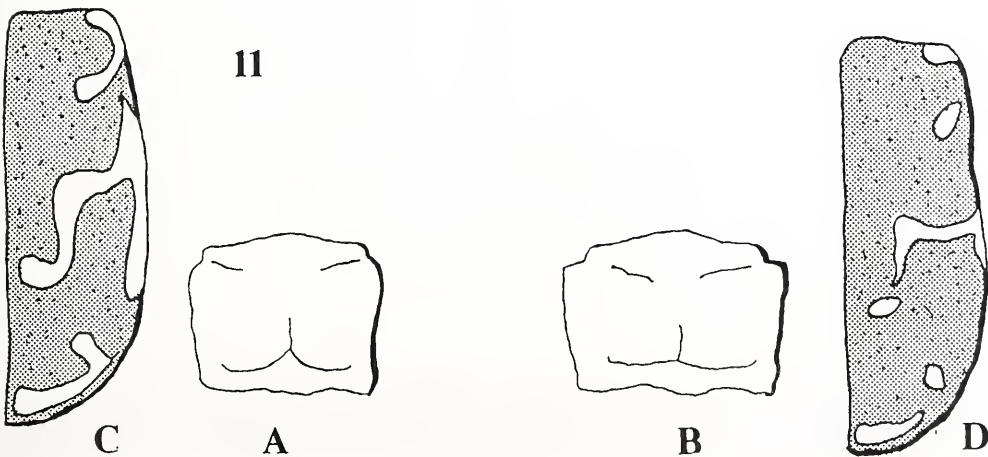
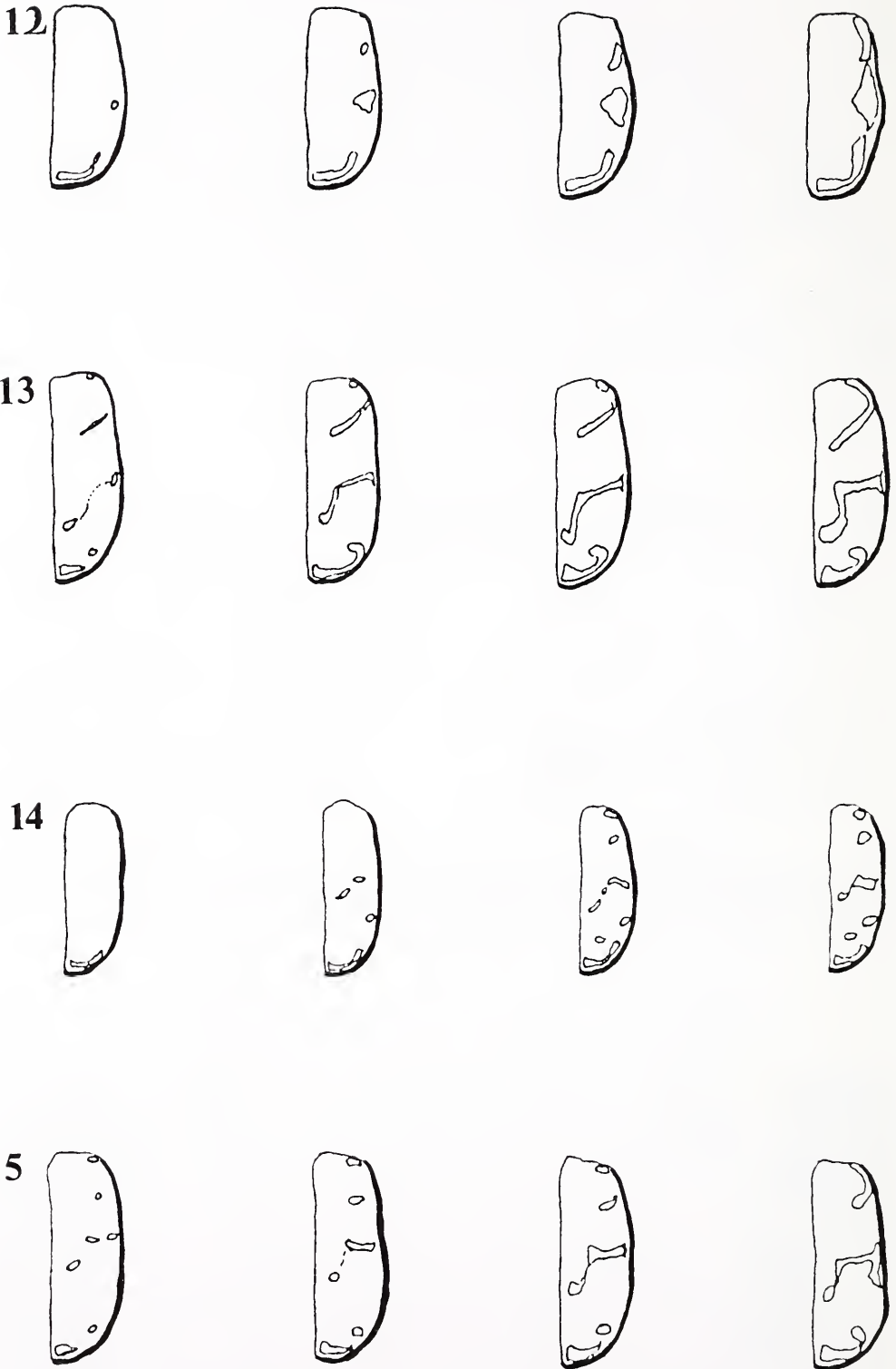
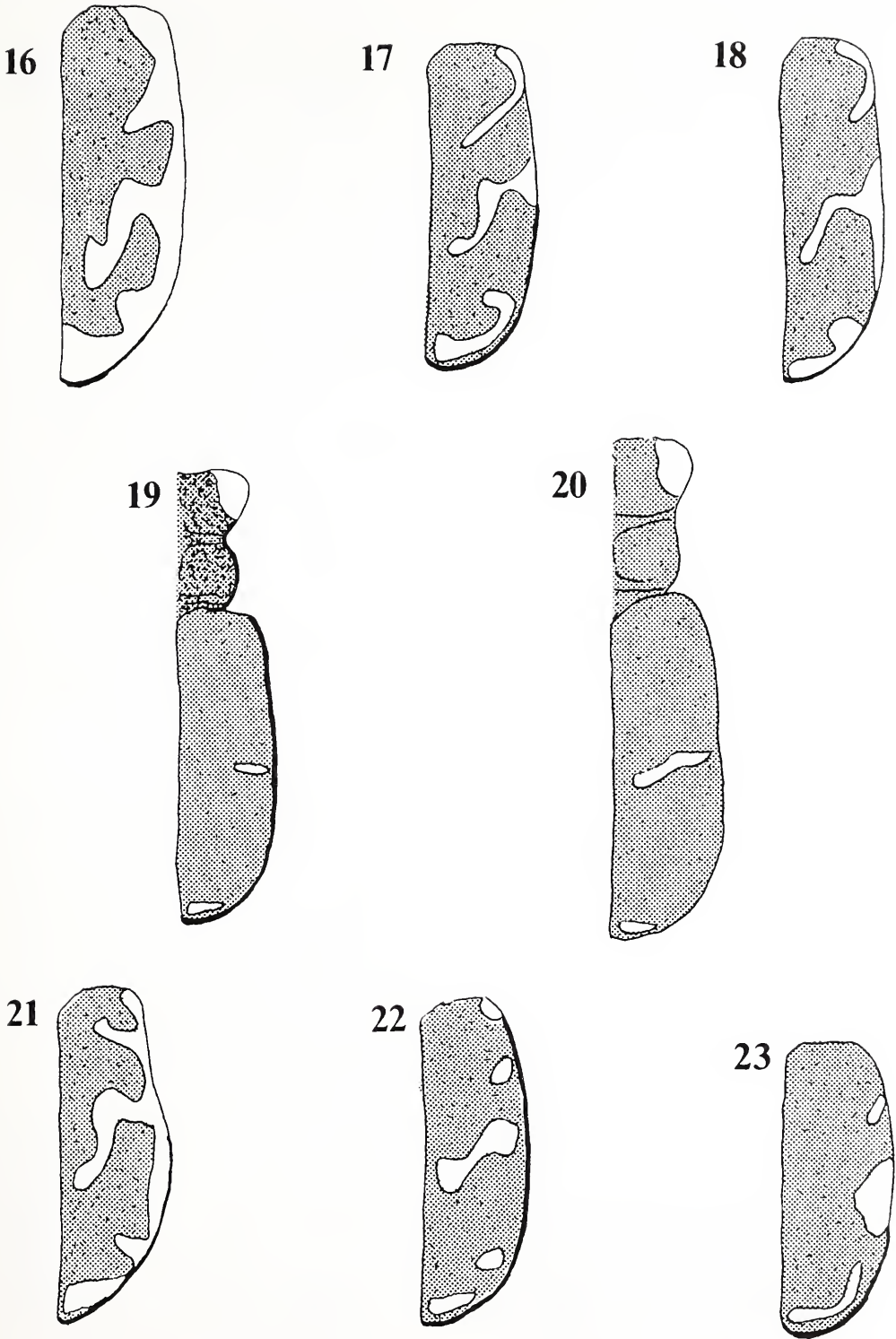


FIGURE 11. Pronota of: A) *Cicindela repanda* showing relatively narrow width and rounded front angles; B) *C. duodecimguttata* showing broader width and acute front angles. (after Willis, 1968) Right elytron of C) *C. repanda*; D) *C. duodecimguttata*.



FIGURES 12-15. Right elytra of 12) *Cicindela scutellaris lecontei*, 13) *C. tranquebarica*, 14) *C. rufiventris*, and 15) *C. duodecimguttata* showing degree of variation in maculation.



FIGURES 16-23. Right elytra of 16) *Cicindela formosa generosa*, 17) *C. tranquebarica*, 18) *C. ancocisconensis*, 19) *C. splendida*, 20) *C. purpurea*. 21) *C. hirticollis*. 22) *C. limbalis*. 23) *C. scutellaris lecontei*.

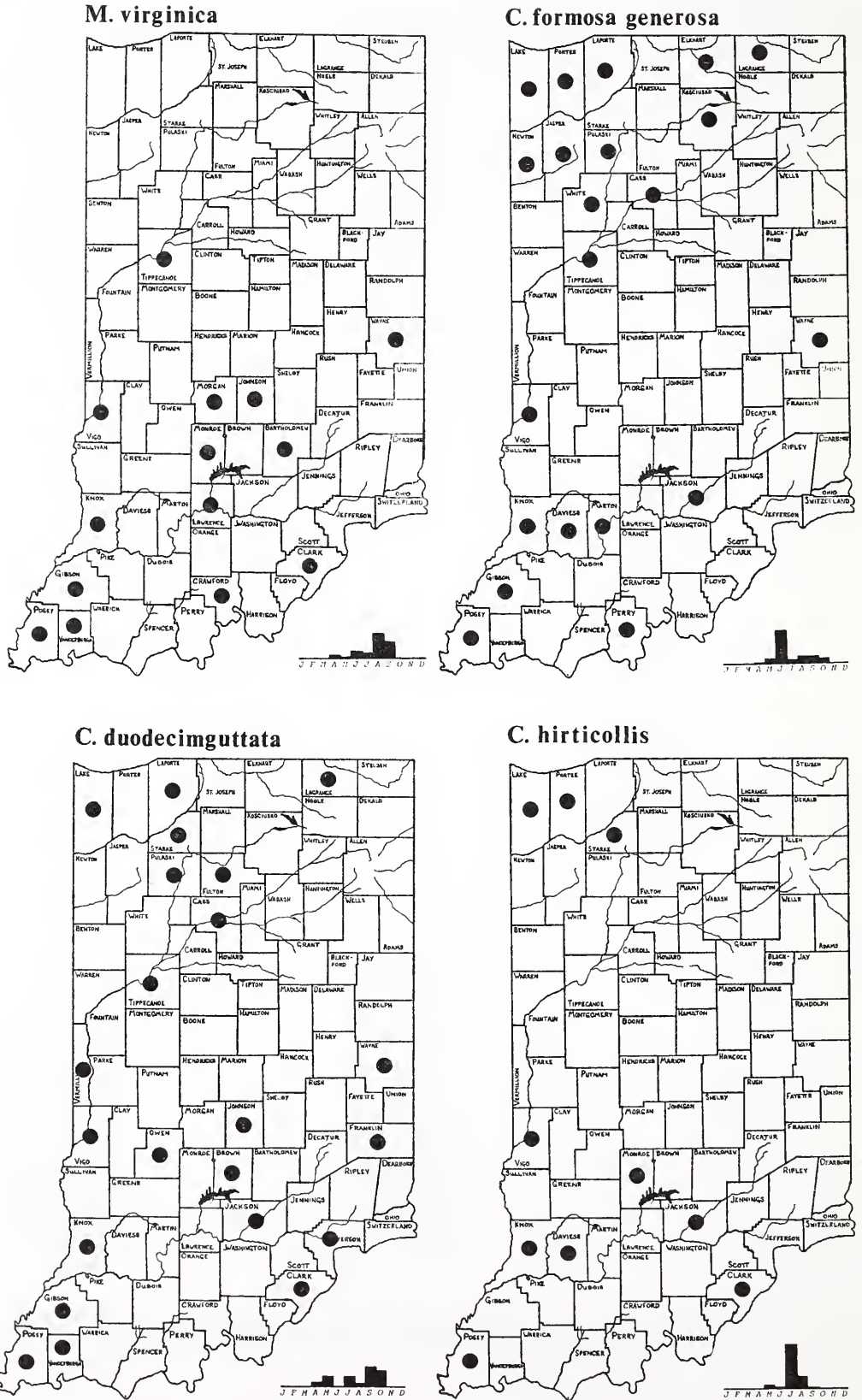
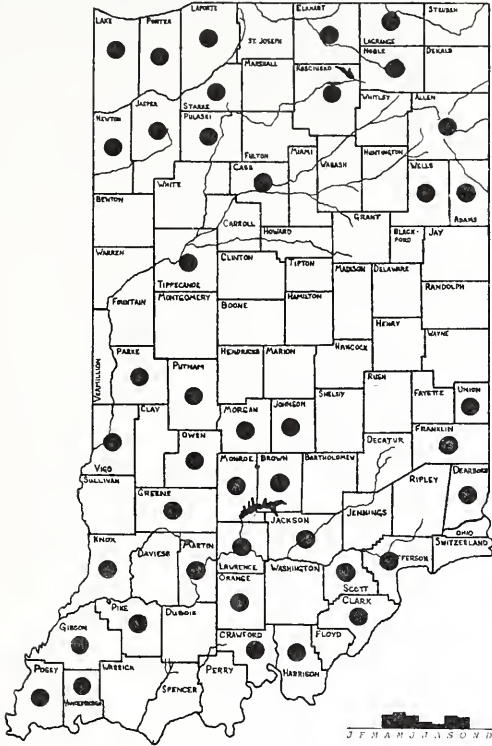
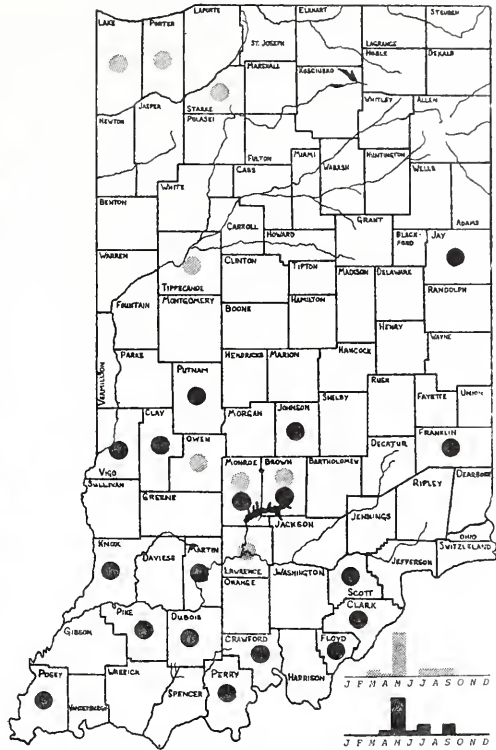


FIGURE 24. Distribution of *Megacephala virginica*, *Cicindela formosa generosa*, *C. duodecimguttata*, and *C. hirticollis*.

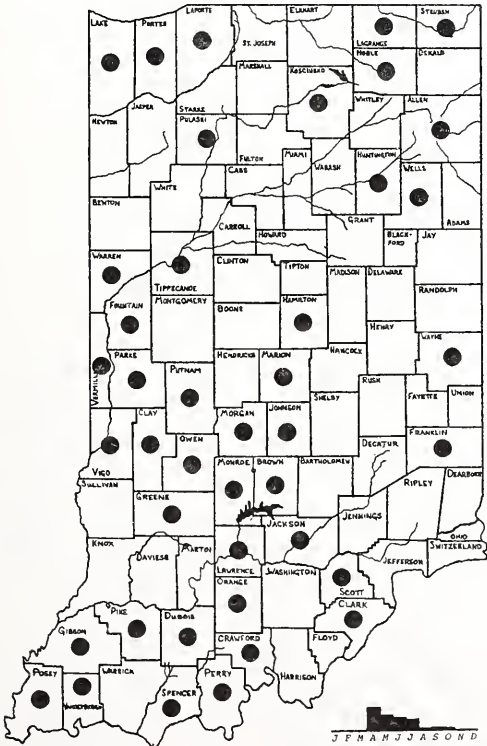
C. repanda



● **C. purpurea** ● **C. patruela**



C. sexguttata



C. scutellaris lecontei

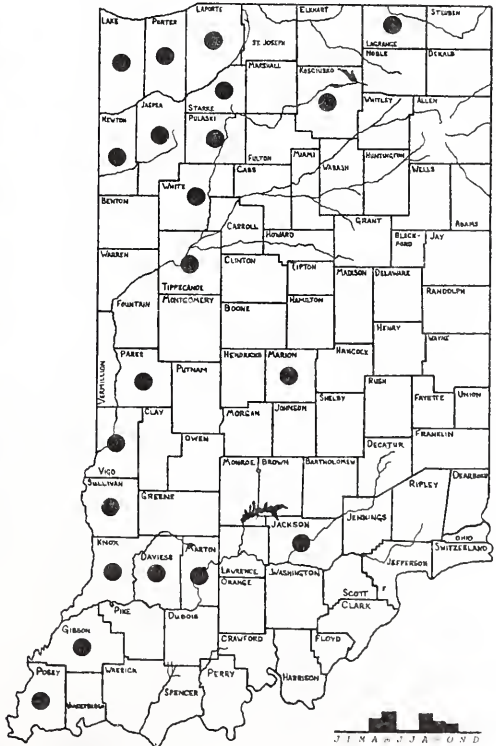


FIGURE 25. Distribution of *Cicindela repanda*, *C. purpurea*, *C. patruela*, *C. sexguttata*, and *C. scutellaris lecontei*.

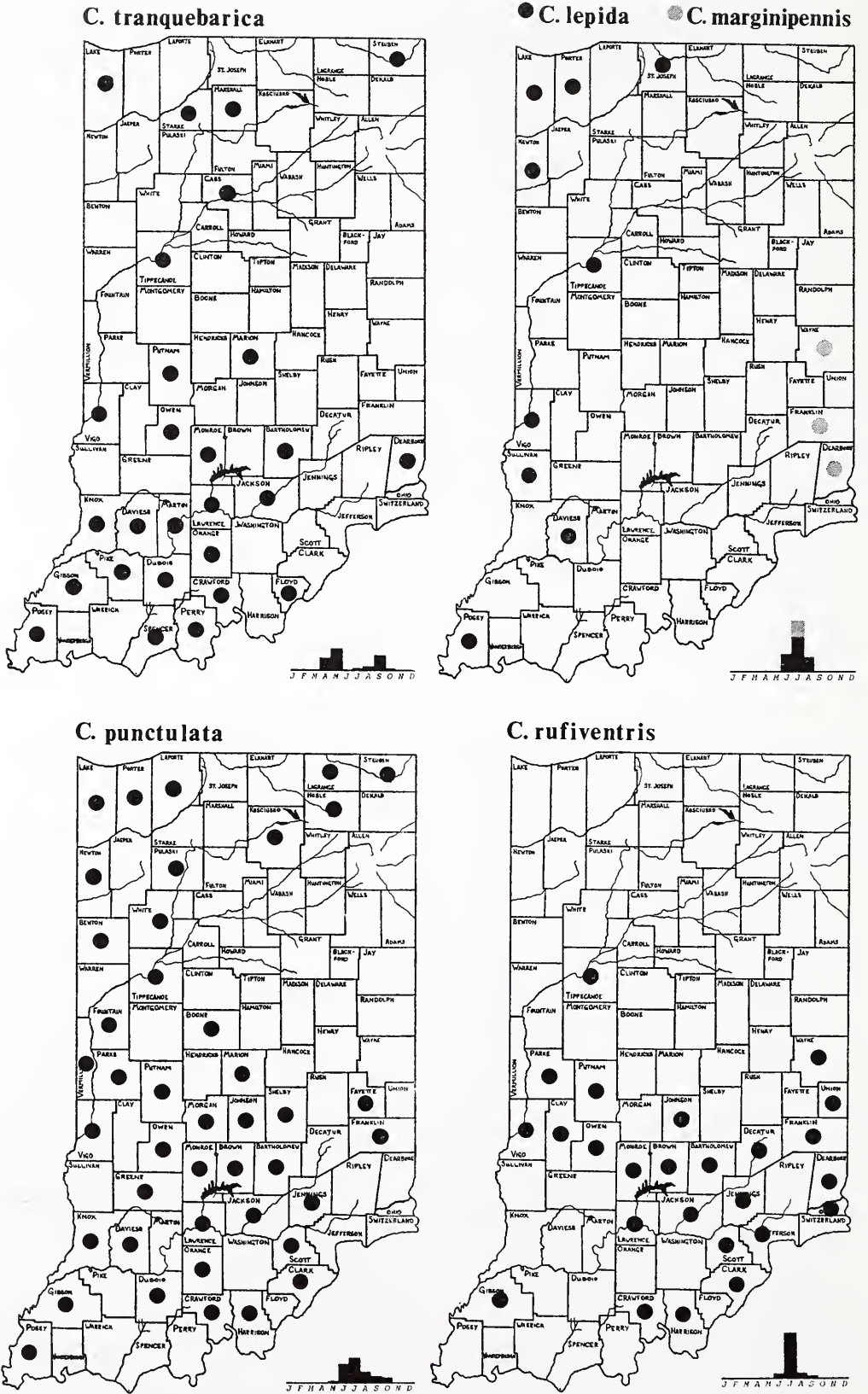


FIGURE 26. Distribution of *Cicindela tranquebarica*, *C. lepida*, *C. marginipennis*, *C. punctulata*, and *C. rufiventris*.

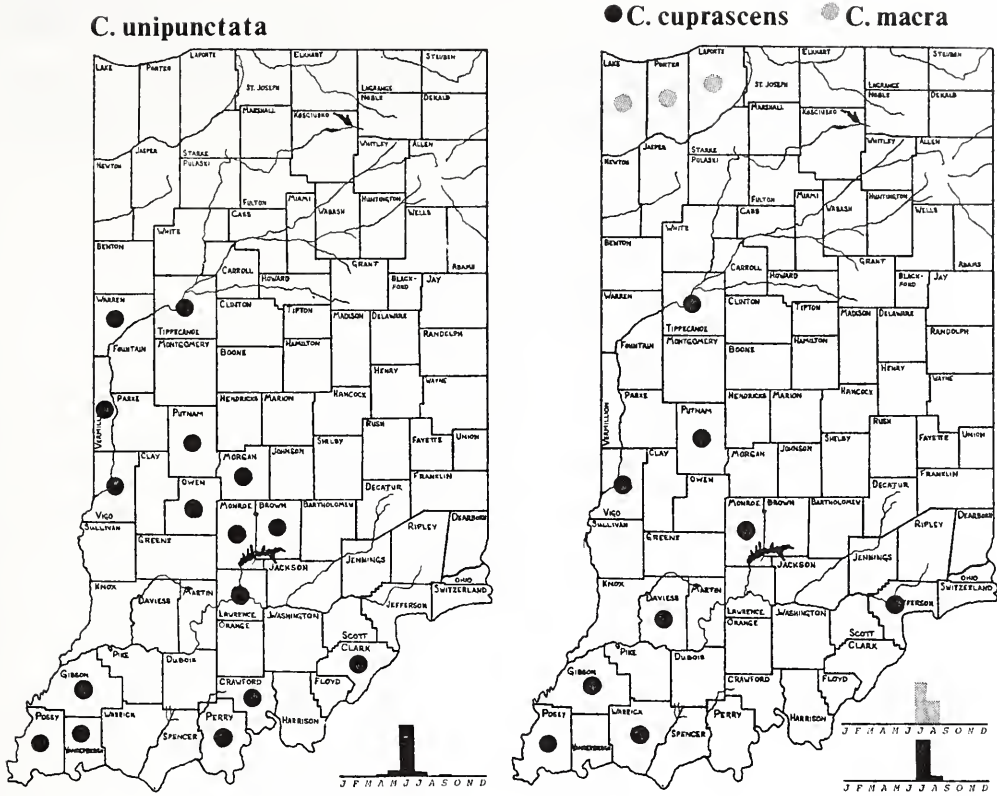


FIGURE 27. Distribution of *Cicindela unipunctata*, *C. cuprascens*, and *C. macra*.

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