

AN ABSTRACT OF THE THESIS OF

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Title: A TAXONOMIC REVIEW OF THE BEETLE GENUS
DICHELONYX HARRIS IN NORTH AMERICA (SCARABAEIDAE:
MELOLONTHINAE)

Signature redacted for privacy.

Abstract approved: _____
Dr. P. O. Ritcher

About 10,000 adult specimens, and several hundred larval specimens of Dichelonyx were examined in a review of the Nearctic genus. In adults, structures of the male aedeagal sac and of the female genitalia were found useful in characterizing the species and species groups of the genus. In the larvae, structures of the epipharynx, raster, and anal lobes were most useful in delimiting species and species groups.

Keys to the adult males based on genitalic and non-genitalic structures are provided. Keys to the known third stage larvae of Dichelonyx are presented. The key characters of each species are figured for adults and larvae.

Dichelonyx macclayi New Species from Illinois and Indiana is described. Dichelonyx kirbyi Brown is reduced to subspecific rank under D. canadensis (Horn). Three species are newly synonymized under D. backi (Kirby):

D. fulgida (LeConte), D. testaceipennis (Fall), and D. vandykei Saylor. Dichelonyx valida (LeConte) is treated as a polytypic species with four subspecies: D. valida valida (LeConte); D. valida lateralis (Fall) New Status, New Combination; D. valida sulcata (LeConte) New Status, New Combination; D. valida vicina (Fall) New Status, New Combination.

Larvae of the genus Dichelonyx are characterized and the third stage larvae of nine species are described:

D. albicollis (Burmeister), D. backi (Kirby),
D. decolorata (Fall), D. elongatula (Schönherr),
D. muscula (Fall), D. pusilla (LeConte), D. robusta (Fall),
D. truncata (LeConte), and D. valida vicina (Fall).

Phenetic and supposed phylogenetic relationships within Dichelonyx based on larval and adult characteristics are discussed.

A Taxonomic Review of the Beetle
Genus Dichelonyx Harris in North America
(Scarabaeidae: Melolonthinae)

by

James Fraser Cornell, Jr.

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A TAXONOMIC REVIEW OF THE BEETLE
GENUS DICHELONYX HARRIS IN NORTH AMERICA
(SCARABAEIDAE: MELOLONTHINAE)

PART I: SYSTEMATICS OF THE ADULTS
OF DICHELONYX HARRIS

INTRODUCTION

The exclusively Nearctic¹ melolonthine genus, Dichelonyx Harris, is composed of twenty species of colorful, medium-sized scarabs.

This review of the genus will be the sixth to treat it (LeConte, 1856; Horn, 1876; Fall, 1901; Saylor, 1945; Brown, 1946). The principal aim of the present study is to present an improved basis for identification of the species by means of keys, illustrations, uniform descriptions, and distributional data. Further it is hoped that these data will provide a basis for re-evaluating the relationships among and within the various species.

Although many of the Melolonthinae are economically important, the species of Dichelonyx are not normally considered important economic pests in either the adult or larval stages. Adults, however, have been reported defoliating conifers (Molnar, 1965) and shade trees (Becker, 1938).

¹I am following Saylor's (1945) removal of the South American species D. violaceipennis (Blanchard) from Dichelonyx.

The biology of Dichelonyx generally conforms to that of the Melolonthinae as described in Ritcher (1958). Adult Dichelonyx are primarily leaf-feeders (Sim, 1934; Becker, 1938). They occur on a wide range of plants from herbs and grasses to trees, but most commonly are found on either coniferous or deciduous trees. Adults have been observed in diurnal flight (Frost, 1946; personal observations). Many species are nocturnally active and are attracted to both white and ultra-violet lights.

The life cycle (egg to adult) as in many Melolonthinae takes from one to two years. The larvae are found in the soil beneath the plants upon which the adults occur. The larvae are rootfeeders as is typical of the subfamily. Although I was able to get females of D. backi and D. robusta to oviposit in the laboratory, I was not successful in rearing either species from egg to adult. Larvae collected in the field in the last instar would pupate and emerge as adults in the laboratory, but smaller larvae provided with various roots for food, did not grow, although they remained alive for as long as eighteen months.

In the course of the present review, about 10,000 specimens of adults were examined. During the summer of 1967, with the support of an N. S. F. grant to Dr. P. O.

Ritcher, the types of all species located in North American collections (excepting that of D. arizonica Barrett, which was not located) were examined and in some cases dissected. The types located outside North America were not seen.

Historical Review

T. W. Harris (1827) described the genus Dichelonyx. The genus was monobasic, founded on the previously described Melolontha linearis Gyllenhal, 1817. Harris (1835) was the first to consider Melolontha elongata Fabricius, 1792 (renamed M. elongatula Schönherr in 1817, as a secondary homonym of M. elongata Olivier, 1789) the senior synonym of M. linearis Gyllenhal. Harris (1835) included M. hexagona Germar, 1824 in Dichelonyx.

W. Kirby (1837) emended the genus name to Dichelonycha, changing the x to ch, and described three new species in Dichelonycha.

C. Blanchard (1850) described Dichelonycha violaceipennis from South America, and treated Melolontha elongatula Schön. as a synonym of Dichelonycha elongata (Fabr.).

H. C. C. Burmeister (1855) described Dichelonycha albicollis and treated Melolontha hexagona Germar, 1824,

as a synonym of Dichelonycha elongata (Fabr.) (=D. elongatula (Schön.)).

J. L. LeConte (1856) revised Dichelonycha, described eight new species, treated Dichelonycha virescens Kirby, 1837, as a synonym of Dichelonycha elongata (Fabr.), and presented a key to the two species groups. LeConte (1859) described Dichelonycha pallens from California in a reference that is usually cited incorrectly as LeConte, 1856.

George Horn (1876) revised Dichelonycha describing three new species, removing Dichelonycha rotundata LeConte, 1856, from Dichelonycha to his new genus Coenonycha, and presenting a key to the species of Dichelonycha. Horn (1894) described Dichelonycha picea from Lower California.

Henry Clinton Fall (1901) revised Dichelonycha, describing nine new species and presenting a key to the known species. Later (Fall, in Fall and Cockerell, 1907) he described two new species of Dichelonycha from New Mexico.

E. C. Van Dyke (1918) described Dichelonycha oregona from Oregon. Leng (1920) revived the correct genus name, Dichelonyx Harris, 1827, and placed all the described species under that name.

Ralph Hopping (1931) described two new species of Dichelonyx.

R. E. Barrett (1933) described a new species of Dichelonyx.

L. W. Saylor (1932) described Dichelonyx vandykei and later (1933) described Dichelonyx arizonensis. He (1939) considered D. deserta Hopping a synonym of D. vicina Fall, and reduced D. columbiana Hopping to a subspecies of D. vicina. Saylor (1945) revised Dichelonyx reducing several existing species to subspecies, but not describing any new species. He was the first² to mention that the structures of the internal sac of the male genitalia (1945, p. 141) "may possibly have some characters of use...there are one to several small chitinous pieces (on the sac) whose number and shape appears to be somewhat specific and but little variable." Saylor presented keys to the males and females of the known species and a short discussion of each species.

Brown (1946) reviewed the eastern North American species of Dichelonyx, described one new species (D. kirbyi), revived the previously synonymized name D. linearis (Gyllenhal), synonymized D. testacea (Kirby, 1837) with D. elongatula (Schön.), used D. elongatula

²The value of these structures was independently re-discovered in 1962, by Mr. Gene Carpenter, then a graduate student at Oregon State College. Further study of the internal sac structures by Dr. P. O. Ritcher and myself has revealed that they are highly diagnostic for species of Dichelonyx.

(Schön.) as the correct name for D. elongata (Fabr., 1792), and presented a key to the eastern species. He also (1946, p. 105) mentioned that the sac characters did not differ between Dichelonyx linearis and Dichelonyx elongatula.

V. S. L. Pate (1946) discussed the generic name problem, concluding that Dichelonyx Harris was correct, not Dichelonycha Kirby.

TECHNIQUES AND METHODS EMPLOYED

This review is essentially based on a study of the comparative anatomy of the sclerotized portions of the bodies of the included species.

Preparation of the Aedeagus

Structures of the aedeagus are most valuable for identifying species of Dichelonyx. These parts may be examined in living and preserved specimens, respectively, using the following methods. The live male beetle, venter uppermost, head to left, is firmly grasped between the thumb and forefinger of the left hand and placed under the dissecting microscope. Gently squeeze the abdomen behind the metacoxae in a caudad direction forcing extrusion of the aedeagus and internal sac. If one experiences difficulty in forcing the extrusion, a hooked insect pin can be used to open the pygidium and help to initiate aedeagal extrusion. After the sac is fully inflated, the beetle is dropped into K.A.A.D. or boiling water for a few minutes to harden the sac in the distended condition. The entire aedeagus may then be cut away from the body and stored in glycerine in a microvial as described below for preserved specimens.

Dried museum specimens are first relaxed in hot water, Barber's Fluid, Aerosol O. T.,³ or in a humidor. Using fine forceps or a hooked insect pin, open the pygidium and pull the genitalia out. It is usually necessary to cut through the membrane surrounding the genital and anal orifices before the aedeagus can be removed. The aedeagus and surrounding tissues are treated with cold 10% KOH until the structures of the sac are visible. Use of hot KOH is not recommended because, if one is not careful, the aedeagal sac sclerites may be distorted. The entire aedeagus is transferred from KOH to acid alcohol (10 drops of glacial acetic acid in two ounces of 95% ethanol) for one hour to neutralize the base. If this is not done the base may continue action for an indefinite period. Transfer the aedeagus to glycerine in a porcelain spotplate for dissection. The internal sac may be removed from the remainder of the aedeagus with fine dissecting knives. For routine identification this completes the necessary dissection. For detailed study, the internal sac may be slit along its ventral side, that opposite the sclerotized projections, and transferred to Hoyer's Mounting medium on

³ Available from the Sargent Chemical Co.

a microscope slide. No special techniques are employed; however, the preparation should be ringed (lourped) with fingernail polish, after drying at 50°C for 48 hours, to prevent deterioration of the hygroscopic mountant.

Following examination the aedeagus and associated structures are stored in glycerine in a 4 x 10 mm microvial stoppered with a neoprene stopper.⁴ The vial is placed on the pin beneath the specimen.

Figures

The figures of the male and female genitalia were made with a Bausch and Lomb microprojector. The parts were mounted on microscope slides in Hoyer's Medium as described above, projected at various magnifications, and traced on white paper. The projection figure was corrected and traced in India ink on tracing paper. The sac sclerites of some species of Dichelonyx are slightly twisted about their vertical axis, so the projected figure is a planar diagrammatic projection of the three-dimensional structure. Shape is the primary characteristic used below, and the magnification used is not indicated. The relative sizes of the figures (e.g. Fig. 59-73, D. backi) do not represent specific differences.

⁴Available from Arthropod Specialties Co., Sacramento, Calif.

The remaining figures of other parts of the beetle, including those of the entire genital capsule, were made with an ocular net reticule on a dissecting microscope.

Descriptions

All of the species were described in a uniform format, from series of many male specimens. Since the females of all species except D. pallens are very similar to the males and lack the diagnostic characters of the species, they are not separately described except for D. pallens and for noting sexually dimorphic characters (sensu Vaurie, 1958, p. 278) where important.

Measurement of the body length was made with an ocular micrometer on a dissecting microscope and is from the anterior edge of the clypeus to the posterior central edge of the elytra.

Synonymical references for each species include only primary nomenclatural references, or revisions. References including data on the biology, morphology, or life history of a species are included in the species discussion.

The present location of all types seen by the writer is indicated following the description. The autopsy symbol (!) indicates a specimen dissected by the writer.

Dissected parts were stored as indicated above. The probable location of types not seen is indicated where possible.

The geographical range of each species is summarized following the species discussion. For most species a distribution map is included among the figures. On the range maps a star symbol indicates a specimen from that state with no more exact locality data available. Detailed data from the labels on material examined is presented separately in the appendix (Appendix 1). To conserve space, yet present as much information as possible, the following procedure is used. The localities are given alphabetically by state or province and county. The date of capture of the earliest and latest specimen seen from each locality is given, followed in parentheses by the number of specimens from that locality, and by any additional information on hosts or how the specimens were collected.

CHARACTERS OF TAXONOMIC VALUE IN DICHELONYX

The following taxonomic characters were investigated and are employed below:

Clypeus: The shape of the clypeus (Figs. 90-96, 101-118) and the degree to which it is reflexed are useful in identifying D. truncata, D. robusta, and D. diluta. The anterior angles are either noticeably angular (e.g. D. truncata) or rounded (e.g. D. subvittata), while the anterior margin may be rounded (e.g. D. subvittata), or emarginate (e.g. D. robusta) in the various species.

Clypeo-frontal Suture: The clypeo-frontal suture (Fig. 101cfs) may be deeply impressed (e.g. D. diluta) or obsolete (e.g. D. elongatula). The suture of the females of D. albicollis and of D. decolorata is more deeply impressed than that of the respective males.

Antennae: Dichelonyx picea has eight segmented antennae, while all the other species have nine segmented antennae. In all species except D. clypeata and D. pallens the male antennal club is subequal in length to the funicle, whereas the female antennal club is distinctly shorter than the funicle. In D. pallens the female antennal club is not noticeably shorter than the funicle, and the male antennal club is noticeably longer

than the funicle. In both males and females of D. clypeata the antennal club is subequal in length to the funicle.

Maxillary Palpi: The shape of the terminal segment of the maxillary palpus is useful in recognizing some species. Dichelonyx robusta and D. pusilla have that segment almost cylindrically shaped, while other species sympatric with them have that segment apically expanded. Care must be used with this character since the asymmetrical terminal segment varies in appearance when viewed from different angles.

Pronotum: A median longitudinal sulcus may be present or absent (Fig. 86, 87) on the pronotum. Those species with a pronotal sulcus are referred to below as sulcate; without as nonsulcate. The outline of the pronotum as seen from above may be rounded (D. picea, Fig. 89), angulate (D. valida, Fig. 86), or subangulate (D. elongatula, Fig. 88). The pronotum of some D. backi individuals and of most of the eastern species is sinuate in front of the hind angles (Fig. 88). The relationship of the anterior angles to the eyes, and the presence of plumose setae on the angles are generic characters.

Elytra: The larger sulcate species (e.g. D. albicollis) have weakly subcostate elytra, the remaining

species lack elytral costae. Dichelonyx pusilla and D. albicollis have longitudinal bands formed of rows of white setae on the elytra, the bands being separated by glabrous areas of about the same width. The other species lack such distinct bands. There are darker elytral vittae in D. picea, D. subvittata, and D. decolorata, the remaining species having unicolored elytra, frequently with lighter colored lateral margins.

Metathoracic Wings: The metathoracic wings of all the species of Dichelonyx have very similar venation (Fig. 98-100). The wing venation of D. macclayi was not examined. The figured wings are representative of the three species groups in Dichelonyx.

Legs: The metatibial spurs of the females are subequal in length and apically pointed. Male Dichelonyx of some species (e.g. D. albicollis, D. decolorata, D. subvittata, D. valida) have modified metatibial spurs (Fig. 8-22) that are unequal to subequal in length, and may be twisted or spatulate. The apex of the spur may be rounded, truncate, or, rarely, bifid. Males of the remaining species have metatibial spurs similar to those of the females.

Abdomen: The abdomen of most male specimens of Dichelonyx is convex when viewed laterally; that of the females, convex.

Male Genitalia: The male genitalia of Dichelonyx are composed of four basic structures; the basal apodeme, parameres, internal sac, and the genital segment (Davidson, 1970; Tuxen, 1956). The genital capsule is of the typical scarabaeoid type (Butt, 1944; Jeannel, 1955; Jeannel and Paulian, 1944; Lindroth, 1957; Sharp and Muir, 1912; Tuxen, 1956).

The basal apodeme (bp) (N. B. letters refer to Fig. 1-2) is a rectangular sclerite, in dorsal view, articulating at its apicolateral angles with the connate bases of the parameres (pm), an area referred to usually as the basal piece. An opening is formed between the sinuate inner margins of the parameres through which the internal sac (is) is everted during copulation (Fig. 1, 3-5). The membranous internal sac is attached to the opening between the parameres, and in repose is retracted within the basal apodeme (Fig. 2). A second membrane (M₁) attached to the parameres and the basal apodeme encloses the retracted internal sac as well as two long narrow apodemes (ap) (or struts, Holloway, 1960) and a small horseshoe-shaped sclerite (Vaurie, 1958). On the surface of the extruded internal sac are numerous projections (or scales, Holloway, 1960) and, in most species, from one to three distinctively shaped sclerotized pieces. In the species descriptions these sac sclerites are numbered

from one to three proceeding from the proximal to the distal end of the sac in its everted position (Fig. 1). The order is reversed and the sac sclerites are found inside the sac when it is retracted (Fig. 2). In D. pusilla the internal sac has no sclerites, but has an irregularly shaped, linear sclerotized area near the apex of the sac (Fig. 83). In D. diluta and D. truncata there are in addition to prominent sclerotized pieces, discrete patches of darkly pigmented setae (Fig. 48, 85). The entire apex of the sac is covered with small, stout setae in D. picea (Fig. 58). The remaining species lack pronounced setae on the internal sac, except for D. fuscula in which their position and presence or absence is variable and not so useful in characterizing the species. The shape of the everted sac (Fig. 1-5) may be of taxonomic value since it varies from almost tubular in D. pusilla to apically expanded in most other species. Since the material available with everted sacs was prepared by forcing live specimens to evert the sac, one cannot be certain the shape differences are not artifacts and I have not used this characteristic in the descriptions.

Ventrad of the internal sac is the genital segment, composed of the ninth abdominal pleurites (Davidson, 1970). The genital segment is a V-or Y-shaped sclerite

(Jeannel, 1955) that does not vary significantly between the species of Dichelonyx examined.

Female Genitalia: There are either one or two sclerites present on each side of the vaginal opening. These represent the coxite in Tanner's terminology (1927). In the species descriptions, if two sclerites are present they are referred to as the dorsal and ventral sclerites of the coxite (D. backi, Fig. 30). If there is only one sclerite present it is referred to as the coxite (D. albicollis, Fig. 38). The coxite composed of two separate sclerites is typical of the non-sulcate species of Dichelonyx and of those species of Coenonycha examined; the coxite composed of a single sclerite, apparently from fusion of the two parts seen in e.g. D. backi, is typical of the species of the sulcate group in Dichelonyx.

DESCRIPTION OF GENUS DICHELONYX

Dichelonyx Harris, 1827

Dichelonyx Harris, 1827 p. 7 footnote; Leng, 1920 p. 257;
Saylor, 1945 p. 137-141; Brown, 1946 p. 105-106;
Pate, 1946 p. 68. Type species, Melolontha linearis
Gyllenhal, 1817 by monotypy.

Dichelonycha Kirby, 1837 p. 133 (unjustified emendation);
LeConte, 1856 p. 278; Horn, 1876 p. 185-186; Fall,
1901 p. 277-280.

Description:

The genus Dichelonyx is composed of melolonthine scarabs of the tribe Macrodactyliini with the following characters:

Head. Behind eyes about two-thirds width of widest part of pronotum: clypeus about one-half width of widest part of pronotum; anterior angles rounded to rectangular, anterior margin straight to curved or emarginate; weakly to strongly reflexed; surface punctate, covered with short setae: clypeo- frontal suture obsolete to deeply impressed, sinuate: antennae with eight (D. picea) or nine (other species) segments; proportion of club to funicle different between sexes as described elsewhere: eyes coarsely faceted, in many species patterned with

irregular splotches of black; moderate in size; separated from anterior angles of pronotum by about one-half to one-third their diameter (except D. picea); setae on anterior angles of pronotum seldom reaching to eyes. (For figures of head capsule see also Stickney, 1923, figs. 113, 261, 406, 550 of D. elongatula).

Thorax. Pronotum widest at about middle, disc with or without median longitudinal sulcus (Figs. 86-89); angulate or subangulate to rounded on anterior, mid-lateral, and posterior angles (Figs. 86-89); narrowly margined laterally and posteriorly (Fig. 87); anterior subapical line variable in width and degree of impression (Fig. 88sas), deeply impressed in D. nana, D. fuscula, some individuals of D. valida and D. subvittata, absent in D. picea; margins of pronotum clothed with appressed, white, plumose setae: elytra variable in color, frequently metallic colors; not costate in most species, weakly subcostate anteriorly in D. albicollis and some D. valida individuals; rugose to rugulose; covered irregularly with short, decumbent, posteriorly directed setae; marked with broad longitudinal white stripes formed by rows of setae in D. pusilla and D. albicollis; marked with distinct darker patterns in D. picea, D. subvittata, and D. decolorata, remaining species not so marked; margins set with a series of longer, erect, white setae,

more numerous toward elytral angles: metathoracic wings well developed in all species; venation similar in all species (Fig. 98-100): Legs with protarsi subequal in length to protibiae; tarsal claws of each leg chelate; pro- and mesotarsal claws always bifid near apex, metatarsal claws bifid near apex except in some *D. albicollis* and *D. valida* populations; metatibial spurs equal to subequal or unequal in length; in females apically acute; in males apically acute, rounded, truncate, or spatulate (as discussed elsewhere).

Abdomen. With six visible sternites, the first not more than two-thirds concealed by metacoxae: aedeagus of typical scarabaeoid type, the parameres and basal piece relatively similar throughout genus; internal sac bearing various numbers and types of sclerites, spines, setae, and projections that are highly species-specific: female genitalia externally consisting of a divided or undivided setiferous coxite on each side of the vaginal opening; an irregularly shaped sclerotized area present internally in the spermatheca of some species.

Discussion

Dichelonyx is very closely related structurally to Coenonycha, in fact it is difficult to find adequate differences beyond color and habitus to separate the two

genera. The remaining genera of Macroductyliini of North America (Ceraspis, Gymnopyge, Isonychus, Macroductylus) are easily separated from Coenonycha and Dichelonyx using characters of the metatarsi, posterior elytral margin, and elytral setal patterns. Davidson (1970) has indicated an important difference between Dichelonyx and Coenonycha in that the former has bare parameres, the latter subapically setose parameres. The genera Coenonycha, Dichelonyx, Gymnopyge, and probably Ceraspis, form a coherent group using characters such as chelate claws, large prominent eyes, and similar genitalia. In addition, Ritcher (1960a) showed that the first three genera mentioned have the last abdominal spiracle in the fifth visible abdominal sternite, and the fifth visible sternite is not fused with the propygidium. Further discussion of the interrelationships among these genera using larval characteristics is in the final section of this paper entitled "Phylogeny."

In both Dichelonyx and Coenonycha the tarsal claws are chelate, not respectively chelate and non-chelate as indicated in the keys to the genera of Macroductyliini in Bradley (1930) and Arnett (1963). Adults of Coenonycha and Dichelonyx are compared further in Table 1. One of the more interesting distinctions between the two genera is that species of Dichelonyx are densely covered beneath

and on the margins of the elytra with plumose, white setae, while the species of Coenonycha examined lacked plumose setae entirely, or had them confined to the scutellum (Table 1, #5).

Although D. picea is very different from the remaining species of Dichelonyx when one examines the male and female genitalia; the wing venation, and characters of the abdominal and mesothoracic spiracles suggest that it should be retained in the genus as a distinctive species.

Table 1. Dichelonyx and Coenonycha adults compared.⁵

<u>Coenonycha</u>	<u>Dichelonyx</u>
1. Anterior angles of pronotum extending beyond posterior margins of eyes.	Anterior angles of pronotum not reaching posterior margins of eyes (except in <u>D. picea</u>).
2. Eyes large, prominent, frequently solid in color.	Eyes not so large, not prominent, frequently patterned with black splotches.
3. Setae on anterior angles of pronotum extending over less than 1/2 diameter of eyes.	Setae on anterior angles of pronotum not extending over more than 1/2 diameter of eyes.
4. Anterior tarsi distinctly longer than protibiae.	Anterior tarsi subequal in length to protibiae.
5. Plumose white setae not present (in species examined) on pronotal margins or venter of body.	Plumose, white setae present on pronotal margins and on venter of body in all species.
6. Clypeus truncate in all species examined.	Clypeus rounded to subangulate, truncate only in <u>D. pusilla</u> and <u>D. truncata</u> .
7. Abdominal sternite I almost completely concealed by metacoxae.	Abdominal sternite I seldom or never more than 2/3 concealed by metacoxae.
8. Metathoracic wings reduced in some species.	Metathoracic wings not reduced in any species.
9. Elytra usually testaceous to brown, never metallic colored.	Elytra usually metallic colored, brown to testaceous in some species.

Table 1. (Continued)

Coenonycha

- | | | |
|-----|--|--|
| 10. | Habitus outline usually rounded at elytral humeri, and posterior elytral margin. | Habitus outline usually rather angular at elytral humeri and posterior elytral margin. |
| 11. | Parameres with subapical setae | Parameres without subapical setae. |

⁵Comparisons based on available material of Coenonycha (about 4 species), and on all species of Dichelonyx.

SPECIES GROUPS IN DICHELONYX

The species of Dichelonyx form three distinct groups.

Group I (The Picea Group)

Adult: Antennae eight-segmented; pronotum without median sulcus; male genital sac with many small, stout setae, without distinct sclerites; female genitalia on each side with an undivided, deeply emarginate coxite.

Larva: Unknown.

Included Species: Dichelonyx picea (Horn)

Group II (The Sulcate Group)

Adult: Antennae nine-segmented; pronotum with a median longitudinal sulcus (except rare individuals of D. clypeata); male genital sac with one to three distinct sclerites, or (D. pusilla) an irregular straplike sclerotized area; female genitalia on each side with an undivided coxite.

Larva: Anal lobes setose; raster with stout, sparsely set long, conical setae laterad of each dense triangular patch of short, conical setae.

Included Species: D. albicollis (Burmeister), D. clypeata (Horn), D. decolorata (Fall), D. pusilla (LeConte), D. valida (LeConte).

Group III (The Non-sulcate Group)

Adult: Antennae nine-segmented; pronotum without median longitudinal sulcus; male genital sac with from one to three distinct sclerites, sometimes with discrete patches of stout setae; female genitalia on each side with an undivided (D. truncata) or divided (remaining species) coxite.

Larva: Anal lobes bare; raster with or without stout, sparsely set setae laterad of each dense, triangular patch of short, conical setae.

Included Species: D. backi (Kirby), D. canadensis (Horn), D. diluta (Fall), D. elongatula (Schönherr), D. fuscula (LeConte), D. macclayi n.sp., D. muscula (Fall), D. nana (Fall), D. pallens (LeConte), D. robusta (Fall), D. subvittata (LeConte), D. truncata (LeConte), D. vaga (Fall).

These species groups are generally coherent.

Dichelonyx clypeata and D. pusilla have unusual male sac sclerites for the sulcate group, and D. pusilla is further distinct from the remaining sulcate species in its unique female coxite (Fig. 37) which seems almost annectant between the single sclerite coxite of, for example, D. albicollis, and the distinctly divided coxite of D. elongatula. D. clypeata on the other hand has the typical coxite found in females of the sulcate group (Fig. 39).

The larva of D. pusilla places it definitely in the sulcate group, with setose anal lobes. The larva of D. clypeata is unknown.

Dichelonyx truncata of the non-sulcate group exhibits some characteristics of the sulcate group. The coxite in the female is undivided, and the pronotum of some specimens bears a lighter colored streak where the sulcus would be. Again, however, the larva places this species definitely in the non-sulcate group. Further the male genital sac sclerite is no more unusual for the non-sulcate group than that of D. robusta (Fig. 5).

KEY TO ADULT MALE DICHELONYX USING MAINLY
STRUCTURES OF THE GENITALIC SAC

- 1 Pronotum with median longitudinal sulcus
(Fig. 86).....18
- Pronotum without median longitudinal sulcus
(Fig. 87)..... 2
- 2(1) Antennae eight segmented, aedeagal sac⁶ without
distinct sclerites, distally covered with small,
spine-like setae (Fig. 58)
(Baja, Calif.).....picea (Horn)
- Antennae nine segmented; sac with distinct
sclerites, may also have patches of small,
spine-like setae..... 3
- 3(2) Sac with one sclerite, with or without small,
discrete setose patch (Fig. 85)..... 4
- Sac with two or three sclerites, without small,
discrete patch of setae..... 11
- 4(3) Sac with one strap-like sclerite, not bifurcate
basally, with a small spinose knob on distal end,
without small discrete setal patch below knob
(Fig. 47).....robusta (Fall)
- Not as above..... 5

⁶Referred to hereafter as sac, and sac sclerite
or sclerite for brevity; sclerites numbered as discussed
above.

- 5(4) Sac with one strap-like, basally bifurcate sclerite, with a distal protruding spinose knob, a discrete small setose patch below knob (Fig. 85).....truncata (LeC.)
Not as above..... 6
- 6(5) Sac sclerite small, spine-like, not hooked (Fig. 84), (Central W. Calif.)....clypeata (Horn)
Sac sclerite larger, hook-like..... 7
- 7(6) Sac sclerite without subapical teeth..... 8
Sac sclerite with one or two subapical teeth (Fig. 48) (E. North America, E. of 105th parallel)..... 9
- 8(7) Sac sclerite without subapical tooth, (E. of 105th parallel in North America).....
.....fuscula (LeC.)(in part)
Sac sclerite without subapical tooth (Fig. 53), (W. of 105th parallel).....10
- 9(7) Sac sclerite strongly curved on convex margin, with one or two small, subapical teeth on inner concave margin, sac with distinct patch of longer stout setae (Fig. 49) (E. North America).....
.....diluta (Fall)
Sac sclerite weakly curved on convex margin, with only one small subapical tooth on inner concave margin, with or without distinct patches of longer,

- stout setae (Fig. 51)(Eastern North America)..
- fuscula (LeC.)(in part)
- 10(8) Sac sclerite apically bent, base flared (Fig. 53)
(Los Angeles and San Diego Cos., Calif.....
.....pallens (LeC.)
- 11(3) Sac with three sclerites (Fig. 57) (Indiana and
Illinois).....macclayi n.sp.
Sac with only two sclerites..... 12
- 12(11) Sac sclerite #1 with one or two subapical
teeth..... 13
Sac sclerite #1 without subapical tooth..... 14
- 13(12) Sac sclerite #1 broad, cross section at about
middle, oval, not twisted about vertical axis,
sclerite #2 short, conical (Fig. 54) (California)
.....muscula (Fall)
Sac sclerite #1 not so broad, cross section at
about middle nearly circular, twisted somewhat
about vertical axis, sclerite #2 very variable,
with from one to many short, curved teeth that may
be basally fused (Fig. 59-73).....
.....backi (Kirby)(in part)
- 14(12) Sac sclerite #2 consisting of one to several short,
curved teeth, that may be basally fused (Fig.59-73)
.....backi (Kirby)(in part)
Not as above..... 15

- 15(14) Sac sclerite #1 spine-like, (if somewhat hook-like, then broad throughout length, with inner curvature smooth, apex rounded) (Fig. 46,52)... 16
 Sac sclerite #1 hook-like, narrow throughout length, with inner concave margin uneven, apex acute (Fig. 45)..... 17
- 16(15) Sac sclerite #1 inclined at acute angle to base, apex usually expanded, blunt, sclerite #2 variable in inclination, may parallel #1 or be vertical (Fig. 46) (E. North America).....
subvittata (LeC.)
 Sac sclerite #1 broadly hook-like, inner concave margin uneven, apex rounded; elytra metallic green to brownish (Fig. 52).....canadensis (Horn)⁷
- 17(15) Sac sclerite #1 broad, base flared, sclerite #2 a sub-erect spine, variable in height (Fig. 55) (California).....vaga (Fall)
 Sac sclerite #1 rather narrow, sclerite #2 a short, conical mound with one to several apical teeth, mound always noticeably shorter than first sclerite (Fig. 43-45) (E. North America).....
elongatula (Schön.)

⁷ Rarely D. canadensis males lack the smaller sclerite, but the larger sclerite is similar to the one figured (Fig. 52), see also species discussion below.

- 18(1) Sac with a simple strap-like sclerite, of variable shape, fused into distal portion (Fig. 83)
 (California).....pusilla (LeC.)
 Not as above..... 19
- 19(18) Sac sclerite small, spine-like, not hooked
 (Fig. 84) (California).....clypeata (Horn)
 Sac with three sclerites..... 20
- 20(19) Sac sclerite #1 hook-like, broadly apically rounded, sclerite #2 elongate, strap-like, rarely spatulate at broader end, sclerite #3 a semilunar mound apically covered with close packed lamellar structures (Fig. 79-80) (California).....
decolorata (Fall)
 Sac sclerite #1 not as above, sclerite #2 distinctly spatulate at larger end, sclerite #3 as above (Fig. 74-77).....21
- 21(20) Sac sclerite #1 beak-like in outline; outer metatibial spur truncate, twisted; elytra with longitudinal bands of white setae separated by narrow glabrous bands (Fig. 77) (Eastern North America).....albicollis (Burm.)
 Sac sclerite #1 more spine-like in outline; metatibial spurs variable, never so strongly twisted as above; elytra not distinctively marked as above (Fig. 74-76, 78)(Western North America).....
 valida (LeC.)

KEY TO ADULT MALE DICHELONYX USING
NON-GENITALIC CHARACTERS

- 1 Antennae eight segmented (Lower California).....
 picea (Horn)
 Antennae nine segmented..... 2
- 2(1) Pronotum with median sulcus (Fig. 86)..... 3
 Pronotum without median sulcus (Fig. 87)..... 7
- 3(2) Elytra with longitudinal bands of white setae
 forming stripes, stripes separated by glabrous
 areas (Eastern North America)..... 4
 Elytra not as above (Western North America only)
 5
- 4(3) Small brownish species with simple, acute, meta-
 tibial spurs (Western United States).....
 pusilla (LeC.)
 Large greenish species with twisted, truncate,
 metatibial spurs (Fig. 9) (Eastern North
 America).....albicollis (Burm.)
- 5(3) Sides of clypeus strongly convergent toward base
 (Fig. 109), elytra dark brown to black (Calif.)
 clypeata (Horn)
 Not as above..... 6
- 6(5) Metatibiae with one moveable spur, one fixed spine;
 elytra brown, translucent, with lateral black "J"
 shaped vittae; clypeus in front of clypeo-frontal

- suture short (Fig. 14, 107).....decolorata (Fall)
 Metatibiae with two moveable spurs; elytra not
 translucent, color brown, gray, or green; without
 "J" shaped black vittae; clypeus in front of
 clypeo-frontal suture long (Fig. 8, 10-13,
 102-105).....valida (LeC.)
- 7(2) Occurring east of 105th parallel..... 8
 Occurring west of 105th parallel..... 15
- 8(7) Clypeus truncate (Fig. 96); small brownish to gray
 species.....truncata (LeC.)
 Clypeus not as above..... 9
- 9(8) Clypeus anteriorly rounded, rather narrow, strongly
 reflexed; elytra green or brownish, metatibial
 spur apically subacute to rounded.....10
 Clypeus and metatibial spurs not as above.....11
- 10(9) Elytra green, metatibial spurs apically rounded
 (mostly east of Minn.).....
 canadensis canadensis (Horn)
 Elytra brownish; metatibial spurs apically sub-
 acute, (mostly west of Minn.).....
 canadensis kirbyi (Brown)
- 11(9) Clypeus broadly rounded, not strongly reflexed
 (Fig. 110), elytra with darker sublateral vittae,
 elytra green to brownish, metatibial spurs apically
 rounded.....subvittata (LeC.)
 Not as above..... 12

- 12(11) Metatibial spurs apically acute (Fig. 20); body
beneath usually rufous; elytra green to brownish
.....elongatula (Schön.)
Metatibial spurs apically acute; body beneath
black; elytra dark green.....backi (Kirby)
Characters not as above..... 13
- 13(12) Outer metatibial spur usually spatulate (Fig. 18);
clypeus strongly reflexed, rounded (Fig. 112);
elytral color variable, green, bronze, violet...
.....diluta (Fall)
Not as above..... 14
- 14(13) Dark brown species; outer metatibial spur apically
rounded, not angulate on inner margin (Fig. 21)...
.....fuscula (LeC.)
Dark brown species; outer metatibial spur apically
acute, angulate on inner margin (Illinois and
Indiana), (Fig. 22).....marclayi n.sp.
- 15(7) Clypeus with sides convergent toward base (Fig. 109)
dark brown to black species (Calif.).....
.....clypeata (Horn)
Not as above.....16
- 16(15) Clypeus truncate, strongly reflexed (Fig. 96);
brown to grey species.....truncata (LeC.)
Not as above..... 17

- 17(16) Clypeus emarginate (Fig. 118); elytra dark green, densely covered with white pubescence; pronotum subrounded; terminal segment of maxillary palpus sub-cylindrical.....robusta (Fall)
Not as above..... 18
- 18(17) Clypeus subquadrate to rounded (Fig. 95), not strongly reflexed, elytra dark brown to brown with green reflections.....muscula (Fall)
Not as above..... 19
- 19(18) Short brownish species with antennal club much longer than funicle; pronotum rounded.....
.....pallens (LeC.)
Not as above.....20⁸
- 20(19) More elongate, usually greenish species; legs rufous to yellowish; scutellum always dark, even in light colored individuals.....vaga (Fall)
Not as above..... 21
- 21(20) Small green to violaceous species; clypeus subquadrate; strongly reflexed; legs rufous to black (Los Angeles and San Diego Co., Calif. only).....
.....nana (Fall)

⁸The key should work reasonably well to this couplet, but the remaining three species are extremely difficult to separate on external characters, and may require dissection for definite determination.

Small to large, variably colored species; clypeus weakly to strongly reflexed, rounded to subquadrate, sometimes emarginate; legs usually black

(Western North America).....backi (Kirby)

SYSTEMATIC DESCRIPTIONS OF DICHELONYX SPECIESDichelonyx albicollis (Burmeister)

Dichelonycha albicollis Burmeister, 1855 p. 74;
LeConte, 1856 p. 281; Horn, 1876 p. 190; Fall, 1901 p. 258.

Dichelonyx albicollis (Burm.) Leng, 1920 p. 258;
Saylor, 1945 p. 156; Brown, 1946 p. 108.

Description:

Male, length 10.0-12.3 mm.; female, length, 10.5-13.0 mm. Head and body piceous to rufous, elytra testaceous tinged with shining green to shining green with testaceous elytral margins, each elytron with several longitudinal white stripes formed of rows of white setae separated by about equally wide glabrous areas, coinciding anteriorly with weakly marked costae.

Head: clypeus (Fig. 101) rufous to piceous, not strongly reflexed, anterior angles rounded, anterior margin straight, surface coarsely, sparsely punctate, clothed with decumbent, white, posteriorly-directed setae; clypeo-frontal suture not deeply impressed in male, more deeply impressed in female; antennae piceous, nine segmented; maxillary palpi piceous, terminal segment of each apically broader, broadly rounded on inner apical margin.

Thorax: pronotum with median sulcus, anterior subapical line narrow, not deeply impressed; elytra colored and patterned as above; legs piceous, often distally darker, clothed with erect setae; metatibial spurs (Fig. 9) subequal in length, strongly sexually dimorphic, in male outer spur much wider than inner, twisted, broadly apically truncate, inner spur narrow, apically subacute, in female both subequal in length, apically acute.

Genitalia: Male; internal sac of aedeagus with three sclerites (Fig. 77), #1 a small, beaklike, recurved spine, #2 large, spatulate, enlarged at either end, with a subapical, lateral, tooth-like projection on inner margin of larger, free end, #3 a semilunar plate apically covered with a dense mat of flattened, often hamate, seta-like projections. Female; genitalia externally consisting on either side of an undivided coxite (Fig. 38), internally a sub-trapezoidal plate present on the spermatheca.

Type:

Holotype female, present location⁹ unknown to writer.
Type locality (Burmeister, 1855 p. 74-75 "Eben daher,

⁹ Germar's collection was said to be (Horn and Kahle, 1935 p. 89) in the "Zool. Mus. Berlin."

herrn Germar's Sammlung....Die Arten sind in Nord-America zu Hause."

Discussion:

The eastern range, characteristic elytral vestiture in both sexes, and the broadly twisted, truncate outer metatibial spur of the males make this species easy to recognize.

The male genital sac sclerites are similar to the D. valida group, except that #1 is more beak-like in D. albicollis and more spine-like in D. valida.

A habitus figure of D. albicollis is given in Dillon and Dillon (1960, p. 527, pl. 51, fig. 13).

General Distribution:

Dichelonyx albicollis is known from North Carolina northward to New Brunswick, Canada, and westward to Minnesota (Fig. 130).

Specimens examined: 81

Dichelonyx backi (Kirby)

Dichelonycha backi Kirby, 1837 p. 134; LeConte, 1856

p. 280; Horn, 1876 p. 189; Fall, 1901 p. 284.

Dichelonyx backi (Kirby) Leng, 1920 p. 258; Saylor, 1945

p. 145; Brown, 1946 p. 108.

Dichelonycha fulgida LeConte, 1856 p. 280; Horn, 1876

p. 190; Fall, 1901 p. 285. NEW SYNONYMY

Dichelonyx fulgida (LeC.) Leng, 1920 p. 258; Saylor,

1945 p. 151.

Dichelonycha crotchii Horn, 1876 p. 189; Fall, 1901 p. 285

Dichelonyx crotchii (Horn) Leng, 1920 p. 258.

Dichelonyx fulgida crotchii (Horn) Saylor, 1945 p. 152.

Dichelonycha testaceipennis Fall, 1907 p. 249. NEW

SYNONYMY

Dichelonyx testaceipennis (Fall) Leng, 1920 p. 258;

Saylor, 1945 p. 149

Dichelonycha mormona Fall, 1907 p. 249.

Dichelonyx mormona (Fall) Leng, 1920 p. 258.

Dichelonyx fulgida mormona (Fall) Saylor, 1945 p. 153.

Dichelonycha oregona Van Dyke, 1918 p. 11-12.

Dichelonyx oregona (Van Dyke) Leng, 1920 p. 258.

Dichelonyx fulgida oregona (Van Dyke) Saylor, 1945 p. 153

Dichelonyx vandykei Saylor, 1932 p. 282; 1945 p. 153.

NEW SYNONYMY

Dichelonyx arizonica Barrett, 1933 p. 132.

Dichelonyx backi arizonica Barrett, Saylor, 1945 p. 149.

Description:

Male, length 6.5-10.4 mm; female, length 8.0-12.2 mm. Head and body black to rufous or testaceous, elytra various colors, typically metallic-green, varying from metallic-blue to bronze, purple, gray, or blackish, legs black to rufous or testaceous.

Head: clypeus (Fig. 90-92) highly variable in shape and reflexion, weakly to strongly reflexed, anterior angles rounded to angulate, anterior margin rounded, straight, or emarginate, surface usually coarsely, densely punctate, clothed with short, decumbent, posteriorly-directed setae; clypeo-frontal suture not usually deeply impressed; antennae rufous to piceous, nine segmented; maxillary palpi rufous to piceous, terminal segment of each usually short, apically truncate, expanded just beyond middle.

Thorax: pronotum without median sulcus, anterior subapical line not deeply impressed, usually narrow; elytra colored as above, sparsely to densely clothed with decumbent, posteriorly-directed setae, setae not arranged in distinct rows or patterns; legs colored as above,

clothed with long, erect setae; metatibial spurs not markedly sexually dimorphic, unequal in length, apically acute.

Genitalia: Male; internal sac of aedeagus with two sclerites, #1 large, hook-like, (Fig. 59-73) slightly twisted about vertical axis, with or without a subapical tooth on inner concave margin, (tooth position variable), #2 a row of from one to about twelve short, tooth-like spines, variable in size, number, and degree of fusion at base, rarely all separate. Female; genitalia externally consisting on either side of a divided coxite (Fig. 30).

Types:

(D. backi Kirby, 1837) Present location of type unknown to writer. Horn and Kahle (1935-1937 p. 134) give the location of Kirby's collection as "British Museum, N. H."

(Dichelonycha fulgida LeConte) Holotype female; LeConte collection, MCZ; labels, (1) blue circle, (2) Suckley, (3) MCZ type #3215. LeConte (1856) gives type locality as Steilacoom, Washington Territory.

(Dichelonycha crotchii Horn) Holotype male; Horn Collection, ANSP; !; labels (1) Cala., (2) ANSP Type #3656.. Type locality (Horn, 1876) High Sierras of Calif.

(Dichelonycha testaceipennis Fall) Lectotype male by present designation; Fall Collection, MCZ; labels, (1) Cloudcroft, N. M., 9000', W. Knaus, (2) MCZ type #24869.

(Dichelonycha mormona Fall) Holotype male; Fall Collection, MCZ; labels, (1) Stockton, Utah, (2) 6-16-03, (3) MCZ type #24865.

(Dichelonycha oregona Van Dyke) Holotype male; Van Dyke Collection, CAS; !; labels (1) Kirby, Josephine Co., Ore., (2) VI-11-1910, F. W. Nunemacher, (3) CAS type #3216. (Allotype female, same data except type #3217.)

(Dichelonyx vandykei Saylor) Holotype male; Saylor Collection, CAS; !; labels (1) Yosemite Valley, Calif., V-17-1921, (2) Quercus chrysolepis, (3) CAS type #3662. (Female allotype; same as above except: labels (1) Mirror Lake, California, 4096', 5-20-31, (2) Quercus chrysolepis, (3) CAS type #3663).

(Dichelonyx arizonica Barrett) Holotype male; White Mtns., Arizona, June. Present location of type or Barrett collection unknown to writer.

Discussion:

Dichelonyx backi, the most widely distributed species in the genus, is also the most difficult species to identify using external characteristics alone. The

second key (above) should, together with range data, suffice in most cases for determination, however, in some instances this species cannot be identified certainly without dissection.

The characters of the male genital sac given in the first key (above) will serve to identify this species in all cases even though the sclerites are quite variable in shape as indicated in the figures.

Dichelonyx backi adults have been collected at both ultra violet and white lights. They are recorded from many plants including: Populus tremuloides, Psuedotsuga mucronata, P. menzissiei (sic), Psyocomp opilfolus (sic), Rumex acetosa, Noble Fir, Douglas Fir, Cherry Apple, and Ponderosa pine. The larva has been collected under grasses, Noble Fir, Douglas Fir, and Ponderosa Pine in Oregon. The larva is described in Ritcher (1966 p. 80).

The male genital sac sclerites, although variable, serve adequately to delimit the species. In figures 59 to 73 I have illustrated some of the forms of genital sclerites seen. The sclerites in most D. backi individuals resemble Figures 59 and 62; the remaining figures show less commonly encountered sclerite types. Sclerite #1 is least variable, always being present as a large recurved, hook-like sclerite with the subapical tooth varying in being present or absent, or double, or placed

nearer the base of the sclerite. Sclerite #2 is quite variable in the number of teeth present, their size, and the degree to which they are fused together into a comb-like structure at their bases. Rarely there are only one or two very small tooth-like projections remaining on the sac, making recognition of sclerite #2 more difficult. Specimens from populations from Oregon, California, and Montana have been observed to have #2 reduced to very small, isolated teeth. Even very distinctive sclerite types such as Fig. 65 are found randomly in various populations (in this case, Oregon and British Columbia).

The color and external characters of D. backi are also highly variable. This fact combined with a tendency in D. backi to form well defined geographical isolates has, in the past, led to the description of many species. I am here treating these species as synonyms of D. backi. Many of the previously described species were recognized, even then, as poorly delimited. For example Fall (1907 p. 248-249) says of D. testaceipennis (perhaps the most strikingly different population involved in the synonymy above) "...forms closely related to backii and fulgida ...differ so constantly in color...that distinctive names are desirable, even though they ultimately prove to be

merely subspecies....Form, structure and sculpture virtually identical with backii."

Some of the populations may eventually be raised to subspecific status as endemic "island-like" subspecies (Mayr, 1964 p. 111.). Two examples of such endemic forms are the Cloudcroft, New Mexico population, (described as D. testaceipennis) and the Yosemite Valley, California population (described as D. vandykei). However, it seems best to treat these now as simply distinctive populations until a very thorough treatment of these and several other equally distinctive populations, that are less well defined by color characters, can be made.

Figures 63 and 70 illustrate the sac sclerites of two of six individuals that I am now somewhat doubtfully associating with D. backi. These specimens--labeled and deposited as follows: Calif., Mono Co., Crooked Cr., White Mts., 9500', VII-5-1961, W. A. Foster (UCB); Calif., Inyo Co., Whitney Portal, VI-28-1962, J. S. Puckett (UCD)--represent two populations that are rather similar in being smaller and more grey than most D. backi individuals. However, I hesitate formally to recognize these at this time, considering the paucity of material as well as the great variability already found within the limits of D. backi as I understand it.

Although no definite geographical clinal trends in morphological variation could be defined with the material at hand, several more general trends in variation are worthy of mention.

(1) Boreal (British Columbia, Montana, Ontario) specimens in general are smaller and darker colored than the more southerly collected material.

(2) Specimens from the northern extremes of the range tend to have a more rounded pronotal outline (viewed from above).

(3) Individuals from populations in British Columbia, Montana, Utah, and New Mexico tend to have a more strongly reflexed, often emarginate clypeus. However, the same clypeus forms occur elsewhere (e.g. Quartz Mtn. and Klamath Falls, Oregon.).

(4) In series collected from conifers (western United States) the females often have the head, pronotum and body rufous, whereas the males have the head, pronotum and body black. By contrast, in series collected from deciduous trees both sexes often have the head, pronotum and body black.

General Distribution:

Dichelonyx backi is the most widely distributed species in the genus. I have records of it from the

following states: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, and Washington, and from the following Canadian provinces: Alberta, British Columbia, Manitoba, Ontario, Quebec, Saskatchewan (Fig. 119).

Specimens Examined: 4057.

Dichelonyx canadensis canadensis (Horn)

Dichelonycha canadensis Horn, 1876 p. 186; Fall, 1901 p. 282.

Dichelonyx canadensis (Horn) Leng, 1920 p. 257; Saylor, 1945 p. 150; Brown, 1946 p. 109.

Description:

Male, length 8.0-10.1 mm.; female, length, 8.4-10.5 mm. Head and body piceous-testaceous, elytra shining green to, rarely, bluish, lateral margins piceous.

Head: clypeus (Fig. 113), strongly reflexed, anterior angles rounded, anterior margin arcuate to straight, surface coarsely, sparsely punctate, clothed with short, decumbent, posteriorly-directed, whitish setae; clypeo-frontal suture not deeply impressed; antennae testaceous, nine segmented; maxillary palpi testaceous, terminal segment of each broadly, apically truncate.

Thorax: pronotum without median sulcus, anterior subapical line narrow, not deeply impressed; elytra colored as above, sparsely, evenly covered with short, decumbent, posteriorly-directed, white setae; legs piceous to rufous, sparsely clothed in erect setae; metatibial spurs slightly sexually dimorphic, unequal in length, in

male, outer and inner spurs broad, apically rounded, not spatulate, in female, both spurs narrow, apically acute.

Genitalia: Male; internal sac of aedeagus with two sclerites (Fig. 52), #1 a simple recurved hook, broadly apically rounded, rather uneven on inner, concave margin, #2 erect, spike-like, shorter than the first; rarely #2 absent. Female; genitalia externally consisting on either side of a divided coxite (Fig. 26).

Type:

Lectotype female by present designation; Horn Collection, ANSP; !; labels, (1) Can., (2) ANSP type #3655. (A male specimen LeConte Collection, MCZ; !; MCZ type #7905; labeled "Can." is not here considered the type.)

Discussion:

The nominate subspecies of D. canadensis may be differentiated from the sympatric species D. diluta, D. elongatula, and D. subvittata by the key characters and as follows: from D. diluta by lacking the spatulate male metatibial spur; from D. subvittata by lacking the darker sublateral vittae; from D. elongatula by having a relatively narrower clypeus than that species.

Two specimens, the "type" in the LeConte Collection, and a specimen collected at Paris, Maine, lacked sclerite #2 on the internal sac. The green color of the elytra, which may be related to the rugosity of the surface of the elytra, is the main character separating this subspecies from the more western one. The two are keyed and further discussed in the discussion of D. c. kirbyi.

Dichelonyx c. canadensis has been collected at ultraviolet light. In Quebec, specimens collected by G. Stace-Smith were from Salix discolor. Frost (1946) records collecting this species on Corylus rostrata.

General Distribution:

Dichelonyx c. canadensis is found from Quebec and Ontario, Canada, westward to Minnesota (Fig. 120).

Specimens Examined: 72.

Dichelonyx canadensis kirbyi Brown
New Combination, New Status

Dichelonyx kirbyi Brown, 1946 p. 107, 109.

Description:

Male, length 8.0-9.3 mm.; female, length 8.5-9.5 mm.
Head, body, elytral, and legs testaceous brown.

Head: clypeus similar to that of nominate sub-species except anterior margin slightly more emarginate in some specimens (Fig. 114); clypeo-frontal suture not deeply impressed; antennae testaceous, nine segmented; maxillary palpi testaceous, terminal segment of each broadest before apex, apically broadly rounded.

Thorax: pronotum without median sulcus; elytra similar to nominate subspecies except in color (above), and in being less micro-rugulose; metatibial spurs not markedly sexually dimorphic, unequal in length, slightly more acute in females than males.

Genitalia: Male; similar to that of nominate subspecies (Fig. 52). Female; genitalia externally consisting on either side of a divided coxite (Fig. 27).

Type:

Holotype male; CNC; labels (1) Attons Lake, Cut Knife, Sask., June 9, 1940, A. R. Brooks (2) CNC type #5612; female allotype same data.

Discussion:

Dichelonyx c. kirbyi Brown has been considered a separate species by previous workers, usually under the name D. testacea (Kirby), which was synonymized with D. linearis (and here with D. elongatula) by Brown (1946). However, the extreme similarity of the male genital sac sclerites, clypeus, tibial spurs, and other morphological features, combined with the occurrence of apparently intermediate color forms where the ranges of the two forms overlap have led me to consider the two as only subspecifically distinct. The principal differences between the two subspecies, excepting range, are the color and elytral rugulosity. The two subspecies may be separated by the following key:

- (1) Elytral color green, elytral micro-rugulose;
male outer metatibial spur apically rounded....
..... D. canadensis canadensis (Horn)
Elytral color brownish, elytra rugulose; male
outer metatibial spur apically subacute to
acute.....D. canadensis kirbyi Brown

The eastern population, the nominate subspecies is always a bright green color, the mid-western population is testaceous brown, the color difference being apparently related to the coarseness of the elytral sculpture.

There is a wide geographical area where the two subspecies are neighboringly sympatric, but only a few intermediate specimens were available in the material examined.

The protibiae of both subspecies are bidentate with a tendency toward a tridentate condition that is more marked in the D. c. kirbyi populations. The head and pronotum of D. c. kirbyi is less densely punctate than those of D. c. canadensis.

Except for color, the comparisons of the nominate subspecies with D. diluta, D. elongatula, and D. subvittata will serve also to separate these from D. c. kirbyi.

General Distribution:

This subspecies is found principally in the plains states and provinces from Manitoba and Saskatchewan southward into the Dakotas and Nebraska (Fig. 120).

Specimens Examined: 33.

Dichelonyx clypeata (Horn)

Dichelonycha clypeata Horn, 1876 p. 187; Fall, 1901 p. 288.

Dichelonyx clypeata (Horn) Leng, 1920 p. 258; Saylor, 1945 p. 154.

Description:

Male, length 8.5-10.1 mm.; female, length 9.0-11.2 mm. Head and body black, elytra dark brown, margined with black to black throughout.

Head: clypeus (Fig. 109) broader at anterior margin than base, explanate, slightly emarginate, strongly reflexed, anterior angles rounded, surface densely, regularly punctate, sparsely clothed with decumbent, posteriorly-directed, yellowish setae; clypeo-frontal suture not deeply impressed; antennae brown, nine segmented; maxillary palpi brown, terminal segment of each widest just before middle, apically rounded.

Thorax: pronotum usually with distinct sulcus, sulcus restricted to central portion of disc (absent in some individuals, and never so pronounced as in remaining sulcate species), anterior subapical line narrow, not deeply impressed; elytra colored as above densely, evenly covered with short, not regularly arranged, decumbent, yellowish setae; legs brown to black, sparsely clothed

in erect, long, white setae; metatibial spurs subequal in length, sexually dimorphic, in male inner spur short, narrow, apically rounded, outer spur long, broad, apically nearly truncate (Fig. 16), in female, both spurs apically acute.

Genitalia: Male; internal sac of aedeagus with only one small spine-like sclerite (Fig. 84), which is rather variable in shape. Female; genitalia externally consisting of an undivided coxite (Fig. 39); internally no sclerotized plate in spermatheca.

Type:

Holotype male; Horn Collection, ANSP; labels (1) Calif., (2) 1987, (3) ANSP type #3657. Type locality (Horn, 1876 p. 190) California, Henry Edwards collector.

Discussion:

The explanate, slightly emarginate clypeus, large size, dark brown color, and restricted distribution make D. clypeata readily recognizable.

The pronotal sulcus is not well developed in this species, although the female genitalia seem to definitely ally it with the sulcate group (Fig. 39). The male genitalia are not closely similar to any of the other species and may indicate a polyphyletic origin for the

sulcate group as I have presented it above. The characters of the larva of this species would be of great interest, but no larvae are yet available.

Since the sulcus may be present or absent, or weakly developed, I have included D. clypeata in both sulcate and non-sulcate alternatives in the keys.

Considered by Saylor (1945) a very rare species, D. clypeata flies only in the early part of the year, from about January to April, and is thus less well represented in most collections than the later flying species. Dichelonyx clypeata is not recorded as being attracted to light. Saylor (1945) summarizes the available host records as "apple blossoms and redwood."

General Distribution:

Dichelonyx clypeata is found only in the coastal counties in California, from Mendocino Co., to Santa Cruz Co.

Specimens Examined: 22.

Dichelonyx decolorata (Fall)

Dichelonycha decolorata Fall, 1901 p. 290.

Dichelonyx decolorata (Fall) Leng, 1920 p. 258;

Saylor, 1945 p. 151.

Description:

Male, length 7.3-9.5 mm.; female, length 6.5-14.0 mm. Head and body black to piceous, elytra testaceous, translucent, with black J shaped stripes laterally and a median black stripe along suture. Females more nearly uniformly testaceous with rufous head and pronotum, sub-lateral and sutural elytral markings often obsolete.

Head: clypeus (Fig. 107) not strongly reflexed, anterior angles rounded, anterior margin straight to weakly emarginate width at front distinctly greater than length from suture at eye to anterior angle, surface densely, coarsely punctate, clothed with decumbent, posteriorly-directed, white setae; clypeo-frontal suture not deeply impressed in male, more deeply impressed in female; antennae piceous, nine segmented; maxillary palpi piceous to testaceous, terminal segment of each subcylindrical, apically truncate.

Thorax: pronotum with median sulcus, anterior sub-apical line broad, not deeply impressed; elytra colored and marked as above, sparsely clothed with decumbent,

posteriorly-directed white setae; legs testaceous, sparsely clothed with long setae; metatibiae of females with two apically acute subequal spurs, of males with one fixed outer spine, apically rounded, and one moveable inner spur, apically acute (Fig. 14).

Genitalia: Male; internal sac of aedeagus with three sclerites (Fig. 79-82), #1 recurved, hook-like, broadly apically bifid, #2 large, recumbent, strap-like to spatulate apically, with lateral tooth on outer margin, or lateral apical tooth-like projection, #3 a semilunar mound apically covered with a mat of flattened, hamate, seta-like structures. Female; genitalia externally consisting on either side of an undivided coxite (Fig. 40), internally a sub-trapezoidal plate present in the spermatheca.

Type:

Holotype male; Fall Collection, MCZ; !; labels (1) Monterey, Calif., (2) type *decolorata*, (3) MCZ type #24861.

Discussion:

The distinctive color, translucent elytra, short clypeus, and single male metatibial spur make D. decolorata easy to identify.

Saylor (1945 p.155) records collecting "many hundreds of specimens from the foliage of knobcone pine (Pinus tuberculata) in...the Santa Cruz Mountains near Ben Lomond, California." Additional host records from material examined are: Pinus radiata, Pinus sp., and Quercus kelloggi. Dichelonyx decolorata has been collected at both ultra-violet and white lights.

General Distribution:

This species is known from the coastal California counties of Mariposa, Monterey, San Louis Obispo, Santa Clara, and Santa Cruz. There is one doubtful record from Butte Co., Big Bend Mt., V-8-1928 from Quercus kelloggi.

Specimens Examined: 355.

Dichelonyx diluta (Fall)

Dichelonycha diluta Fall, 1901 p. 283.

Dichelonyx diluta (Fall) Leng, 1920 p. 258; Saylor, 1945 p. 148; Brown, 1946, p. 109.

Description:

Male, length 7.5-9.5 mm.; female, length 8.2-9.2 mm. Head and body yellow-brown, pronotum in some individuals almost black, elytra yellow-brown to, frequently, tinged with metallic green or bronze.

Head: clypeus (Fig. 112) strongly reflexed, often weakly emarginate, anterior angles rounded, surface densely, coarsely punctate, sparsely clothed with posteriorly directed, decumbent, yellow-white setae; clypeo-frontal suture deeply impressed, particularly at middle; antennae yellow-brown, nine segmented, maxillary palpi yellow-brown, terminal segment of each widened abruptly just before apex, broadly apically rounded.

Thorax: pronotum without median sulcus, anterior subapical line broad, deeply impressed; elytra colored as above, sparsely, evenly clothed with short, decumbent, posteriorly-directed setae; legs brownish to rufous, sparsely clothed with long erect setae; metatibial spurs unequal in length, strongly sexually dimorphic, in male, outer spur spatulate, broadly apically rounded, inner spur

short, narrow, apically subacute, in female, both spurs apically subacute to rounded, narrower than those of male (Fig. 18).

Genitalia: Male; internal sac of aedeagus with one large recurved, hook-like sclerite with either one or two subapical teeth on inner concave margin, a distinct patch of long, heavy, spinose, seta-like projections on distal portion of sac (Fig. 48-49). Female; genitalia externally consisting of a divided coxite on either side of vaginal opening (Fig. 28).

Type:

Lectotype male by present designation; Fall Collection, MCZ; !; labels, (1) Mass., Austin, (2) 5663, (3) type *diluta*; (4) MCZ type #24862. Fall (1901 p. 283) gives the type locality as Tyngsboro, Massachusetts.

Discussion:

Dichelonyx diluta can readily be separated from the similar sympatric species D. sybvittata and D. elongatula by lacking the sublateral elytral vittae of the former, and the spatulate male metatibial spur of the latter. In addition the shape and reflexion of the clypeus (Fig. 110-112) will aid in separating the three species.

Considered a rare species by Saylor (1945), I was fortunate to receive a large series of specimens collected by Mr. W. Rosenberg of Balsam, North Carolina, at ultra-violet light. The color is highly variable in the series, ranging from a dilute brown to distinctly metallic bronze and green.

General Distribution:

Dichelonyx diluta ranges from North Carolina northward into Nova Scotia, Canada, and west from the Atlantic coast in Connecticut to Michigan (Fig. 126).

Specimens examined: 145.

Dichelonyx elongatula (Schönherr)

Melolontha elongata Fabricius, 1792 p. 170 (Nec
Olivier, 1789 p. 23, pl. IV, Fig. 31).

Melolontha elongatula Schönherr, 1817 p. 210.

Melolontha linearis Gyllenhal, 1817 p. 103.

Melolontha hexagona Germar, 1824 p. 124; Harris,
1835 p. 70.

Dichelonyx linearis (Gyll.) Harris, 1827 p. 7
footnote; Leng, 1920 p. 257; Brown, 1946 p. 106, 108.

Dichelonycha virescens Kirby, 1837 p. 134; LeConte,
1856 p. 279; Brown, 1946 p. 106.

Dichelonycha testacea Kirby, 1837 p. 135; LeConte,
1856 p. 279; Horn, 1876 p. 188; Fall, 1901 p. 284.

Dichelonycha elongata (Fab.) Blanchard, 1850 p. 116;
Burmeister, 1855 p. 74; LeConte, 1856 p. 279; Horn, 1876
p. 187; Fall, 1901 p. 282.

Dichelonyx elongata (Fab.) Leng, 1920 p. 257; Saylor,
1945 p. 148.

Dichelonyx elongatula (Schön.) Brown, 1946 p. 106.

Description:

Male, length 8.5-9.7 mm.; female, length 9.0-11.1 mm.
Head and body piceous to rufous, elytra shining metallic
green to brownish, elytral margins lighter.

Head: clypeus (Fig. 111) not strongly reflexed, anterior angles rounded, anterior margin arcuate to straight, surface densely, coarsely punctate, densely covered with short, posteriorly-directed, decumbent setae; clypeo-frontal suture not deeply impressed; antennae piceous, nine segmented; maxillary palpi piceous, terminal segment of each narrow, sub-triangular, broadly rounded on inner apical margin.

Thorax: pronotum without median sulcus, anterior subapical line narrow, not deeply impressed; elytra colored as above, densely clothed with posteriorly-directed, short, decumbent, white setae, not regularly arranged; legs flavous to piceous or rufous, sparsely clothed with long setae; metatibial spurs unequal in length, not strongly sexually dimorphic, apically acute (Fig. 20).

Genitalia: Male; internal sac of aedeagus (Fig. 43-45), with two sclerites, #1 large, recurved, hook-like, #2 smaller, mound-like, with from one to several apical tooth-like projections. Female; genitalia externally consisting on either side of a divided coxite (Fig. 24).

Types:

Present location of types unknown to writer. Horn and Kahle (1935-1937) give the location of the collections

as follows: Fabricius (D. elongata) Zool. Mus. Copenhagen (Ibid. p. 71); Germar, (D. hexagona) "Zool. Mus. Berlin" (Ibid. p. 89); Gyllenhal (D. linearis) "Zool. Univ. Mus. Uppsala" (Ibid. p. 100); Kirby (D. testacea, D. virescens) "British Museum N. H." (Ibid. p. 134). (Citation of D. linearis n. sp. (Brown, 1946 p. 106) apparently a typographical error, no type designated.)

Discussion:

Dichelonyx elongatula, the type species of the genus, is the most common eastern North American species. It is very variable in both color and punctation. In the series of D. elongatula at hand I was unable consistently to recognize D. linearis (Gyll.) as treated by Brown (1946) and consider it a synonym of D. elongatula.

Dichelonyx elongatula resembles several sympatric species--D. backi, D. canadensis, D. diluta and D. subvittata. The characters given in the keys to the adults based on genitalic and non-genitalic characters should suffice to separate it from these. Habitus figures of D. elongatula are given in Blatchley (1910 p. 952 Fig. 370), Dillon and Dillon (1960 p. 527, pl. 51 Fig. 11), and Jacques (1951 p. 242 Fig. 572). Several views of the head capsule are given in Stickney (1923)

Sim (1934) figures a larvae that may belong to this species. Adults have been collected at both ultra-violet and white lights. They are recorded from the following plants: pine, oak, birch, willow.

General Distribution:

Dichelonyx elongatula is found from North Carolina northward into Ontario and Quebec, Canada, and westward to Nebraska (Fig. 124).

Specimens Examined: 519.

Dichelonyx fuscula (LeConte)

Dichelonycha fuscula LeConte, 1856 p. 281; Horn, 1876 p. 189; Fall, 1901 p. 283.

Dichelonyx fuscula (LeConte) Leng, 1920 p. 258; Saylor, 1945 p. 151; Brown, 1946 p. 108.

Description:

Male, length 7.8-8.5 mm.; female, length 8.1-8.8 mm. Head and body dark brown, elytra and pronotum dark brown, frequently with a bronze sheen, elytral margins lighter.

Head: clypeus (Fig. 115) strongly reflexed, anterior angles rounded, anterior margin straight, surface densely, coarsely punctate, sparsely, evenly clothed with decumbent, posteriorly-directed, yellow-white setae; clypeo-frontal suture deeply impressed; antennae yellow-brown, nine segmented; maxillary palpi yellow-brown, terminal segment of each broad, apically truncate.

Thorax: pronotum without median sulcus, anterior subapical line deeply impressed; elytra colored as above, densely clothed with short, appressed, posteriorly-directed, yellow-white setae; legs yellow-brown to black, sparsely clothed with long setae; metatibial spurs unequal in length, not markedly sexually dimorphic, outer spur long, broad, apically rounded to, in males sub-spatulate, inner spur short, narrow, apically rounded (Fig. 21).

Genitalia: Male; internal sac of aedeagus (Fig. 51) with one large recurved, hook-like sclerite with either no or one subapical teeth on inner concave margin, sac with irregular areas of dense seta-like projections. Female; genitalia externally consisting on either side of a divided coxite (Fig. 23).

Type:

Holotype male; LeConte Collection, MCZ; !; labels (1) yellow-orange circle, (2) MCZ type number 3216.

Discussion:

Dichelonyx fuscula most resembles the sympatric species D. diluta and D. macclayi n. sp. It can be separated from the former by the shape of the tibial spur in the males, and from the latter, only with some difficulty, by the relatively more angulate inner margin of the outer metatibial spur in D. macclayi. The male genitalia of the three species (Fig. 48, 51, 57) allow easy recognition of the species. Specimens collected by Dr. Walter Suter at Mammoth Cave, Kentucky, lack the subapical tooth on the concave margin of sclerite #1, this tooth is present on all other material examined.

Host or collecting data from material seen was limited to "at light" (Kentucky), and "on oak" (New Jersey).

General Distribution:

Dichelonyx fuscula has been collected from Alabama northward to New York and Pennsylvania (Fig. 128). Brown (1946) records it also from Georgia and Missouri.

Specimens Examined: 93.

Dichelonyx macclayi n. sp.

Dichelonyx fuscula Auctt. partim.

Description:

Male (only sex known) length 7.8-9.0 mm. Head and body black, elytra and pronotum dark brown, tinged very faintly with bronze.

Head: clypeus (Fig. 116) strongly reflexed, anterior angles broadly rounded, slightly emarginate along anterior margin, surface densely, coarsely punctate, clothed with decumbent, posteriorly-directed, yellowish setae; clypeo-frontal suture sinuate, deeply impressed; antennae castaneous, nine segmented; maxillary palpi piceous, terminal segment of each narrower toward base, widest at about middle, broadly apically rounded.

Thorax: pronotum without median sulcus, disc densely, coarsely punctate, densely covered with short, appressed, yellowish, setae, anterior subapical line not deeply impressed; elytra colored as above, densely covered with short, decumbent, posteriorly-directed, yellowish setae; legs piceous to brown, clothed sparsely with long setae; metatibial spurs unequal in length, dimorphism unknown, outer spur of male broad, slightly angulate on inner margin, apically subacute, inner spur narrower, apically rounded (Fig. 22).

Genitalia: Male; internal sac of aedeagus with three sclerites (Fig. 57), #1 large, recurved, hook-like, with one or two subapical teeth on inner concave margin, #2 a short, mound-like unit with several apical acute teeth, #3 a decumbent to suberect spine, apically rounded. Female unknown.

Type:

Holotype male; MacClay Collection, UCD; !; labels (1) Pittsfield, Pike Co., Illinois, VI-7-1947, (2) B. Cadwell Collector, Fifteen topotypic paratypes information as above except as follows: VI-7 (5); VI-8 (8); VI-12 (2). Five specimens retained in Oregon State Univ. Collection, remainder in UCD. Three additional specimens assigned to this species but not paratypes as follow: Tippecanoe Co., Ind., N. M. Downie, 5-29-1959 (2); and same, 5-30-1959 (1).

Discussion:

Although the genitalia of this species is very distinctive, externally the species may be separated from the very similar D. fuscula only with difficulty. The outer male metatibial spur in D. macclayi is slightly angulate on the inner margin, while D. fuscula is curved at that point. There was no data available on host plants, or whether the species may be collected at lights.

Dichelonyx macclayi is named in honor of Dr. A. T. MacClay whose fine and extensive collection of Dichelonyx formed one of the cornerstones of the present review.

General Distribution:

Dichelonyx macclayi is known presently from only the two localities given above.

Specimens Examined: 18.

Dichelonyx muscula (Fall)

Dichelonycha muscula Fall, 1901 p. 286.

Dichelonyx muscula (Fall) Leng, 1920 p. 258; Saylor, 1945 p. 150.

Description:

Male, length 5.8-8.0 mm.; female, length 6.5-8.0 mm. Head and body black, elytra and pronotum black with bronzy to faintly metallic-green sheen, lateral elytral margins pale (some females rufescent beneath, elytra of females more frequently with greenish tinge than those of males).

Head: clypeus (Fig. 95), not strongly reflexed, anterior angles rounded, anterior margin rounded, surface finely, sparsely punctate, densely clothed with decumbent, posteriorly-directed setae; clypeo-frontal suture not deeply impressed; antennae piceous to rufescent, nine segmented; maxillary palpi rufescent, terminal segment of each widest near apex, apically truncate.

Thorax: pronotum without median sulcus, anterior subapical line not deeply impressed; elytra colored as above, densely clothed with short, decumbent, posteriorly-directed, whitish setae, setae not arranged in definite pattern; legs black to piceous, sparsely clothed with

long, erect, setae; metatibial spurs not markedly sexually dimorphic, unequal in length, apically acute.

Genitalia: Male; internal sac of aedeagus with two sclerites (Fig. 54), #1 a large recurved, broad, hook-like unit with a subapical tooth on inner concave margin, #2 short, spike-like, variable in height. Female; genitalia externally consisting on either side (Fig. 31) of a divided coxite.

Type:

Lectotype male by present designation; Fall Collection, MCZ; !; labels (1) Pasadena, Calif., 6-12-97, (2) type muscula, (3) MCZ type #24866.

Discussion:

Dichelonyx muscula is unlikely to be confused with any other sympatrically occurring species except rare individuals of D. backi. From these it may be separated using the clypeus shape and the genitalic characters. The larger sclerite (#1) in D. muscula tends to have an oval cross-section, whereas that of D. backi is more nearly circular in cross-section. In this respect D. muscula is more similar to D. nana from Southern California, and D. vaga than any of the eastern congeners.

Saylor (1945) indicates D. muscula as being found on many plants. Specimens examined bore the following host data: Ceanothus sp.; Adenostoma fasciculatum, Chamisa sp., and Eriodogon sp. I have collected it in Los Angeles Co., California at ultra-violet light.

The larvae of D. muscula is described briefly in a key in Ritcher (1966 p. 80).

General Distribution:

Dichelonyx muscula is found only in California. Material examined was from the following counties: Los Angeles, Riverside, San Bernardino, San Diego, San Luis Obispo, and Ventura (Fig. 123).

Specimens Examined: 492.

Dichelonyx nana (Fall)

Dichelonycha nana Fall, 1901 p. 286.

Dichelonyx nana (Fall) Leng, 1920 p. 258; Saylor,
1945 p. 150.

Description:

Male, length 5.7-6.5 mm.; female, length 6.1-7.0 mm.
Head and body black to rufescent, elytra brilliant green
to violaceous, lateral elytral margins yellowish.

Head: clypeus (Fig. 93) strongly reflexed, anterior
margin straight to slightly curved, anterior angles
rounded to subangulate, surface coarsely, rather sparsely
and unevenly punctate, sparsely clothed with decumbent,
posteriorly-directed setae; clypeo-frontal suture not
deeply impressed; antennae piceous, nine segmented; maxil-
lary palpi piceous, terminal segment of each short, broad,
apically truncate.

Thorax: pronotum without median sulcus, anterior
sub-apical line narrow, strongly impressed; elytra
colored as above, densely covered with short, decumbent,
posteriorly-directed setae; legs piceous to rufous,
sparsely clothed with long, white setae; metatibial spurs
not markedly sexually dimorphic, unequal in length,
apically acute.

genitalia: Male; internal sac of aedeagus with one (Fig. 53), hook-shaped, sclerite without sub-apical teeth, base rather flared. Female; genitalia externally consisting on either side of a divided coxite, (Fig. 32).

Type:

Holotype male; Fall Collection, MCZ; !; labels (1) San Diego, Calif., May 1, 1897, (2) MCZ type #24867.

Discussion:

Dichelonyx nana has a very restricted range being confined to Los Angeles and San Diego Counties, California. It can only be separated with great difficulty from D. vaga and D. backi using external characters, but the genitalic characters given in the first key will serve to identify it in all cases.

Early in the course of this review I began to suspect that D. nana might be extinct as all records were prior to 1900. However, through the courtesy of Dr. H. Howden of the CNC I was able to see three specimens from their collection that were collected by D. J. and J. N. Knull, May, 1960 at Newton, California, and one specimen (same locality) collected on June 24, 1954. Two of the specimens are not the typical green color of D. nana, but are a more violet color. (I believe the Newton, California locality is the town of that name in Los Angeles Co.)

I have not seen any host plant records for D. nana nor is it recorded as being collected at lights.

General Distribution:

This species is restricted to Los Angeles and San Diego Counties in California, (Fig. 125).

Specimens Examined: 29.

Dichelonyx pallens (LeConte)

Dichelonycha pallens LeConte, 1859 p. 283; Horn, 1876 p. 188; Fall, 1901 p. 287.

Dichelonyx pallens (LeC.) Leng, 1920 p. 258; Saylor, 1945 p. 153.

Dichelonycha longiclava Fall, 1901 p. 287.

Dichelonyx longiclava (Fall) Leng, 1920 p. 258; Saylor, 1945 p. 153.

Description: (Male)

Male, length 5.5-7.5 mm. Head and body piceous black, elytra dark brown with bronzy sheen, lateral elytral margins lighter.

Head: clypeus (Fig. 117) strongly reflexed, anterior angles rounded, anterior margin arcuate, surface coarsely, sparsely punctate, sparsely clothed with short, decumbent, posteriorly-directed, yellowish setae; clypeo-frontal suture not deeply impressed; antennae fuscous, nine segmented, club distinctly longer than funicle; maxillary palpi fuscous, terminal segment of each, broad, rounded, apically truncate, widest just before apex.

Thorax: pronotum without median sulcus, anterior subapical line not deeply impressed; elytra colored as above, clothed with short, decumbent, posteriorly-directed yellowish setae, setae arranged in poorly defined

longitudinal rows; legs fuscous, sparsely clothed with long, erect setae; metatibial spurs not strongly sexually dimorphic, unequal in length, apically acute.

Genitalia: Male; internal sac of aedeagus with one slightly curved, hook-like sclerite, apically rounded (Fig. 50), base not flared.

Description: (Female)

Female, length 6.7-8.5 mm. Head and body castaneous, elytra and pronotum yellow-brown to fuscous, with a faint metallic-golden sheen.

Head: clypeus similar to male except slightly wider in relation to pronotum at widest point; antennae castaneous to piceous, nine segmented, club subequal in length to funicle; maxillary palpi castaneous to piceous, terminal segment of each short, sub-cylindrical, angulate, narrowly, apically truncate.

Thorax: pronotum similar to male; elytra colored as above, otherwise similar to those of male; legs similar to those of male; metatibial spurs similar to male.

Genitalia: Female genitalia externally consisting on either side of a divided coxite (Fig. 7).

Type:

(D. pallens) Lectotype female by present designation; LeConte Collection, MCZ; !; labels (1) gold circle, no other labels.

(D. longiclava) Holotype male; Fall Collection, MCZ; !; labels (1) Sonoma Co., Calif., (2) "49," (3) type longiclava, (4) MCZ type #24864.

Discussion:

Dichelonyx pallens is most similar to the sympatrically occurring species D. muscula and D. truncata from which it may be readily separated by its shorter form and differently shaped clypeus (cf. Figs. 95, 117, 96).

Dichelonyx pallens has been collected from Artemesia sp. and from oak. There are no records of it being collected at lights.

General Distribution:

Dichelonyx pallens has been collected from the following California counties: Alameda, Los Angeles, Marin, Mendocino, Monterey, Napa, Santa Clara, Santa Cruz, Sonoma. It is most abundant during April through June.

Specimens Examined: 73.

Dichelonyx picea (Horn)

Dichelonycha picea Horn, 1894 p. 396; Fall, 1901 p. 289.

Dichelonyx picea (Horn) Leng, 1920 p. 258; Saylor, 1945 p. 154.

Description:

Male, length 6.1-8.0 mm.; female, length 6.5-7.7 mm. Head and body brownish or testaceous, elytra brown, each marked with about five longitudinal dark brown bands, these bands obscure or absent on very dark or very light colored individuals.

Head: clypeus (Fig. 108) strongly reflexed, anterior angles rounded, anterior margin rounded, surface impunctate to sparsely punctate, very sparsely clothed with short, erect setae; clypeo-frontal suture not deeply impressed; antennae yellow-brown, eight segmented; maxillary palpi yellow-brown, terminal segment of each cylindrical, broadly apically rounded.

Thorax: pronotum (Fig. 89) without median sulcus, anterior sub-apical line obsolete; elytra colored and marked as above, sparsely, evenly clothed with short, white, posteriorly-directed setae, setae in poorly defined, irregular rows; legs yellow brown, very sparsely clothed

in erect, white setae; metatibial spurs (Fig. 17) not strongly sexually dimorphic, unequal in length, apically subacute.

Genitalia: Male; internal sac of aedeagus without distinct large sclerites (Fig. 58), with numerous short, stout, spike-like processes on distal portion of sac. Female; genitalia externally consisting on either side of an undivided coxite (Fig. 42).

Type:

Holotype female; Horn Collection, CAS; !; labels (1) San Jose del Cabo, (2) CAS type #A64.

Discussion:

Dichelonyx picea is known only from Lower California, Mexico. It is unlikely to be confused with any of the more northern species.

Dichelonyx picea is here treated as an extremely distinctive species of Dichelonyx. Both the male and female genitalia are very distinctive (Fig. 42, 58) and the lack of an anterior sub-apical line on the pronotum is unique for the genus. It may be necessary to place this species in a separate genus, but I am here considering the wing venation (Fig. 99) as evidence to retain it in Dichelonyx for the time being.

The female genitalia are similar to those of Coenonycha (Fig. 97) in general shape, although D. picea has an undivided coxite and the species of Coenonycha illustrated has a divided coxite. The coxite of D. picea resembles more closely that of D. truncata (Fig. 41) than of any of the remaining species of Dichelonyx.

I have found no host plant records for this species, nor any records of it being collected at lights.

General Distribution:

Dichelonyx picea is presently known only from Lower California, Mexico. There is one doubtful record (label inverted) from Clear Lake, California, IX-13-1942.

Specimens Examined: 47.

Dichelonyx pusilla (LeConte)

Dichelonycha pusilla LeConte, 1856 p. 282; Horn, 1876 p. 191; Fall, 1901 p. 290.

Dichelonyx pusilla (LeConte) Leng, 1920 p. 258; Saylor, 1945 p. 154.

Description:

Male, length 7.0-8.5 mm.; female, length 7.5-9.0 mm. Head and body dark piceous, elytra brown, usually marked with longitudinal white vittae formed by discrete bands of white setae, each band about 4-8 setae wide, bands separated by about equally wide glabrous areas.

Head: clypeus (Fig. 106) strongly reflexed, anterior angles, rounded to sub-angulate, anterior margin arcuate to weakly emarginate, distinctly narrower anteriorly than at eyes, surface finely, sparsely punctate, clothed with short, decumbent, posteriorly-directed, yellow-white setae; clypeo-frontal suture not deeply impressed; antennae piceous, nine segmented; maxillary palpi piceous, terminal segment of each sub-cylindrical, apically truncate.

Thorax: pronotum with median sulcus, anterior sub-apical line narrow, not deeply impressed; elytra colored and patterned as above; legs piceous to brown, sparsely clothed with erect setae; metatibial spurs not markedly sexually dimorphic, unequal in length, apically acute.

Genitalia: Male, internal sac of aedeagus (Fig. 83), without distinct projecting sclerites, with a simple elongate, strap-like sclerotized area in distal portion of extruded sac. Female; genitalia externally consisting on either side of an undivided coxite, deeply emarginate and almost appearing to consist of a divided coxite (Fig. 37).

Type:

Lectotype male by present designation; LeConte Collection, MCZ; labels (1) small gold circle, (2) MCZ type #3211. Type locality (LeConte, 1856) San Diego, California.

Discussion:

The brown color, sulcus, and white-striped elytra of D. pusilla make it readily recognizable.

Dichelonyx pusilla morphologically occupies a position almost between the sulcate and non-sulcate groups. The female coxite is almost divided, a non-sulcate trait, but actually is fused along the caudal margin enough to allow its inclusion in the sulcate group. The male sac sclerites of the sulcate group excepting D. clypeata regularly consist of three distinctive projecting sclerites; that of D. pusilla is unique in being a strap-like sclerotized area in the distal portion of the sac.

Dichelonyx pusilla frequently is collected at both white and ultra-violet lights. In early June, 1967, I collected it at ultra-violet light at about 10:00 p.m. P.D.S.T., in Los Angeles Co., Calif. Saylor (1945) records D. pusilla from Adenostoma sp., chemise, and rose-bushes. Additional records from material examined by me are: Ceanothus cuneatus, Phacelia grandiflora, and beating Adenostomus (sic) fascicularum.

General Distribution:

Dichelonyx pusilla has been recorded from the following California counties: Inyo, Los Angeles, Mariposa, Monterey, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Ventura. It has also been collected in Storey Co., Nevada (Fig. 121). Two specimens with questionable locality labels were seen from Allison, Colorado, and Yamhill Co., Oregon.

Specimens Examined: 707.

Dichelonyx robusta (Fall.)

Dichelonycha robusta Fall, 1901 p. 288.

Dichelonyx robusta (Fall), Leng, 1920 p. 258;

Saylor, 1945 p. 154.

Description:

Male, length 7.4-8.6 mm.; female, length 8.3-9.3 mm.

Head and body black, elytra dark green, some females testaceous along lateral elytral margins and beneath body.

Head: clypeus (Fig. 118) strongly reflexed, weakly to strongly emarginate, anterior angles rounded, surface densely, coarsely punctate, sparsely clothed with erect, yellowish setae; clypeo-frontal suture not deeply impressed; antennae piceous-black, nine segmented; maxillary palpi piceous-black, terminal segment of each cylindrical.

Thorax: pronotum without median sulcus, anterior subapical line narrow, not deeply impressed; elytra colored as above, densely clothed with short, decumbent to suberect, posteriorly-directed, white setae; legs black, sparsely clothed with long, erect white setae; metatibial spurs unequal in length, not markedly sexually dimorphic, apically rounded.

Genitalia: Male; internal sac of aedeagus with one large, strap-like sclerite (Fig. 47), having an enlarged ball-like head distally, ball covered with short, deltoid,

scale-like, projections, overlapping in squamous pattern. Female; genitalia externally consisting on either side of a divided coxite (Fig. 6).

Type:

Lectotype male by present designation; Fall Collection, MCZ; !; labels (1) Corvallis, Oregon, (2) type robusta, (3) MCZ type #24868.

Discussion:

Dichelonyx robusta is most similar to D. backi. In some cases it is not possible to differentiate the two species without dissection, but usually the emarginate clypeus, and densely hairy dark green elytra of D. robusta will allow separation from D. backi in which the hairs on the elytra and under the body are usually appressed, the elytra a lighter shade of green, and the clypeus not usually emarginate.

Dichelonyx robusta adults and larvae have been collected under bunch grass (Saylor, 1945; Ritcher, 1966) in California. The larva is figured in Ritcher (1966 p. 80). In Oregon, I have collected larvae under Rumex sp. and beaten adults from Douglas fir and other trees. I have found no record of the adults being attracted to lights.

General Distribution:

Dichelonyx robusta specimens have been seen from Hood River, Oregon, south to Junction City, Oregon, and from Lake, Santa Clara, and Santa Cruz counties in California. The adult flight period is usually over before the middle of June.

Specimens Examined: 148.

Dichelonyx subvittata (LeConte)

Dichelonycha subvittata LeConte, 1856 p. 279; Horn, 1876 p. 187; Fall, 1901 p. 282.

Dichelonyx subvittata (LeC.) Leng, 1920 p. 257; Saylor, 1945 p. 148; Brown, 1946 p. 108.

Description:

Male, length 8.5-10.8 mm.; female, length 9.5-10.4 mm. Head and body testaceous to castaneous, elytra variable, usually glaucous-brown with greenish tinge, with sublateral dark green vittae extending from umbones along sides to posterior apex, lateral elytral margins lighter brown.

Head: clypeus (Fig. 110) not strongly reflexed, anterior angles rounded, anterior margin rounded, surface coarsely, sparsely punctate, clothed with short, posteriorly-directed, decumbent, white or yellowish setae; clypeo-frontal suture not deeply impressed; antennae piceous to castaneous, nine segmented; maxillary palpi piceous to castaneous, terminal segment of each broadly rounded on inner margin.

Thorax: pronotum without median sulcus, anterior subapical line not deeply impressed; elytra colored and marked as above, densely clothed with short, decumbent, posteriorly-directed, white setae, setae not arranged in distinct rows

or bands; legs piceous to castaneous or rufous, clothed sparsely in erect, white setae; metatibial spurs (Fig. 19) unequal in length, sexually dimorphic, in males, outer spur usually sub-spatulate, broadly, apically rounded, inner spur apically acute, not spatulate, in female both spurs apically subacute.

Genitalia: Male; internal sac of aedeagus with two distinct sclerites (Fig. 46) #1 a non-vertical, spike-like sclerite with expanded, blunt apex, #2 a more nearly vertical spine with subacute apex. Female; genitalia (Fig. 25) externally consisting on either side of a divided coxite.

Type:

Lectotype male by present designation; LeConte Collection, MCZ; !; labels (1) small grey or white circle, (2) subvittata 3, (3) MCZ type #3218(3). Type locality (LeConte, 1856) Lake Superior.

Discussion:

Dichelonyx subvittata may be readily recognized by its vittate green to brownish elytra, weakly reflexed, rounded clypeus, and usually spatulate male metatibial spurs. The genital sclerites seem to be of two distinct types, in one both sclerites are inclined at about the same angle to their bases, while in the other the second

(#2) is distinctly more vertical than #1. No geographic or ecological correlation of the two forms was apparent and they are considered as intra-specific variation. There is a habitus figure of this species in Dillon and Dillon (1960 p. 527, pl. 51, Fig. 12).

Dichelonyx subvittata has been collected at ultra-violet light. The evening flight of this species at Ithaca, New York¹⁰ was about 9-11 p.m. E.S.T. and the same timing was seen by the writer in Michigan in June, 1965. Host records for D. subvittata include hazel and pine.

General Distribution:

Dichelonyx subvittata occurs from North Carolina northward into Quebec, Ontario, New Brunswick, and Manitoba, Canada, and as far West as South Dakota (Fig. 122).

Specimens Examined: 163.

¹⁰H. H. Neunzig, personal communication.

Dichelonyx truncata (LeConte)

Dichelonycha truncata LeConte, 1856 p. 281; Horn, 1876 p. 190; Fall, 1901 p. 289.

Dichelonyx truncata (LeC.) Leng, 1920 p. 258; Saylor, 1945 p. 153; Brown, 1946 p. 107.

Description:

Male, length 5.6-7.8 mm.; female, length 6.0-8.1 mm. Head and body black, elytra variable in color from typically griseous or piceous to flavo-testaceous, testaceous, or tinged with metallic-bronze sheen, lateral elytral margins lighter.

Head: clypeus (Fig. 96) strongly reflexed, truncate, anterior angles almost rectangular, corners produced vertically, anterior margin straight to slightly emarginate, surface sparsely, coarsely punctate, clothed with decumbent, posteriorly-directed, yellow-white setae; clypeo-frontal suture not deeply impressed; antennae flavo-testaceous to piceous, nine segmented; maxillary palpi flavo-testaceous to piceous, terminal segment of each subcylindrical, apically truncate.

Thorax: pronotum without median sulcus, may have lighter colored area in position of sulcus, anterior subapical line not deeply impressed; elytra colored as above, densely covered with decumbent, posteriorly-directed,

white setae; legs flavo-testaceous to piceous, sparsely clothed with white setae; metatibial spurs not markedly sexually dimorphic, unequal in length, apically acute in male, more rounded apically in female.

Genitalia: Male; internal sac of aedeagus (Fig. 85) with one large strap-like sclerite, bifurcate at base, ending in a roughened knob covered with short projections giving knob a rasp-like appearance, sac with an additional discrete patch of setae-like projections below knob of main sclerite. Female; genitalia externally consisting of an undivided coxite (Fig. 41).

Type:

Lectotype male by present designation; LeConte Collection, MCZ; labels (1) small green circle, (2) *truncata* 2, (3) MCZ type #3214-2. Type locality in LeConte (1856) Platte River, Kansas Territory.

Discussion:

The truncate angulate clypeus of D. truncata will at once separate it from any other species in the genus.

In addition to having been collected at both regular and ultra-violet lights, I have the following host plant records from material examined: Ceanothus sp., Pinus ponderosa, Arctostaphylos sp., Salix sp., Yucca whipplei,

Mt. Mahogany, and from burrows in dry stacks of Haplopappus cooperi. Saylor (1945) records D. truncata as feeding on rose and Fremontia.

General Distribution:

Dichelonyx truncata has an unusual and rather wide distribution for the genus. I have seen material from the following states: Arizona, California, Colorado, Idaho, Nebraska, Nevada, South Dakota, Utah, Wyoming, and from the Canadian province of Saskatchewan. Brown (1946) records it from Montana and Nebraska (Fig. 127).

Specimens Examined: 844.

Dichelonyx vaga (Fall)

Dichelonycha vaga Fall, 1901 p. 285.

Dichelonyx vaga (Fall) Leng, 1920 p. 258; Saylor
1945 p. 150.

Description:

Male, length 6.4-7.5 mm.; female, length 7.0-8.0 mm.
Head and body black to piceous, elytra uniform metallic
dark green to testaceous or flavous, tinged with metallic
green, lateral margins testaceous in darker colored
individuals.

Head: clypeus (Fig. 94) strongly reflexed, anterior
angles rounded, anterior margin slightly, broadly emargi-
nate, surface coarsely, evenly punctate, clothed with
short, decumbent, posteriorly-directed white setae;
clypeo-frontal suture deeply impressed; antennae piceous,
darker apically, nine segmented; maxillary palpi piceous,
terminal segment of each broadly cylindrical, narrowly
apically truncate.

Thorax: pronotum without median sulcus, anterior
subapical line broad, not deeply impressed; elytra
colored as above, densely covered with short, decumbent,
posteriorly-directed setae; legs piceous to flavous,
sparsely clothed with erect setae; metatibial spurs not
markedly sexually dimorphic, unequal in length, apically
acute.

Genitalia: Male; internal sac of aedeagus with two sclerites (Fig. 55), #1 broadly hook-like, #2 a simple, erect spine with enlarged base, sometimes with two or three subsidiary spines beside the main one. Female; genitalia externally (Fig. 29) consisting on either side of a divided coxite.

Type:

Lectotype male by present designation; Fall Collection, MCZ; !; labels (1) Kaweah, Calif., R. Hopping, (2) type vaga, (3) MCZ type #24870.

Discussion:

The lighter colored testaceous to flavous individuals of D. vaga are easily separated from the sympatrically occurring other Dichelonyx species on color alone. The darker green individuals are almost impossible to separate from the similarly colored D. nana and D. backi, it is usually necessary to examine the genitalic structures for certain identification. Frequently the combined characters of clypeus shape, small size, piceous to flavous legs, and always black scutellum of D. vaga will serve to distinguish it from D. backi.

Dichelonyx vaga has been collected on "all types of conifers" according to Saylor (1945 p. 150). In addition, material from Mariposa Co., California was collected on Ceanothus sp.

General Distribution:

Dichelonyx vaga is recorded by Saylor (1945) from California and Nevada. I have examined material from the following counties in California: Calaveras, Eldorado, Fresno, Kern, Los Angeles, Madera, Mariposa, San Diego, and Tulare (Fig. 129).

Specimens Examined: 174.

Dichelonyx valida (DeConte)

This species comprises a group of populations treated below as four subspecies. The characters common to the group are given below, followed by briefer descriptions of the four subspecies and the synonymies involved:

Description:

Male, length 8.5-12.0 mm.; female, length 9.1-14.5 mm. Head and body black to piceous or rufous, elytra variable in color from shades of metallic-green to testaceous, castaneous, griseous, or black, lateral elytral margin usually lighter.

Head: clypeus (Fig. 102-105) weakly to strongly reflexed, anterior angles sub-angulate to rounded, anterior margin straight, arcuate, or slightly emarginate, surface impunctate to weakly or densely punctate, sparsely to densely clothed with decumbent, posteriorly-directed short setae; clypeo-frontal suture deeply to not deeply impressed; antennae piceous to rufous, nine segmented; maxillary palpi piceous to rufous, terminal segment of each usually widest near apex, apically truncate.

Thorax: pronotum with distinct median sulcus (Fig. 86), often with sublateral secondary sulci on either side of main sulcus on disc, disc variable in punctation, anterior sub-apical line usually not deeply

impressed, broad; elytra colored as above, sometimes with weakly developed costae at anterior margin, setae on elytra not arranged into distinct longitudinal bands, may be regularly arranged in rows; legs castaneous, fuscous, rufous, or piceous, often darker toward apices of segments, sparsely clothed in long setae; metatibial spurs (Fig. 8-13) sexually dimorphic subequal in length, in males (described separately for subspecies) highly variable in shape, width, and shape of apex, in females, both spurs apically acute; metatarsal claws bifid or not near apex.

Genitalia: Male; internal sac of aedeagus (Fig. 74-78) with three sclerites, #1 a short recurved spine, apically acute, #2 large, spatulate, enlarged at either end, free distal end with a sublateral marginal tooth, #3 a semilunar mound apically covered with a densely packed mat of flattened seta-like projections, often apically hamate. Female: genitalia externally consisting on either side of an undivided coxite, variable in shape (Fig. 33-36), internally a distinct, sub-trapezoidal sclerotized area present in the spermathecal wall.

Dichelonyx valida valida (LeConte)

Dichelonycha valida LeConte, 1856 p. 281; Horn,
1876 p. 191; Fall, 1901 p. 291.

Dichelonyx valida (LeC.) Leng, 1920 p. 258; Saylor,
1945 p. 155.

Description:

As above except:

Head: clypeus (Fig. 102) often impunctate along
anterior margin, strongly reflexed.

Thorax: pronotum, disc sparsely to densely punctate;
elytra dark metallic green, often with bronzy reflections;
metatibial spurs (Fig. 15) subequal in length, in male,
usually apically subacute.

Genitalia: Male; three sac sclerites present
(Fig. 76), #3 in Marin Co. population as shown in Fig. 76,
others approaching form shown in Fig. 78. Female: coxite
undivided, shaped usually as in Fig. 33.

Type:

Holotype male; LeConte Collection, MCZ; !; labels
(1) gold circle, (2) MCZ type #3213. Type locality
(LeConte, 1856 p. 281) San Francisco, California.

Discussion:

Dichelonyx valida valida may usually be recognized by its uniformly dark green elytra, often anteriorly impunctate clypeus, usually apically subacute male metatibial spurs, and restricted range. It may prove to range further north than Humboldt Co., California, but specimens from non-coastal Oregon populations definitely belong with either D. valida vicina or, possibly for the more eastern ones, D. valida sulcata. On the eastern, southern, and northeastern borders of its range D. valida valida overlaps the D. valida vicina populations and specimens from the area of overlap cannot always be definitely assigned to one or the other subspecies. The subspecies are treated on the following page in a key that will serve to identify most males collected.

The only host records presently available are: on Umbellularia californica.

General Distribution:

This is primarily a coastal California species occurring in the following California counties: Alameda, Contra Costa, Humboldt, Marin, Mendocino, Napa, San Francisco, San Mateo, Santa Cruz, and Sonoma. On the

eastern and southern borders of its range D. valida valida intergrades with D. valida vicina (Fig. 131).

Specimens Examined: 323.

Key to Males of the Subspecies of Dichelonyx valida

- 1 Metatibial spurs subequal in length, apically subacute (Fig. 15); anterior portion of clypeus nearly impunctate; elytra dark green colored (coastal counties in California).....
..... valida valida (LeC.)
Metatibial spurs subequal in length, apically truncate or rounded; anterior portion of clypeus usually densely punctate; elytra various colors.....2
- 2 Pronotal sulcus with impunctate areas on either side; outer metatibial spur rounded to truncate at tip....3
Pronotal sulcus with punctate areas on either side; metatibial spurs variable in shape, usually as in Fig. 12, 13 (British Columbia to S. California, Nevada, Wyoming).....valida vicina (Fall)
- 3 Outer metatibial spur rounded on outer margin, (rarely truncate) (Fig. 10, 11), variable in relative width from subequal to inner spur, to much wider than inner spur, elytra dark gray to grayish green in color, (West from Nevada, New Mexico, Colorado, Arizona, Wyoming, B. C.).....valida sulcata (LeC.)
Both metatibial spurs distinctly truncate, outer spur always distinctly wider than inner spur (Fig. 8) usually about twice as wide, elytra dark brown (E. California, Western Nevada)....valida lateralis (Fall)

Dichelonyx valida lateralis (Fall)
New Combination, New Status.

Dichelonycha lateralis Fall, 1901 p. 292.

Dichelonyx lateralis (Fall) Leng, 1920 p. 258; Saylor,
1945 p. 156.

Description:

As above except:

Head: clypeus (Fig. 103), strongly reflexed, not
impunctate on anterior margin, usually lighter colored
than remainder of head.

Thorax: pronotum on either side of median sulcus
usually glabrous, shining, impunctate to sparsely punctate;
elytra light brown colored, with darker sublateral and
sutural bands; legs brownish; metatibial spurs, in male
outer spur much wider than inner spur (Fig. 8) apically
truncate to slightly rounded on inner margin of outer spur.

Genitalia: Male; three sac sclerites present (Fig.
75), Female; undivided coxite, usually shaped as in Fig. 36.

Type:

Holotype male; Fall Collection, MCZ; !; labels (1)
Placer Co., Calif., (2) type lateralis, (3) MCZ type
24863.

Discussion:

Although the most readily characterized subspecies in the group by virtue of its dark brown color and male metatibial spur shape, D. v. lateralis intergrades on the borders of its range with the subspecies D. v. sulcata in the north and east, and on the western border with D. v. vicina. Thus one finds the very characteristic male metatibial spur of D. v. lateralis on both bright green individuals, and distinctly grey individuals where the ranges of the three subspecies meet.

None of the specimens examined bore host data, but several were marked as collected at light.

One individual (CAS) was labeled only Ut. (Utah?) probably in error.

General Distribution:

I have examined specimens of this subspecies from Ormsby and Washoe Counties, Nevada, and from the following counties in California: Amador, Calaveras, Eldorado, Nevada, Placer, Plumas, and Shasta (Fig. 131).

Specimens Examined: 61.

Dichelonyx valida sulcata (LeConte)
New Combination, New Status.

Dichelonycha sulcata LeConte, 1856 p. 281-282; Horn, 1876 p. 191; Fall, 1901 p. 292.

Dichelonyx sulcata (LeC.) Leng, 1920 p. 258; Saylor, 1945 p. 156.

Dichelonyx arizonensis Saylor, 1933 p. 158-159.

Dichelonyx sulcata arizonensis Saylor, 1945 p. 156.

Description:

As above except:

Head: clypeus similar to Fig. 105, strongly reflexed, dark colored, never anteriorly impunctate.

Thorax: pronotum on either side of median sulcus usually glabrous, shining, impunctate to sparsely punctate; elytra usually dark gray to brown, less commonly dark grayish or blackish green, specimens from Arizona lighter grey, with sublateral and posterior darker markings; metatibial spurs, in male outer spur broader than inner, apically rounded on inner margin of larger spur, (Fig. 11), rarely much wider than inner, flared apically (Fig. 10).

Genitalia: male; three sac sclerites (Fig. 74), female; undivided coxite, usually shaped as in Fig. 35.

Types:

(Dichelonycha sulcata LeC.) Holotype male; LeConte Collection, MCZ; !; labels (1) green circle, (2) MCZ type #3212. Type locality (LeConte, 1856 p. 282) Santa Fe, New Mexico.

(Dichelonyx arizonensis Saylor) Holotype male; Saylor Collection, CAS; !; labels (1) Grand Canyon, Arizona, June 16, 1921, Mr. C. D. Duncan, (3) CAS type #3680. (Female allotype same data except CAS type #3681).

Discussion:

Dichelonyx valida sulcata may usually be recognized by its typically dark gray-brown color, the distinctively shaped outer male metatibial spur that is apically rounded on the inner margin, and the subglabrous areas on either side of the pronotal sulcus. This subspecies overlaps the range of D. v. lateralis with which it apparently intergrades on the west, and further north in the west it intergrades with D. v. vicina. I have assigned specimens from British Columbia to this subspecies somewhat doubtfully based on the characters given above. These may not be true D. v. sulcata but extremes of variation in northern populations of D. v. vicina. Specimens from southeastern Oregon of D. v. vicina display some of the

characters of D. v. sulcata suggesting that the two subspecies are interbreeding in southeastern Oregon.

The mesothoracic spiracles of several D. v. sulcata individuals were compared with those of the remaining subspecies. The atrium of D. v. sulcata differed from the remaining subspecies in being somewhat produced giving the spiracle a "hooded" aspect.

Host data from material I examined may be summarized as follows: Psuedotsuga taxifolia, on cordwood, on Pinon Pine, and at U. V. light.

General Distribution:

This subspecies is known from the following states: Arizona, Colorado, Idaho, Nevada, New Mexico, Utah, and Wyoming. It extends northward into southern British Columbia, Canada (Fig. 131).

Specimens Examined: 265.

Dichelonyx valida vicina (Fall)
New Combination, New Status

Dichelonycha vicina Fall, 1901 p. 291-292.

Dichelonyx vicina (Fall) Leng, 1920 p. 258; Saylor,
1945 p. 156.

Dichelonyx deserta R. Hopping, 1931 p. 236-237;
Saylor, 1939 p. 455-456.

Dichelonyx columbiana R. Hopping, 1931 p. 236-237.

Dichelonyx vicina columbiana R. Hopping, Saylor,
1939 p. 457; 1945 p. 156.

Description:

As above except:

Head: clypeus (Fig. 104-105), densely punctate,
strongly reflexed.

Thorax: pronotum usually rufous, usually without
sublateral impunctate areas on either side of median
sulcus, rarely with sparsely punctate areas on either
side of median sulcus; elytra variable in color from
blackish to various shades of metallic green, usually a
light, shining metallic green, covered densely with
white setae; legs variable in color from rufous to dark
piceous; metatibial spurs, in male outer spur not very
much wider than inner spur, both spurs twisted, apically

subacute to truncate, rarely one or both apically bifid or hooked (Figs. 12, 13).

Genitalia: male; three sac sclerites present (Fig. 78); female; undivided coxite shaped usually as in Fig. 34.

Types:

(Dichelonycha vicina Fall) Holotype male; Fall Collection, MCZ; labels, (1) Kaweah, Calif., 7500', June, 22, (2) type vicina, (3) MCZ type #24871.

(Dichelonyx deserta Hopping) Holotype male and allotype female; CNC; labels (1) Walker Lake, Bloody Canyon, Calif., VI-17-1917, (2) CNC type #3264.

(Dichelonyx columbiana Hopping) Holotype male; CNC; labels (1) Vernon, B. C., V-1-1924, R. Hopping, (2) CNC type #3263. (Allotype female same data except: V-2-1924).

Discussion:

Dichelonyx valida vicina may usually be recognized by the light green color of the elytra, lack of impunctate areas on the pronotum, and shape of the male metatibial spurs. I have included the disjunct population from Wyoming somewhat doubtfully in D. v. vicina. This population may deserve separate subspecies status, but at present I cannot separate it structurally from D. v.

vicina. D. v. vicina intergrades with all three remaining subspecies where the ranges overlap and specimens from these areas cannot always be assigned definitely to a subspecies.

I have examined material with the following host data:
at light, at U. V. light, Abies magnifica, Abies sp.,
Pinus ponderosa, Pinus murrayana, Pinus washoensis,
Yellow Pine, Juniperus occidentalis, Heracleum, Ceanothus
cuneatus, Douglas Fir, Pinus flexilis, Abies concolor.

The larva is keyed in Ritcher (1966 p. 80).

General Distribution:

Dichelonyx valida vicina is the most widespread of the four subspecies. It occurs from British Columbia southward into Washington, Oregon, and California, and eastward extends into Nevada and Wyoming (Fig. 131).

Specimens Examined: 1554.

PART II: LARVAL SYSTEMATICS OF THE GENUS
DICHELONYX HARRIS

INTRODUCTION

Historical Review

Ritcher (1949, 1966) characterized the larvae of the melolonthine tribe Dichelonycini (Macrodactyliini Auctt., pars), describing larvae of the genera Coenonycha and Dichelonyx. Sim (1934) figured the raster of an eastern species of Dichelonyx tentatively assigned to D. elongatula. Ritcher (1949) described third stage larvae of Dichelonyx backi (Kirby), D. robusta (Fall), and D. muscula (Fall) (by error called D. truncata). The larva of Dichelonyx vicina (Fall) was described by Ritcher (1966) who presented a key to the four known species. Peterson (1960) figured the raster of a typical Dichelonyx after Ritcher (1949).

Materials and Methods

Collection of Specimens:

The larvae of Dichelonyx may best be located by digging for them at sites where adults are known to occur. In general, I have found it most productive to dig in grassy areas beneath the plants upon which the adults are

feeding or resting. The larvae are seldom found at depths greater than two feet and are frequently encountered in the upper six inches of soil.

Preservation of Specimens:

Larvae may be preserved by dropping them into gently boiling water for about three minutes, then transferring them to 70% ethyl alcohol for storage. As reported by Baker (1969), care must be used with this method as the digestive tract of actively feeding larvae may burst during boiling, releasing the gut contents into the hemocoel and blackening the specimen. The problem may be avoided in most cases by starving the larvae for long enough to allow emptying of the gut. Properly prepared larvae will retain their natural yellow-white or white color. Larvae may also be satisfactorily preserved by killing them in KAA (Kerosene, Glacial Acetic Acid, 95% Ethyl Alcohol, 1:1:9), and after about 48 hours transferring the specimens to 70% ethyl alcohol for storage.

Rearing:

Attempts by this writer to rear Dichelonyx from egg to adult were unsuccessful, although several species would oviposit in the laboratory. Young larvae in the first and second stages could be maintained in the laboratory for up to 18 months. However, even when supplied

with cereal flakes, grains of wheat, roots from the collection site, or growing grasses the larvae did not continue development. The most successful technique for laboratory rearing of Dichelonyx is that of Ritcher (1966) and personal communications, in which the late third stage larvae, prepupae, or pupae collected in the field are kept in salve tins in the laboratory at a temperature of 60-70°F. If one is careful to keep mold from forming in the containers, larvae will rapidly complete development in the tins.

Preparation and Study of Specimens:

The descriptions are based on observation of preserved whole larvae with a binocular dissecting microscope at 10X to 90X. Structural details of the mouthparts, antennae, and raster were studied in microscope slide preparations with a binocular compound microscope at 100X to 430X. Head capsule widths were measured with an ocular micrometer in a Wild M 5 binocular dissecting microscope. The width was measured on specimens submerged in alcohol. Maximum head capsule width was found to be at the antennal insertions, or just posterior to them.

Permanent wholemount microscope slides were made of the raster, maxillae, hypopharynx, epipharynx, mandibles, and antennae for all species studied. Where necessary

dissected parts of the head and mouthparts were cleared in a cold 10% KOH solution for up to 24 hours before mounting. Cleared structures were fixed in acid alcohol to stop the action of the KOH, then washed in an excess of distilled water. The material was mounted in Hoyer's Mounting Medium (See Baker, 1969 for formula). The slide was dried for 48 hours at 50°C in an oven. Finally the preparation was sealed (lourped) with clear fingernail polish to prevent deterioration of the hygroscopic mountant.

The following technique was developed for preparation of microscope slides of the rasters:

1. Remove abdominal segment X and place in cold 10% KOH;
2. After about 24 hours, remove segment to a watchglass filled with distilled water, and with forceps gently remove all muscle and other tissues from the exoskeleton leaving an almost transparent shell;
3. Transfer segment to acid alcohol bath for five minutes, then to distilled water, and using a micro-dissecting knife gently cut a longitudinal slit along the mid-dorsal line to the caudal margin;

4. Transfer the segment, ventral side up, to Hoyer's Medium on a microscope slide;
5. Observing the preparation under a dissecting microscope, spread the dorsal flaps, on either side of the previous incision, apart;
6. With the micro-dissecting knife, cut two or more short slits through the caudal margin, allowing the exoskeleton to flatten;
7. Add coverslip and treat as described above for microscope slides.

This technique has the advantage of preserving in an observable condition all the structures of the raster and anal lobes.

Illustrations:

The figures were drawn with the aid of an ocular net reticule (10 x 10) mounted in a dissecting microscope, and with a Bausch and Lomb microprojector. After drawing in pencil, the figures were checked and corrected using a binocular compound microscope. Photographs of the raster and epipharynx of the species examined were prepared by the writer and Mr. Ted Helseth using a 35 mm camera mounted on a binocular compound Wild M20 microscope. The photographs were used to check setal counts on these structures.

Sclerotized structures are indicated in the figures by stippling; heavier stippling indicating darker pigmentation and heavier sclerotization.

Terminology:

No new terminology is employed in the descriptions. The terms are those of Böving (1936, 1942), Ritcher (1966), and Baker (1969), with the exception that the simplified terminology for abdominal and thoracic lobes proposed by Butt (in Baker, 1969) is followed without elaboration.

GENERIC DESCRIPTION OF THIRD STAGE
DICHELONYX LARVAE

Larvae of this genus may be characterized as follows:

Cranium (Fig. 132) light orange-brown to light yellow-brown; with 1-5, usually 2, dorsoepicranial setae, and 1 median epicranial seta on each side; with 3-4 setae near each antenna. Eyespots absent. Frons with 1 posterior, 1 exterior, and 1 anterior seta on each side. Each anterior angle of frons with 1 seta. Clypeo-frontal suture distinct throughout length. Clypeus broad, trapezoidal in outline. Postclypeus as dark as head capsule; with 1 anterior and 1-2 lateral, marginal setae on each side. Preclypeus lighter colored than postclypeus, glabrous. Labrum symmetrical; anterior angles broadly rounded; front margin broadly rounded to distinctly trilobed; with 1 posterior, 1 lateral, 1 antero-lateral, and 1 anterior seta on each side. Antenna four-segmented, segment IV shorter than each of I-III; segments I-III with few setae, more setae usually present on segment II; segment IV with 6-10 apical sensory pegs. Segment IV of each antenna also with 3 lighter colored sensory spots: a single large dorsal spot and smaller lateral and latero-ventral spots. Epipharynx (Fig. 134) with 5-6 stout setae on each side of corypha. Clithra present, more heavily pigmented in species of sulcate group than those of non-sulcate group.

Zygum absent. Corypha with 4 stout, prominent setae arising from submarginal tubercles. Plegmatia present, well developed along lateral margins, generally rather short. Proplegmatia consisting of a single, often indistinct, proplegma on each side. Haptomerum lightly sclerotized distally; with 6 large and 2 smaller sensilla set in an irregular arching line distad of heli; with 3-4 (rarely 2) prominent, stout heli. Acroparia with 10-20 slender setae on each side. Chaetoparia well-developed, with few or no sensilla, inner half of chaetoparia set with about 40-100 stout setae, outer half set with about 20-30 smaller, short setae. Pedium without macrosensilla. Haptolachus with a dense (about 50-80 filaments in sulcate group, about 20-40 filaments in non-sulcate group species) dexiophobal mass on pedium distad of torma and a sparse phoba of 3-15 long, slender filaments between right nesium and right pair of macrosensilla. Laeophobal mass extending distally from sense cone beyond torma. Haptolachus with 2 nesia, a sclerotized, triangular plate on the right, and a sturdy sense cone with 1-4 apical sensory pores on the left, with 2 macrosensilla laterad of the right and of the left nesia, with 10-15 microsensilla located predominately on the left side. Tormae united medially, asymmetrical, with left side usually apically produced as an apotorma. Glossa of labium (Fig. 133) with 4

macrosensilla on antero-median margin, distally with 15-30 long setae, proximally with 20-25 shorter setae. Labial palpi 2-segmented, terminal segment with about 6-12 apical sensory pegs. Hypopharynx (Fig. 133) with a strongly sclerotized, basal, hypopharyngeal sclerome. Sclerome with deep fossae for insertion of accessory condyles of mandibles. Anteriorly on sclerome a sub-median, anteriorly projecting process. Sclerome with 1-5 usually 4, stout setae anterior to left fossa; with 10-30 stout setae extending from right fossa onto hypopharynx distad of sclerome; with 3 roughly parallel, linear, phobal masses on surface, one extending along right margin of sclerome, the second extending along inner margin of right fossa, the third extending approximately across midline of sclerome, sometimes curving toward left fossa. Maxilla (Fig. 133) with galea and lacinia fused for about first two-thirds of length, closely appressed throughout length. Maxillary palpus 4-segmented, segment IV the longest, apically with 8-12 sensory pegs. Galea broad, with stout terminal uncus; 3-5 stout dorsal setae near terminal uncus; 4 broad, stout, inner marginal setae (obscured by overlying lacinia in figures); 6-20 outer marginal and medial setae. Lacinia with 3 prominent unci; terminal uncus slightly the largest, with a very stout seta dorsally near apex; 13-27 longer, slender setae on

margin. Stipes with about 10-25 marginal and submarginal setae; submedially with 9-18 conical, stridulatory teeth. Cardo set sparsely with short setae. Maxillary articulating area with a patch of about 8-20 slender setae.

Mandibles (Fig. 135-136) darker than head capsule, some specimens with structural margins of mandible distinctly darker than central portions; 5-6 setae in dorsal exterior groove (scrobis); 3 sensory pores on dorsal surface near apex. Mandibles with 2 small teeth (S_1 , S_2) distad of scissorial notch; a larger tooth proximad of scissorial notch. Teeth more pronounced on left mandible than on right (N. B. Teeth may be worn off in older specimens). Left molar area with 2 teeth, a broad brustia near base. Right molar area with 2 teeth, calyx present, with a more compact brustia set in basal fossa. Molar area of left mandible with fossa for reception of mola of right mandible.

Prothorax with a yellow-brown, sclerotized shield on each side. Shield with more setae on anterior margin than on posterior margin, setae continuous across non-sclerotized dorsal area between shields. A posteriorly-directed, cribriform spiracle located caudo-dorsad above lateral lobes, on each side. Thoracic spiracles about twice as large as abdominal spiracles. Sternum set with 8-12 setae.

Mesothorax divided dorsally into a larger anterior lobe, DL 1, and a smaller posterior lobe, DL 2. DL 1 with about 8-20 setae; DL 2 with about 20-40 setae. Lateral lobe with about 10-15 setae. Sternum with about 10-22 setae.

Metathorax divided dorsally into two smaller anterior lobes, DL 1 and DL 2, and a larger posterior lobe, DL 3. DL 1 with about 10-32 setae; DL 2 with about 6-20 setae; DL 3 with about 20-60 setae, without setae in mid-dorsal area. Lateral lobe with about 10-20 setae. Sternum with about 10-22 setae.

Legs 4-segmented, increasing in length slightly from prothoracic to metathoracic pair. Short setae on all segments of each leg. Femora of prothoracic legs each with a ventral row of 4-8 stout, fossorial setae. Each leg with long terminal claw; claw shorter on mesothoracic leg, very short on metathoracic leg; each claw with 2 setae.

Abdomen with 10 segments. Segments I-VI dorsally trilobed; with a lateral, anteriorly-directed, cribriform spiracle on each side, abdominal spiracles about 1/2 diameter of thoracic spiracles. Each segment set with similar setal pattern, setae increasing in number posteriorly from segments I-III. Each dorsal lobe of segments III-VI with 3-6 transverse rows of short, spinelike setae, and a posteriorly directed caudal row of long setae.

Species in sulcate group usually with 5-6 transverse rows of spinelike setae on each lobe; species in non-sulcate group usually with 3 or fewer rows. Longer posterior setae becoming intermixed with lateral, marginal, spine-like setae on more posterior segments. Spiracular lobes with 10-18 setae. Segment VII with 3 broader, dorsal lobes. DL 1 with 3-4 (non-sulcate group) or 5-6 (sulcate group) transverse rows of short, spinelike setae, and a posterior row of longer setae. DL 2 with 20-40 short setae not arranged in distinct transverse rows, and a row of longer setae posteriorly. DL 3 with about 15-30 scattered short setae, and a few longer, posterior setae. Spiracular lobe with about 10-12 setae. Segment VIII dorsally with 2 poorly defined lobes. DL 1 with about 10-20 setae, longer posterior setae set in a poorly-defined transverse row. DL 2 with about 20-40 setae, longer posterior setae set in a poorly-defined transverse row. Spiracular lobe with about 8-12 setae. Segment IX without dorsal lobes, set with about 8 transverse rows of short, non-spinelike setae, each row with about 10-16 setae. Segment X without dorsal lobes, densely set with long and short posteriorly-directed setae. Segments I-IX ventrally with 10-14 setae. Segment X ventrally with raster lyriform, posteriorly with a broad teges of long, hamate setae; anteriorly, on each side, with a dense triangular patch of short, stout, conical setae; outer

setae of triangle curved toward outside margin of raster; margins of triangular setal patches set with long slender setae. The number of distribution of these elements of the raster constitute specific differences and are separately discussed. Anal lobes (Fig. 155-156) bare in species of non-sulcate group, set with short setae in species of sulcate group. Anal opening Y-shaped, stem of Y only slightly shorter than the arms of the Y. Ventral and lateral anal lobes triangular.

KEY TO KNOWN THIRD STAGE LARVAE
OF THE GENUS DICHELONYX HARRIS

- 1 Anal lobes setose (sulcate group).....2
 Anal lobes not setose (non-sulcate group).....5
- 2 Raster with triangular patches of short, conical
 setae separated at base by a space bare of short,
 conical setae.....3
 Raster with triangular patches of short, conical
 setae not separated at base by a space bare of
 short, conical setae.....4
- 3 Raster with each triangular patch with about 38-41
 short, conical setae of uniform length, Western
 U. S. A.....pusilla (LeC.)
 Raster with each triangular setal patch with about
 90-100 short, conical setae, the outermost setae
 about twice as long as the inner setae, Eastern
 U. S. A. and Canada.....albicollis (Burm.)
- 4 Basal inner margin of triangular setal patches with
 only long, slender setae.....decolorata (Fall)
 Basal inner margin of triangular setal patches with
 a few hamate setae in addition to long, slender
 setae.....valida vicina (Fall)
- 5 Head with 2-3 dorsoepicranial setae.....6
 Head with 4-6 dorsoepicranial setae...muscula (Fall)

- 6 Raster with triangular setal patches composed of
setae of uniform length.....7
- Raster with triangular setal patches composed of
setae of two distinct lengths, the outer marginal
setae about 2-3 times as long as the inner setae of
the triangle.....backi (Kirby)
- 7 Maximum height of each triangular setal patch
approximately twice the width of base at widest
point.....8
- Maximum height of each triangular setal patch
approximately equal to width of base at widest
point.....robusta (Fall)
- 8 Each triangular setal patch with about 50-54 short,
conical setae, teges with about 35-47 hamate setae,
having curved tips, Eastern U. S. A. and Canada.....
.....elongatula (Schön.)
- Each triangular setal patch with about 36-41 short,
conical setae, teges with about 15-18 hamate setae,
having curved tips, Western U. S. A. to South
Dakota.....truncata (LeC.)

SYSTEMATIC DESCRIPTIONS OF DICHELONYX LARVAEDichelonyx albicollis (Burmeister)

Dichelonycha albicollis Burmeister, 1855 p. 74.

Material studied:

1. Six first stage and 1 third stage larvae, January 13, 1971. North Carolina, Watauga Co., near Boone, dug from soil 10-24" deep under Pinus strobus, J. F. Cornell.

Description of Third Stage Larva

Cranium yellow-brown, with 2 pairs of dorsoepicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 2.7 mm (1 specimen). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 138) with clithra strongly defined. Haptomerum distally sclerotized, with 2 or 3 stout heli arranged in a transverse row; distad of heli an arching irregular row of 5 larger and 3 smaller sensilla. Acroparia with 14-18 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 70 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 40-80 filaments extending distad of torma onto pedium; with a very sparse phoba of 6-8 long filaments between right nesium and right

macrosensilla; with a lacophobal mass extending from near left mesium distally beyond torus. Hypopharynx with hypopharyngeal sclerome with about 6 setae distad of right fossa; with about 26 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 147) with about 10 outer marginal and marginal setae; lacinia with about 18 marginal setae; stipes with about 11 marginal and submarginal setae, set submedially with a row of 10 conical stridulatory teeth; maxillary articulating area with a patch of about 12 slender setae.

Prothorax with about 8 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 8 setae; DL 2 with about 18 setae. Sternum with about 12 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 20 setae; DL 2 with about 7 setae; DL 3 with about 80 setae. Sternum with about 8 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with about 3-5 transverse rows of spinelike setae. Raster (Fig. 156) on each side with a roughly triangular patch of about 100 short, conical setae of two distinct lengths, the outer about 2-22 marginal setae approximately 2-3 times as long as the about 78-80 inner setae; maximum height of each

triangular setal patch approximately twice the basal width at widest point. Triangular setal patches separated at base by a space, bare of short, conical setae, approximately twice the length of an hamate seta. Teges with about 34 hamate setae, having curved tips, set between and along bases of triangular setal patches, extending onto caudal margin of segment. Each triangular setal patch with about 26-30 slender setae set predominately along inner margin. Anal lobes setose.

Dichelonyx backi (Kirby)

Dichelonycha backi Kirby, 1837 p. 134.

Material studied:

1. Two second stage, 5 third stage larvae, June 21, 1967, California, Mount Palomar, at private campground, dug from soil about 6" deep beneath Fir tree, J. F. and S. J. Cornell.
2. Eleven second stage, 9 third stage larvae and 8 adults, February 23, 1966, Oregon, Benton Co., Kiger Island near Corvallis, dug from sandy soil under Aspens, J. F. Cornell and C. W. Baker.
3. Two first stage, 8 second stage larvae and 1 adult, February 25, 1967, Oregon, Benton Co, Kiger Island near Corvallis, dug from sandy soil 12-24" deep, J. F. and S. J. Cornell.
4. Twenty-three first stage, 11 second stage, 10 third stage larvae and 2 adults, June 11, 1966, Oregon, Benton Co., Marys Peak near Corvallis, dug from soil under grass and Rumex in summit meadow, J. F. Cornell and D. L. Mays.
5. One third stage larva, July 9, 1966, Oregon, Benton Co., Marys Peak near Corvallis, dug from soil under grass and Rumex in summit meadow, J. F. Cornell.

6. One first stage, 8 second stage, 3 third stage larvae, August 11, 1966, Oregon, Benton Co., Marys Peak near Corvallis, dug from soil under grass and Rumex in summit meadow, J. F. and S. J. Cornell.

7. Three first stage, 13 second stage, 9 third stage larvae, September 13, 1966, Oregon, Benton Co., Marys Peak, near Corvallis, dug from soil under grass and Rumex in summit meadow, J. F. and S. J. Cornell.

8. Three first stage, 24 second stage, 32 third stage larvae and 1 pupa, September 20, 1966, Oregon, Benton Co., Marys Peak near Corvallis, dug from soil under grass and Rumex in summit meadow, J. F. Cornell and Eric Yensen.

9. One third stage larva, July 5, 1962, Oregon, Deschutes Co., 17 miles S. Bend, dug from soil under Ponderosa pine, D. R. Smith. Loaned by P. O. Ritcher.

10. Three second stage, 1 third stage larvae, July 24, 1965, Oregon, Deschutes Co., Indian Ford Creek, 6 miles W. Sisters, C. W. Baker and J. F. Cornell.

11. One first stage, 14 second stage, 18 third stage larvae and 2 adults, September 12, 1965, Oregon, Deschutes Co., Indian Ford Campground near Sisters, dug from grassy soil, J. F. and S. J. Cornell.

12. One second stage larva, April 23, 1957, Oregon, Deschutes Co., near China Hat, collected under sod, P. O. Ritcher and G. Krantz. Loaned by P. O. Ritcher.

13. Three second stage, 2 third stage larvae, Jan. 3, 1961, Oregon, Jackson Co., 13 miles E. Butte Falls, D. G. Fellin. Loaned by P. O. Ritcher.

14. Seven first stage, 2 second stage, 2 third stage larvae, May 10, 1961, Oregon, Jackson Co., 13 miles E. Butte Falls (site 3) D. G. Fellin. Loaned by P. O. Ritcher.

15. One second stage, 2 third stage larvae, May 11, 1961, Oregon, Jackson Co., 2 miles W. Butte Falls, D. G. Fellin. Loaned by P. O. Ritcher.

16. One second stage, 11 third stage larvae and 1 adult, May 21, 1966, Oregon, Jackson Co., Inesco, Rogue River National Forest. Loaned by P. O. Ritcher.

17. One third stage larva, March 20, 1967, Oregon, Jackson Co., Whiskey Springs Campground near Butte Falls, dug from soil under grass near Douglas fir, J. F. and S. J. Cornell.

18. Three first stage, 3 second stage, 6 third stage larvae, December 30, 1953 (53-5 A 1), Oregon, Wasco Co., Friend, V. O. and P. O. Ritcher. Loaned by P. O. Ritcher.

19. Nine third stage larvae, August 28, 1956, Oregon, Wasco Co., 22 miles SW The Dalles, in soil, P. O. Ritcher. Loaned by P. O. Ritcher.

Description of Third Stage Larva

Cranium yellow-brown to orange-brown, with 2 pairs of dorsoepicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 2.1-2.4 mm (10 specimens). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 145) with clithra well-defined. Haptomerum distally sclerotized, with 3 (rarely 2) stout heli arranged in a transverse row; distad of heli an arching irregular row of 6 larger and 2 smaller sensilla. Acroparia with 12-18 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 50-80 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 40 filaments extending distad of torma onto pedium; with a very sparse phoba of about 4-6 long filaments between right nesium and right macrosensilla; with a laeophobal mass extending from near left nesium distally beyond torma. Hypopharynx with hypopharyngeal sclerome with about 9 setae distad of right fossa; with about 20 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 152) with about 6-7 outer marginal and marginal setae; lacinia with about 24 marginal setae; stipes with about 6-15 outer marginal and marginal setae, set submedially with a row of 9-13 conical

stridulatory teeth; maxillary articulating area with a patch of about 12-24 slender setae.

Prothorax with about 10 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 10 setae; DL 2 with about 20-32 setae. Sternum with about 8-10 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 10-20 setae; DL 2 with about 8-10 setae; DL 3 with about 24-40 setae. Sternum with about 8-10 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with 3-4 transverse rows of short, spinelike setae. Raster (Fig. 158) on each side with a roughly triangular patch of about 70-76 short, conical setae of two distinct lengths, the about 13-25 outer marginal setae approximately 2-3 times as long as the about 51-60 inner setae; maximum height of each triangular setal patch approximately $1\frac{1}{2}$ to 2 times the width of base at widest point. Triangular setal patches separated at base by a space, bare of short, conical setae, approximately twice the length of an hamate seta. Teges with about 30-35 hamate setae, having curved tips, set between and along bases of triangular setal patches, extending onto caudal margin of segment. Each triangular

setal patch with about 25-35 long, slender setae set along inner and outer margins. Anal lobes bare (Fig. 164).

Dichelonyx decolorata (Fall)

Dichelonycha decolorata Fall, 1901 p. 290.

Material studied:

1. Seven third stage larvae, March 25, 1965, California, Santa Cruz Co., 2.5 miles N. Scotts Valley, Bean Creek, along old Glenwood Highway, C. W. Baker.
2. One second stage larva, March 14, 1966, California, Santa Cruz Co., 1.6 miles SW Glenwood, C. W. Baker.

Description of Third Stage Larva

Cranium dark yellow-brown, with 2 pairs of dorso-epicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 2.9-3.4 mm (5 specimens). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 140) with clithra well-defined. Haptomerum distally sclerotized, with 3 stout heli arranged in a transverse row; distad of heli an arching irregular line of 6 large and 2 smaller sensilla. Acroparia with 14-18 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 100 stout setae, outer half set with about 30 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 50 filaments extending distad of torma onto pedium; with a very sparse phoba of 4-5 long

filaments between right nesium and right macrosensilla; with a laeophobal mass extending from near left nesium distally beyond torma. Hypopharynx with hypopharyngeal sclerome with about 9 setae distad of right fossa; with about 24 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 149) with about 10 outer marginal and marginal setae; lacinia with about 27 marginal setae; stipes with about 24 marginal and submarginal setae, set submedially with a row of 17 conical stridulatory teeth; maxillary articulating area with a patch of about 13 slender setae.

Prothorax with about 12 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 10-12 setae; DL 2 with about 24 setae. Sternum with about 8 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 10-12 setae; DL 2 with about 10-12 setae; DL 3 with about 24 setae. Sternum with about 8 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with 3-5 transverse rows of spinelike setae. Raster (Fig. 157) on each side with a roughly triangular patch of about 100-110 short, conical setae of 2 distinct lengths, the about 26 outer marginal setae about twice as long as the about 80 inner setae;

maximum height of each triangular setal patch approximately 1-1/3 times the basal width at widest point. Triangular setal patches merging at base, not separated by a space bare of short, conical setae. Teges with about 30 hamate setae, having curved tips, set along base of triangular setal patches, extending onto caudal margin of segment. Each triangular setal patch with about 26-36 long, slender setae bordering inner and outer margins. Anal lobes setose.

Dichelonyx elongatula (Schönherr)

Melolontha elongata Fabricius, 1792 p. 170.

Material studied:

1. One third stage larva, August 9, 1968, N. C., near Balsam, The Orchards Overlook on Blue Ridge Parkway, dug from soil under grass in mixed deciduous woods, J. F. and S. J. Cornell.
2. One second stage larva, May 4, 1969, N. C., near Balsam, The Orchards Overlook on Blue Ridge Parkway, dug from soil under grass in mixed deciduous woods, J. F. and S. J. Cornell.
3. Three second stage, 1 third stage larvae, June 1, 1969, N. C., Watauga Co., Rich Mt., near Boone, dug from soil 6-12" deep under young Quercus castanea, J. F. Cornell and Ted Helseth.
4. One second stage larva, October 7, 1970, N. C., Watauga Co., Rich Mt. near Boone, dug from soil about 2" deep in mixed deciduous woods, J. F. Cornell and Ron Hawkins.
5. One second stage larva, April 23, 1971, N. C., Watauga Co., near Boone, dug from soil under Quercus castanea, J. F. Cornell and Roger Ables.

Description of Third Stage Larva

Cranium straw-colored, with 2 pairs of dorsoepicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 2.5 mm (1 specimen). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 142) with clithra well-defined. Haptomerum distally sclerotized, with 3 stout heli arranged in a transverse row; distad of heli an arching irregular line of 6 large and 2 smaller sensilla. Acroparia with 10-14 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 50-60 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 20 filaments extending distad of torma onto pedium; with a very sparse phoba of 6-8 long filaments between right nesium and right macrosensilla; with a laeophobal mass extending from near left nesium distally beyond torma. Hypopharynx with hypopharyngeal sclerome with about 7 setae distad of right fossa; with about 18 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 153) with about 8 outer marginal and marginal setae; lacinia with about 23 marginal setae; stipes with about 6-15 marginal and submarginal setae, set submedially with a

row of 10 conical stridulatory teeth; maxillary articulating area with a patch of about 16 slender setae.

Prothorax with about 6 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 8 setae; DL 2 with about 13 setae. Sternum with about 6 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 8 setae; DL 2 with about 8 setae; DL 3 with about 20 setae. Sternum with about 6 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with 3-4 transverse rows of spinelike setae. Raster (Fig. 163) on each side with a roughly triangular patch of about 50-54 short, conical setae of uniform length; maximum height of each triangular setal patch approximately twice the basal width at widest point. Triangular setal patches separated at base by a space, bare of short, conical setae, approximately 3 times the length of an hamate seta. Teges with about 42 hamate setae, having curved tips, set between and along the bases of the triangular setal patches, extending onto the caudal margin of segment. Each triangular setal patch with about 14-16 long, slender setae set predominately along inner margin. Anal lobes bare.

Dichelonyx muscula (Fall)

Dichelonycha muscula Fall, 1901 p. 286.

Material studied:

1. Two third stage larvae, and microscope slides of the rasters of 2 third stage larvae, April 15, 1946, California, Banning Canyon, 11 miles N. Banning, dug from soil beneath Adenostoma shrubs, P. O. Ritcher (No. 46-17A). Loaned by P. O. Ritcher.

Description of Third Stage Larva

Cranium yellow-brown, with 3 pairs of long, 2 pairs of short dorsoepicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 1.4 mm (1 specimen). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 144) with clithra not well-defined. Haptomerum distally sclerotized, with 4 stout heli arranged in a transverse row; distad of heli an arching irregular line of 6 large and 2 smaller sensilla. Acroparia with 10-14 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 40 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 20 filaments extending distad of torma onto pedium; with a very sparse phoba of 3-4 long filaments between right nesium and right macro-

sensilla; with a laeophobal mass extending from near left mesium distally beyond torus. Hypopharynx with hypopharyngeal sclerome with about 3 setae distad of right fossa; with about 19 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 151) with about 6 outer marginal and marginal setae; lacinia with about 13 marginal setae; stipes with about 9 marginal and submarginal setae, set submedially with a row of 11 conical stridulatory teeth; maxillary articulating area with a patch of about 8 slender setae.

Prothorax, mesothorax, metathorax and abdominal setae not tabulated due to poor condition of specimen available.

Abdomen with raster (Fig. 161) on each side with a roughly triangular patch of about 36-40 short, conical setae of uniform length; maximum height of each triangular setal patch approximately twice basal width at widest point. Triangular setal patches separated at base by a space, bare of short, conical setae, approximately $2\frac{1}{2}$ times the length of an hamate seta. Teges with about 15-22 hamate setae, having curved tips, set between and along bases of triangular setal patches, extending onto caudal margin of segment. Each triangular setal patch with about 15-16 long, slender setae set predominately along the inner margin. Anal lobes bare.

Dichelonyx pusilla (LeConte)

Dichelonycha pusilla LeConte, 1856 p. 282.

Material studied:

1. One cast skin of third stage larva and associated pupa, July 2, 1967, became adult July 13, 1967, California, Monterey Co., Nacimiento River, 1.7 miles N. Camp Ponderosa, C. W. Baker.

Description of Third Stage Larva

Cranium yellow-brown, with 2 pairs of dorsoepicranial setae, with 1 pair of median epicranial setae. Maximum width of head 2.0 mm (1 specimen). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 137) with clithra well-defined. Haptomerum distally sclerotized, with 3 stout heli arranged in a transverse row; distad of heli an arching irregular line of 6 large and 2 smaller sensilla. Acroparia with 18-20 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 60 stout setae, outer half set with about 30 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 50 filaments extending distad of torma onto pedium; with a very sparse phoba of 2-3 long filaments between right nesium and right macrosensilla; with a laeophobal mass

extending from near left mesium distally beyond toma.

Hypopharynx with hypopharyngeal sclerome with about 3 setae distad of right fossa; with about 30 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 148) with about 9 outer marginal and marginal setae; lacinia with about 18 marginal setae; stipes with about 22 marginal and sub-marginal setae, set submedially with a row of 11 conical-stridulatory teeth; maxillary articulating area with a patch of about 18 slender setae.

Prothorax with about 10 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 12 setae; DL 2 with about 35 setae. Sternum with about 16 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 18 setae; DL 2 with about 12 setae; DL 3 with about 28 setae. Sternum with about 20 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with 3-5 transverse rows of spinelike setae. Raster (Fig. 162) on each side with a roughly triangular patch of about 41 uniform in length, short, conical setae; maximum height of each triangular setal patch approximately $1\frac{1}{2}$ times basal width at widest point. Triangular setal patches separated at base by a

space, bare of short, conical setae, approximately $2\frac{1}{2}$ times the length of an hamate seta. Teges with about 25 hamate setae, having curved tips, set between and along bases of triangular setal patches, extending onto caudal margin of segment. Each triangular setal patch with about 16-25 slender setae bordering inner and outer margins. Anal lobes setose.

Dichelonyx robusta (Fall)

Dichelonycha robusta Fall, 1901 p. 288.

Material studied:

1. One second stage larva, cast skin of third stage larva that became pupa April 22, 1966, became adult female April 29, 1966, collected behind plow in grassy field April 7, 1966; 8 second stage larvae, 4 third stage larvae, cast skin of third stage larva that became pupa April 22, 1966, became adult male May 7, 1966, collected behind plow, near small oak tree in grassy field April 16, 1966; 2 first stage larvae, 3 third stage larvae, cast skin and associated pupa that was adult May 18, 1966, collected from soil covered with grass and Rumex near a small Douglas Fir tree, the larvae from about 8-10" deep in soil May 5, 1966; cast skin of third stage larva that was pupa July 27, 1966, dug from soil about 6-10" deep under small Douglas Fir tree May 10, 1966; 42 eggs laid in laboratory by female adult collected from Rumex May 10, 1966, eggs preserved June 21, 1966; all preceding material collected at Oregon, Benton Co., 14 miles S. Corvallis, on Belle-fountain Road, T13S R6W S19 SE $\frac{1}{4}$ SE $\frac{1}{4}$, J. F. and S. J. Cornell at dates specified.

2. Two second stage and 7 third stage larvae collected behind plow, Oregon, Benton Co., near

Bellefountain, by C. W. Baker and D. R. Smith, No. S64-1-1, loaned by P. O. Ritcher.

3. Three second stage larvae, and slides of the rasters of 2 third stage larvae dug from about 1-7" deep in soil in a grassy flat near the top of Mt. Hamilton, California, February 22, 1946, by P. O. Ritcher and L. W. Saylor, No. 46-8A, loaned by P. O. Ritcher.

Description of Third Stage Larva

Cranium dark yellow-brown, with 2 pairs of dorso-epicranial setae, with 1 pair of longer median epicranial setae, some specimens with 2 microsetae posterior to each dorsal epicranial seta. Maximum width of head-capsule 1.8-2.3 mm (6 specimens). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 143) with clithra well-defined. Haptomerum distally sclerotized, with 4 stout heli arranged in a transverse row; distad of heli an arching irregular line of 6 large and 2 smaller sensilla. Acroparia with 10-14 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 50 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 40 filaments extending distad of torma onto pedium; with a very sparse phoba of 3-6 long filaments between right nesium and right macrosensilla; with a laeophobal mass extending from near

left mesium distally beyond torus. Hypopharynx with hypopharyngeal sclerite with about 7 setae distad of right fossa; with about 18 short, stout setae extending from right fossa onto hypopharynx distad of sclerite. Galea of maxilla (Fig. 150) with about 6 outer marginal and marginal setae; lacinia with about 18 marginal setae; stipes with about 30 marginal and submarginal setae, set sub-medially with a row of 10-13 conical stridulatory teeth; maxillary articulating area with a patch of about 8-12 slender setae.

Prothorax with about 10-14 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 10 setae; DL 2 with about 18-20 setae. Sternum with about 12 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 18-20 setae; DL 2 with about 6-8 setae; DL 3 with about 22-26 setae. Sternum with about 10 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with 3-4 transverse rows of spinelike setae. Raster (Fig. 159) on each side with a roughly triangular patch of about 40-52 short, conical setae of uniform length; maximum height of each triangular setal patch approximately equal to basal width at widest point. Triangular setal patches separated at base by a

space, bare of short, conical setae, approximately $2\frac{1}{2}$ times the length of an hamate seta. Teges with about 22-23 hamate setae, having curved tips, set between and along bases of triangular setal patches, extending onto caudal margin of segment. Each triangular setal patch with about 17-20 long, slender setae set predominately along inner margin. Anal lobes bare.

Dichelonyx truncata (DeConte)

Dichelonycha truncata DeConte, 1856 p. 281.

Material studied:

1. Nine first stage, 3 second stage, 34 third stage larvae, and cast skins of 15 third stage larvae reared to pupal or adult stages, March 15, 1966, California, Monterey Co., Arroyo Seco Campground, C. W. Baker.

Description of Third Stage Larva

Cranium light yellow-brown, with 2 pairs of dorso-epicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 1.2-1.4 mm. (11 specimens). Postclypeus with 1 pair of anterior, 2 pairs of lateral setae. Epipharynx (Fig. 141) with clithra well-defined. Haptomerum distally sclerotized, with 3 or 4 stout heli arranged in a transverse row; distad of heli an irregular arching row of 6 large and 2 smaller sensilla. Acroparia with 10-12 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of chaetoparia set with about 50 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 20 filaments extending distad of torma onto pedium; with a very sparse phoba of about 3 long filaments between right nesium and right macrosensilla; with a laeophobal

mass extending from near left nesium distally beyond torma. Hypopharynx with hypopharyngeal sclerome with about 8 setae distad of right fossa; with about 18 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 154) with about 10 outer marginal and marginal setae; lacinia with about 14 marginal setae; stipes with about 12 marginal and submarginal setae, set submedially with a row of 9 conical stridulatory teeth; maxillary articulating area with a patch of about 10 slender setae.

Prothorax with about 8 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 4 setae; DL 2 with about 18-20 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 18-20 setae; DL 2 with about 6-8 setae; DL 3 with about 22-26 setae. Sternum with about 10-12 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more posterior segments. Each lobe with 3-4 transverse rows of spinelike setae. Raster (Fig. 159) on each side with a roughly triangular patch of about 35-41 short, conical setae of uniform length; maximum height of each triangular setal patch approximately twice basal width at widest point. Triangular setal patches separated at base by a space, bare of short, conical setae, approximately $2\frac{1}{2}$ times length

of an hamate seta. Teges with about 15-20 hamate setae between and along bases of triangular setal patches, extending onto caudal margin of segment. Each triangular setal patch with about 20-35 long, slender setae bordering inner and outer margins. Anal lobes bare.

Dichelonyx valida vicina (Fall)

Dichelonycha vicina Fall, 1901 p. 291-292.

Material studied:

1. Three second stage larvae, July 20, 1965, Oregon, Benton Co., MacDonald Forest near Corvallis, dug from soil under Douglas Fir, J. F. Cornell and C. W. Baker.
2. One third stage larva, October 1, 1952, Oregon, Benton Co., MacDonald Forest near Corvallis, V. D. Roth, F. Beer, and P. O. Ritcher. Loaned by P. O. Ritcher.
3. Eight second stage larvae, September 1, 1954, Oregon, Benton Co., MacDonald Forest near Corvallis, F. Beer and P. O. Ritcher. Loaned by P. O. Ritcher.
4. One second stage larva, April 6, 1956, Oregon, Benton Co., under bark of old doug fir log, Joan DeWitt. Loaned by P. O. Ritcher.
5. Three second stage and 3 third stage larvae, July 23, 1954 (54-10B); 1 prepupa, cast skin and associated reared adult, September 20, 1954 (54-10A 7); 1 second stage larva, October 12, 1954; Oregon, Benton Co., MacDonald Forest near Corvallis, P. O. Ritcher. Loaned by P. O. Ritcher.
6. Five third stage larvae, January 28, 1961; 1 third stage larva, February 25, 1961; 1 second stage, 1 third stage larvae, April 8, 1961; 1 third stage larva,

May 19, 1960; 3 second stage and 5 third stage larvae, May 29, 1961; 3 third stage larvae, June 8, 1961; 2 third stage larvae, June 28, 1961; 1 third stage larva, August 11, 1961; 1 second stage and 2 third stage larvae, October 21, 1961; 5 third stage larvae, November 12, 1960; Oregon, Benton Co., MacDonald Forest near Corvallis, D. G. Fellin. Loaned by P. O. Ritcher.

7. One second stage, 1 third stage larvae, January 3, 1961, Oregon, Jackson Co., 13 miles E. Butte Falls (site 3), D. G. Fellin. Loaned by P. O. Ritcher.

8. One second stage, 3 third stage larvae, June 16, 1960, Oregon, 13 miles NW Union Creek (site 21), D. G. Fellin. Loaned by P. O. Ritcher.

Description of Third Stage Larva

Cranium dark yellow-brown, with 2 or 3 pairs of dorso-epicranial setae, with 1 pair of median epicranial setae. Maximum width of head capsule 2.5-3.1 mm (12 specimens). Postclypeus with 1 pair of anterior setae, 2 pairs of lateral setae. Epipharynx (Fig. 139) with clithra well-defined. Haptomerum distally sclerotized, with 3 stout heli arranged in a transverse row, distad of heli an arching irregular line of 6 larger and 2 smaller sensilla. Acroparia with 14-18 slender setae. Chaetoparia well-developed, with few or no sensilla; inner half of

chaetoparia set with about 90 stout setae, outer half set with about 20 smaller, short setae. Haptolachus with a dense dexiophobal mass of about 50 filaments extending distad of torma onto pedium; with a very sparse phoba of 8-10 long filaments between right nesium and right macrosensilla; with a laeophobal mass extending from near left nesium distally beyond torma. Hypopharynx with hypopharyngeal sclerome with about 9 setae distad of right fossa; with about 15-20 short, stout setae extending from right fossa onto hypopharynx distad of sclerome. Galea of maxilla (Fig. 146) with about 10 outer marginal and marginal setae; lacinia with about 24 marginal setae; stipes with about 24 marginal and submarginal setae, set submedially with a row of 13 conical stridulatory teeth; maxillary articulating area with a patch of about 12-24 slender setae.

Prothorax with about 8 setae on sternum.

Mesothorax with 2 dorsal lobes; DL 1 with about 10-20 setae; DL 2 with about 20-40 setae. Sternum with about 8 setae.

Metathorax with 3 dorsal lobes; DL 1 with about 20-32 setae; DL 2 with about 12-20 setae; DL 3 with about 30-38 setae. Sternum with about 8-10 setae.

Abdomen with 3 dorsal lobes on each of segments I-VI. Number of short, spinelike setae increasing on more

posterior segments. Each lobe with 3-5 transverse rows of spinelike setae. Raster (Fig. 155) on each side with a roughly triangular patch of about 100-105 short, conical setae of two distinct lengths, the about 31 outer marginal setae approximately 2-3 times as long as the about 74 inner setae; maximum height of each triangular setal patch approximately 1-1/3 times the basal width at widest point. Triangular setal patches merging at base, not separated by a space bare of short, conical setae. Teges with about 25 hamate setae, having curved tips, set just in front of short, conical setae at base of triangular setal patches, and along basal margin of triangular setal patches, extending onto the caudal margin of segment. Each triangular setal patch with about 25-30 long, slender setae bordering predominately the inner margin. Anal lobes setose.

PHYLOGENY

The tribe Macroductyliini as presently recognized comprises a heterogenous assemblage of genera that are probably unrelated (Dalla Torre, 1913; Davidson, 1970). Within the tribe the group of genera including Dichelonyx, Coenonycha, Gymnopyge, and Ceraspis form a coherent group based on shared characters of the adults and larvae (Ritcher, 1966, 1969a; Davidson, 1970). This group probably deserves recognition as a subtribe or tribe; however, until the remaining genera in the Macroductyliini are studied, I believe it best not to recognize any new supergeneric taxa.

I am reluctant to speculate about phylogenetic inter-relationships within the genus Dichelonyx and between Dichelonyx and allied genera. There are no fossils known to me, preventing incorporation of a realistic time dimension in a phylogeny (Coope, 1970; Ross, 1965). The classification at the tribal level is far from stable (see e.g. Arnett, 1963; Blackwelder, 1944; Dalla Torre, 1913; Davidson, 1969; Ritcher, 1966, 1969). This complicates determination of zoogeographic parameters such as center of origin, or direction of dispersal (Howden, 1963, 1966, 1969; Remington, 1968). The closest genera, Gymnopyge, Coenonycha, and Ceraspis auger for a South to

North dispersal route (Halfpeter, 1964). However, I have seen undetermined material at the U. S. National Museum (possibly Dichelormorpha) from mainland China, that could lend credence to a Northern origin for the group and to a dispersal from North to South (Van Dyke, 1939). Lacking objective data on these key points, I have prepared a diagram summarizing my interpretation of the phenetic relationships within Dichelonyx and between it and Coenonycha (Fig. 166).

The phenetic diagram shows present relationships based on adult and larval morphological characters, and to some extent on adult behavioral and ecological preferences. The major branching points are labeled to indicate the structures involved. The diagram supposes a monophyletic origin for Dichelonyx, a point that is debatable, and best fits the hypothesis of a southern origin for the genus.

Dichelonyx and Coenonycha generally exhibit an ecological distinction in that species of Dichelonyx are diurnal beetles that as adults feed predominately on trees and inhabit areas with a high rainfall; whereas, the species of Coenonycha are predominately nocturnal beetles that as adults feed mostly on shrubs and herbs and tend to occur in regions of less rainfall.

If one interprets the vertical axis of the phenetic diagram as being time-related, it is possible to hypothesize an archetypal ancestor for Coenonycha and Dichelonyx and to interpret the relationships depicted as phylogenetic.

The hypothetical ancestor for the two genera had larvae with 3 or 4 heli. on the epipharynx, setose anal lobes, and a simple raster. The adults had simple pronota, and simple body hairs. The coxite in the female had two or more separate sclerites. The males had a simple genital sac armature consisting of elaborated setae, and probably setae on the tips of the parameres.

From this hypothetical ancestral group Coenonycha evolved as a xeric habitat preferring nocturnal genus. The larvae retained three heli. on the epipharynx and the setose anal lobes with a simple rastral pattern. The adults retained simple pronota and simple body setae. Females retained a coxite composed of more than one sclerite; males evolved a more elaborate genital sac armature consisting of prominent setae and knobs, and retained subapical setae on the parameres.

The line leading from the hypothetical ancestor to Dichelonyx gave rise to a predominately mesic habitat preferring group of mostly diurnal beetles. The adults developed complex plumose body setae. The males lost the subapical setae from the parameres. This line diverged

into three species groups: a group with a pronotal sulcus; a group without a pronotal sulcus, but with an elaborate male genital sac armature; and a group represented by one species, D. picea, having no pronotal sulcus, and a very simple male genital sac armature. The larvae developed a complex rastral pattern.

The morphological characteristics of the two major groups of Dichelonyx are discussed separately. In the species of the sulcate group, the larvae retained setose anal lobes and three heli on the epipharynx. In the females the two sclerites of the divided coxite fused to form a single coxite. The males developed a complex genital sac armature of from one to three spinelike processes and sclerites, of which at least one remains spinelike in all present species except D. pusilla which has a simple straplike sclerite. The adults developed a marked pronotal sulcus, and, possibly as an adaptation to feeding predominately on conifers, many species have the elytral vestiture arranged in long parallel rows.

The non-sulcate Dichelonyx line retained the simple pronotum of the hypothetical ancestor, and an elytral vestiture that is not arranged in long parallel rows. The larvae lost the setation of the anal lobes. In the females the coxite consists of two separate sclerites. In the males the genital sac armature became elaborate,

the elaborations falling into three main groups: development of simple straplike sclerites (D. robusta), development of patches of stout setae in conjunction with either straplike or hooklike sclerites (D. truncata, D. diluta) and development of two or three stout, sclerotized, hooklike or spinelike projections (D. backi).

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APPENDIX

Abbreviations Used on Figures

1, 2, 3	genital sac sclerites one, two, and three
A	antenna
AA	anterior frontal angle
aa	anterior angle of pronotum
ACR	acroparia
ACS	anterior clypeal setae
AFS	anterior frontal setae
ALS	anterolateral labral setae
ap	apodeme
ASP	asperities
BLR	setae of basolateral region
bp	basal apodeme
BR	brustia
cfs	clypeo-frontal suture
CL	clithra
CO	corypha
CPA	chaetoparia
CS	clypeo-frontal suture
DES	dorsoepicranial setae
DPH	dexiophoba
DSS	dorsal sensory spot
E	epicranium
ECS	marginal exterior clypeal setae
EFS	exterior frontal setae

ELS	lateral labral setae
ES	epicranial setae
F	frons
FS	frontal suture
GL	glossa
H	heli
HM	haptomerum
HSC	hypopharyngeal sclerite
HSP	phobae of hypopharynx
is	internal sac
L	labrum
LA	lacinia
la	lateral pronotal angle
LP	labial palpus
LPH	laeophoba
LSS	median posterior labral setae
m ₁	membrane one
M	mandible
MO	mola
MP	maxillary palpus
MPH	minor phoba
MS	macrosensilla
MSS	sensory pores of haptomerum
PE	pedium
PFS	posterior frontal setae

PL	plegmattia
PLS	posterior labral setae
pm	paramere
PS	median epicranial setae
PTA	postartitis
S	"horseshoe-shaped" sclerite
SA	scissorial area
sas	subapical line
SC	sense cone
SD	stridulatory teeth
SP	sclerotized plate
su	median pronotal sulcus
TO	tormae
UN	uncus
VP	ventral process

Figures 1-5. Male genitalia, entire, of Dichelonyx species.

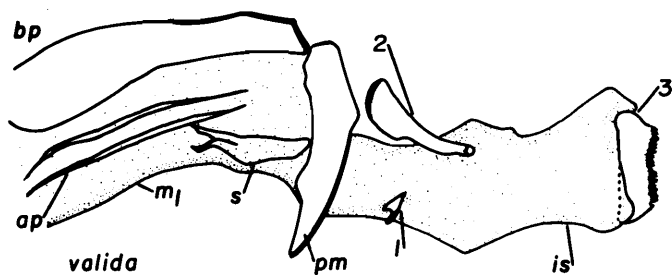
1. D. valida male genitalia with sac extruded.
2. Same with sac in resting position.
3. D. truncata male genitalia with sac extruded.
4. D. diluta male genitalia with sac extruded.
5. D. robusta male genitalia with sac extruded.

Figures 6-7. Female genitalic sclerites of Dichelonyx species.

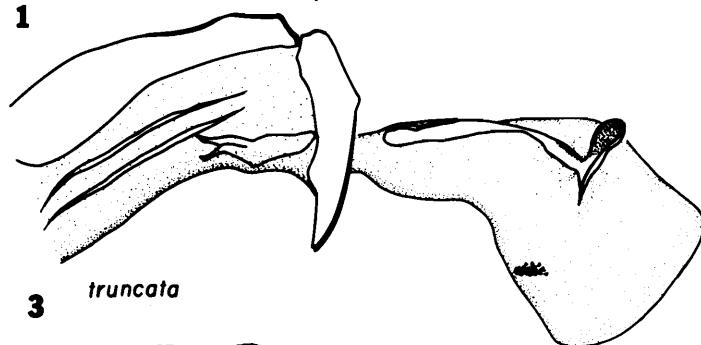
6. D. robusta female genitalia, lateral view, head to left.
7. D. pallens female genitalia, lateral view, head to left.

Figures 8-22. Ventro-lateral view of metatibial spurs of Dichelonyx males, slightly diagrammatic.

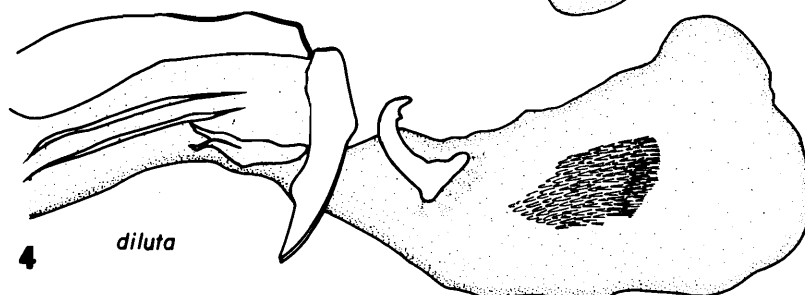
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|--|---------------------------|
| 8. <u>D. valida lateralis.</u> | 19. <u>D. subvittata.</u> |
| 9. <u>D. albicollis.</u> | 20. <u>D. elongatula.</u> |
| 10. <u>D. valida sulcata.</u>
(Arizona) | 21. <u>D. fuscula.</u> |
| 11. <u>D. valida sulcata.</u>
(New Mexico) | 22. <u>D. macclayi.</u> |
| 12. <u>D. valida vicina</u>
(San Diego, Calif.) | |
| 13. <u>D. v. vicina.</u>
(Placer Co., Calif.) | |
| 14. <u>D. decolorata.</u> | |
| 15. <u>D. v. valida.</u>
(Mill Valley, Calif.) | |
| 16. <u>D. clypeata.</u> | |
| 17. <u>D. picea.</u> | |
| 18. <u>D. diluta.</u> | |



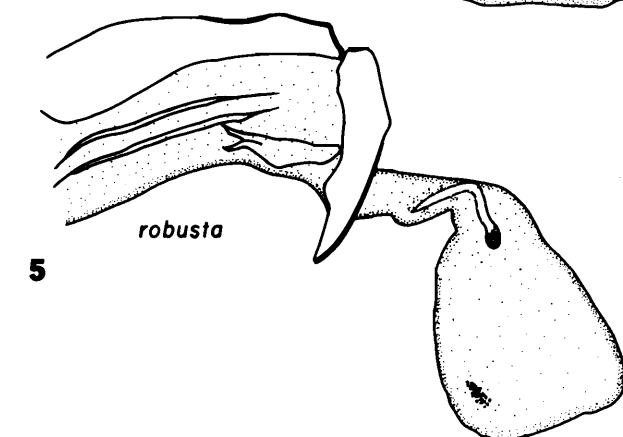
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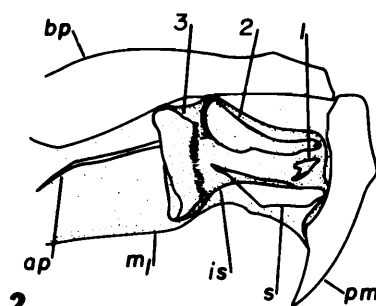
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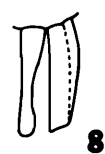
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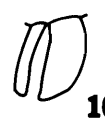
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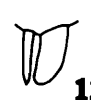
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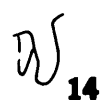
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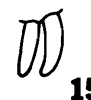
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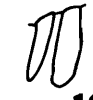
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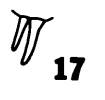
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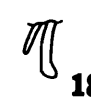
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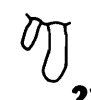
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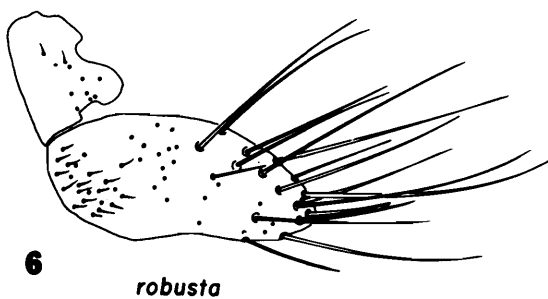
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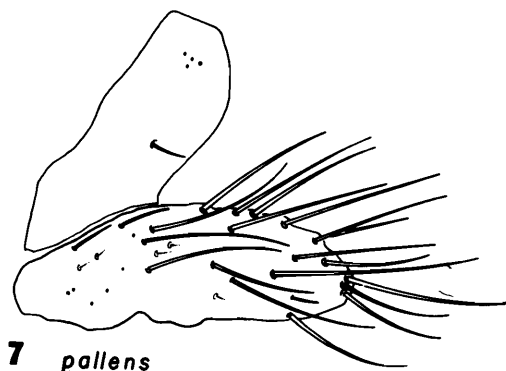
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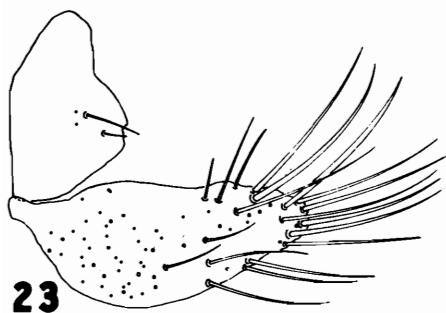
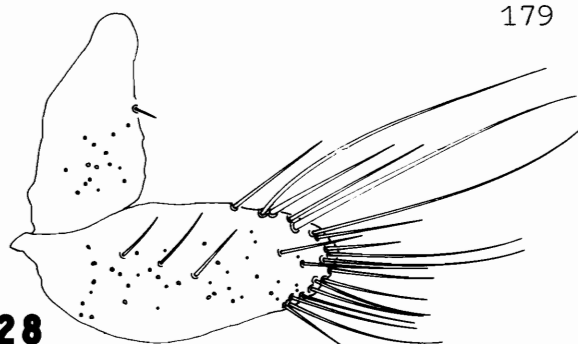
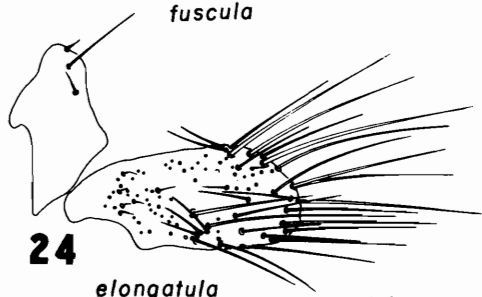
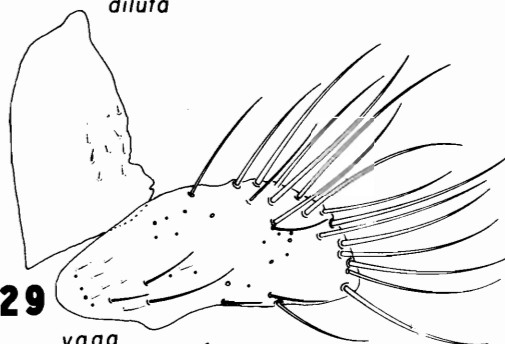
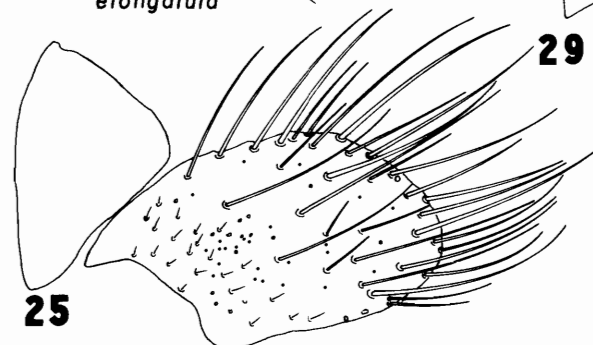
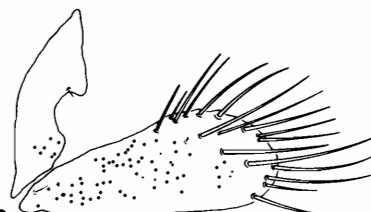
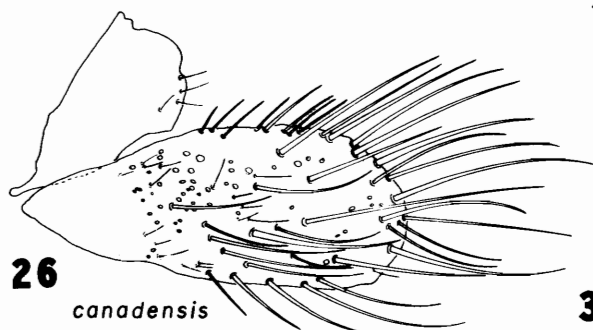
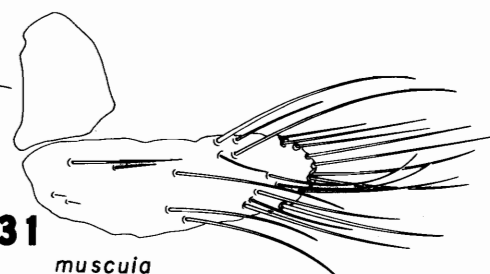
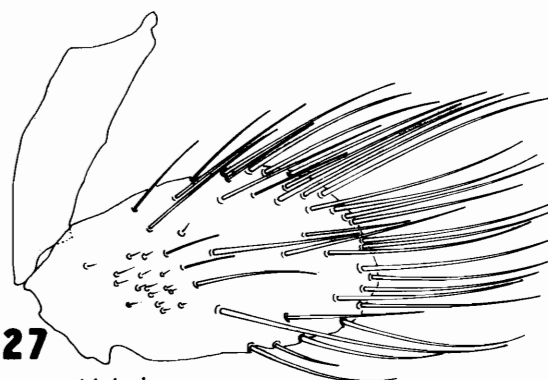
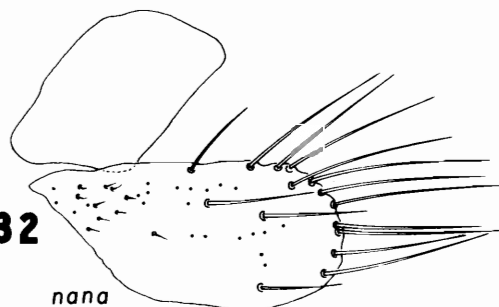
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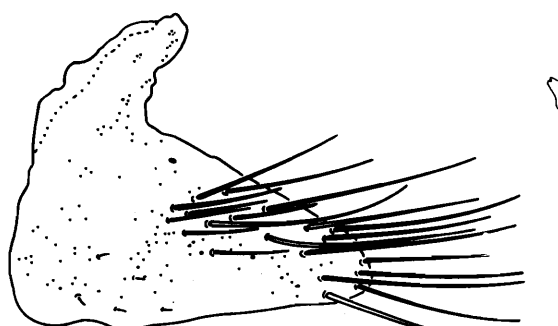
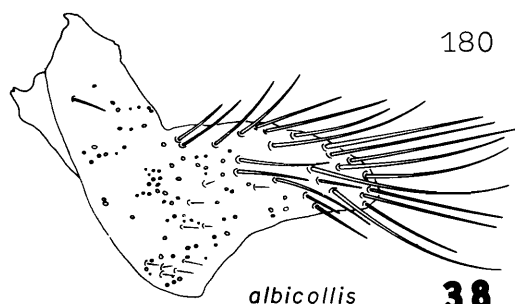
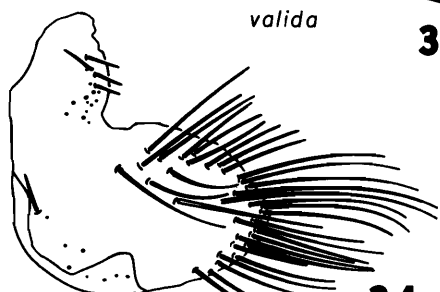
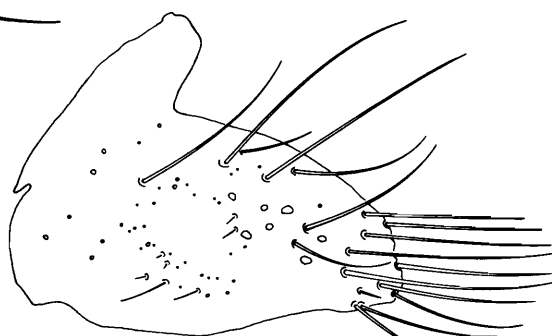
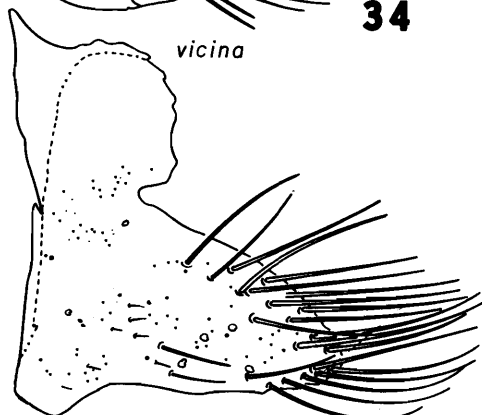
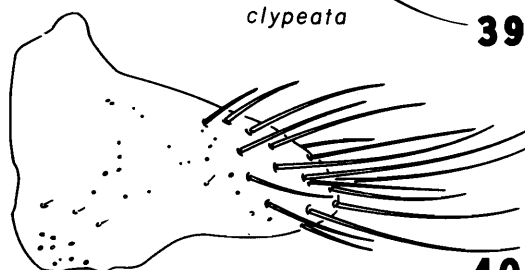
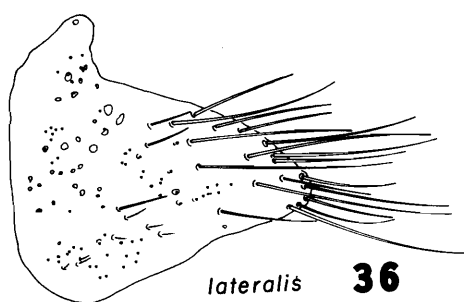
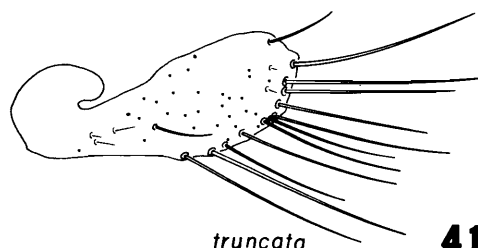
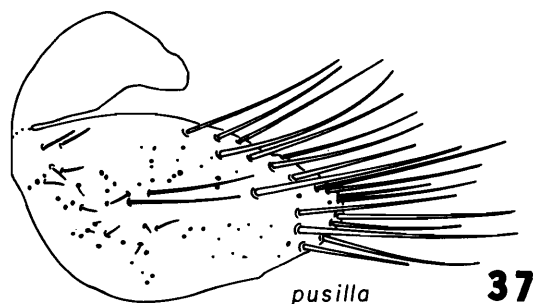
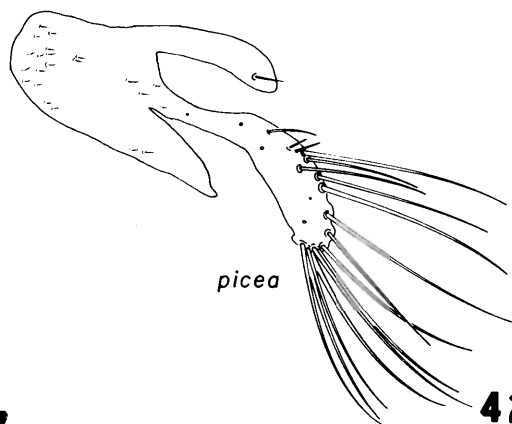
Figures 23-32. Female genitalic sclerites of Dichelonyx species, head of specimen to left of page.

- 23. D. fuscula.
- 24. D. elongatula.
- 25. D. subvittata.
- 26. D. canadensis canadensis.
- 27. D. canadensis kirbyi.
- 28. D. diluta.
- 29. D. vaga.
- 30. D. backi.
- 31. D. muscula.
- 32. D. nana.

**23***fuscula***28***diluta***24***elongatula***29***vaga***25***subvittata***30***backi***26***canadensis***31***muscula***27***kirbyi***32***nana*

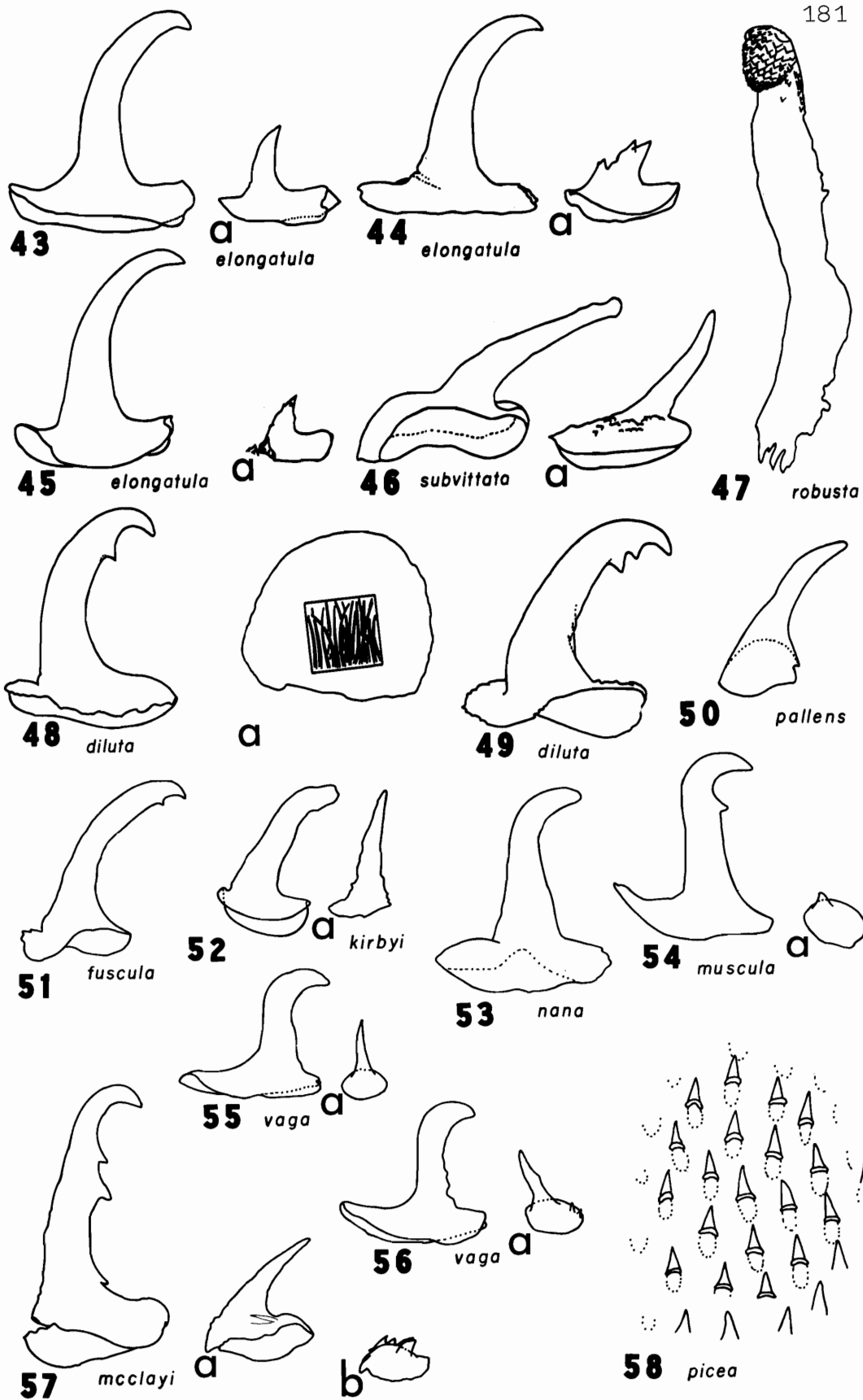
Figures 33-42. Female genitalic sclerites of Dichelonyx species, head to left of page.

- 33. D. valida valida.
- 34. D. valida vicina.
- 35. D. v. sulcata from White Mts., Ariz.
- 36. D. v. lateralis.
- 37. D. pusilla.
- 38. D. albicollis.
- 39. D. clypeata.
- 40. D. decolorata.
- 41. D. truncata.
- 42. D. picea.

*valida***33***albicollis***38***vicina***34***clypeata***39***sulcata***35***decolorata***40***lateralis***36***truncata***41***pusilla***37***picea***42**

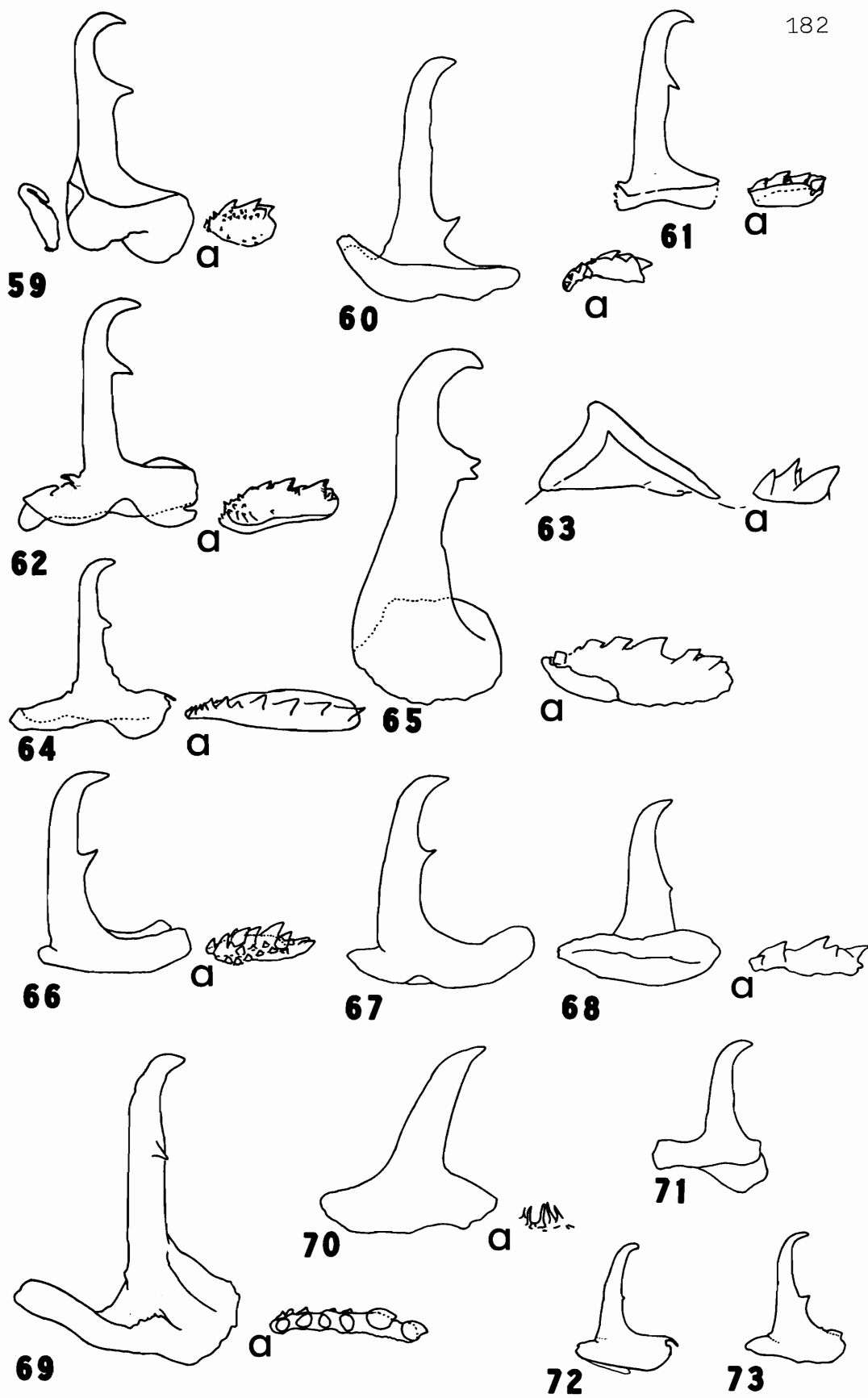
Figures 43-58. Male genital sac sclerites of Dichelonyx species numbered as described in text.

- 43. D. elongatula #1, a, #2.
- 44. D. elongatula #1, a, #2.
- 45. D. elongatula #1, a, #2.
- 46. D. subvittata #1, a, #2.
- 47. D. robusta.
- 48. D. diluta #1, a, patch of long setae (diagram).
- 49. D. diluta #1 only.
- 50. D. pallens.
- 51. D. fuscula.
- 52. D. canadensis kirbyi #1, a, #2.
- 53. D. nana.
- 54. D. muscula #1, a, #2.
- 55. D. vaga #1, a, #2.
- 56. D. vaga #1, a, #2.
- 57. D. macclayi #1, b, #2, a, #3.
- 58. D. picea section of end of internal sac showing many spine-like setae.



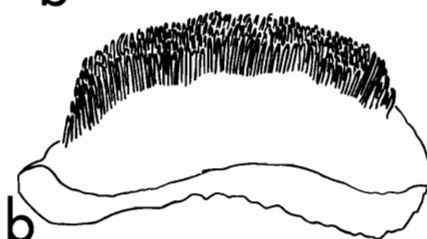
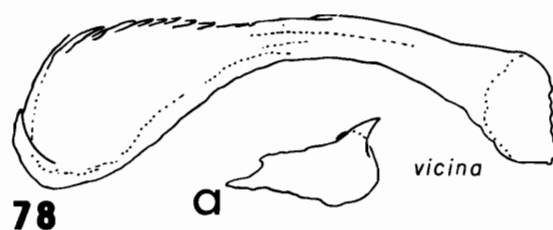
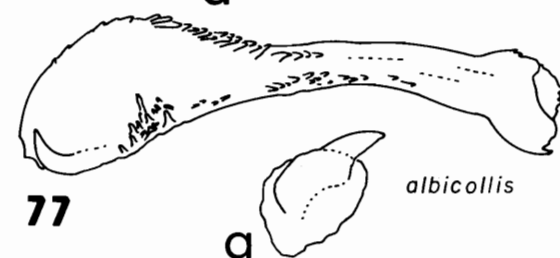
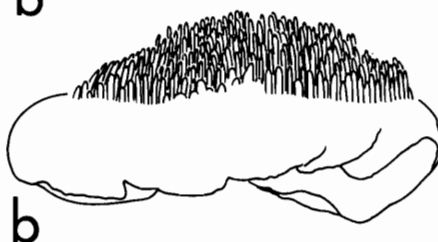
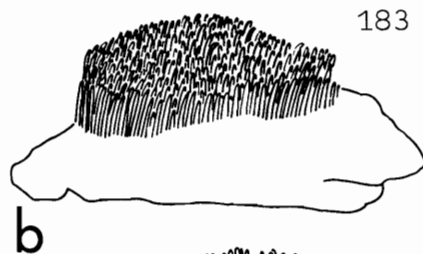
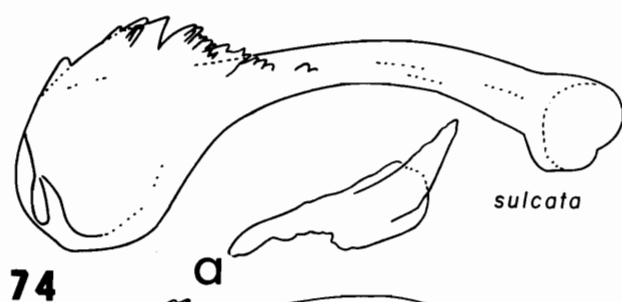
Figures 59-73. Sclerites of male genitalic sac of Dichelonyx backi from various localities showing range of variability.

- 59. D. backi #1, a, #2.
- 60. D. backi #1, a, #2.
- 61. D. backi #1, a, #2.
- 62. D. backi #1, a, #2.
- 63. D. backi #1, a, #2.
- 64. D. backi #1, a, #2.
- 65. D. backi #1, a, #2.
- 66. D. backi #1, a, #2.
- 67. D. backi #1 only.
- 68. D. backi #1, a, #2.
- 69. D. backi #1, a, #2.
- 70. D. backi #1, a, #2.
- 71. D. backi #1 only (only one found)
- 72. D. backi #1, only #1 found.
- 73. D. backi #1, only #1 found.



Figures 74-85. Male genital sac sclerites of Dichelonyx species.

- 74. D. valida sulcata #2, a, #1, b, #3.
- 75. D. valida lateralis #2, a, #1, b, #3.
- 76. D. valida valida #2, a, #1, b, #3.
- 77. D. albicollis #2, a, #1, b, #3.
- 78. D. valida vicina #2, a, #1, b, #3.
- 79. D. decolorata #2, a, #3.
- 80. D. decolorata #2.
- 81. D. decolorata #1, from same individual as Fig. 79.
- 82. D. decolorata #1, from same individual as Fig. 80.
- 83. D. pusilla.
- 84. D. clypeata.
- 85. D. truncata #1, a, setal patch.



Figures 86-89. Dorsal view of Dichelonyx pronota.

86. D. valida.

87. D. backi.

88. D. elongatula.

89. D. picea.

Figures 90-96. Clypeus of Dichelonyx species; above to left dorsal outline, at right, diagrammatic cross-section at about middle showing relative reflexion and eye position.

90. D. backi.

91. D. backi.

92. D. backi.

93. D. nana.

94. D. vaga.

95. D. muscula.

96. D. truncata, above, cross-section; below, lateral view.

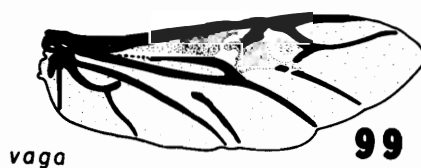
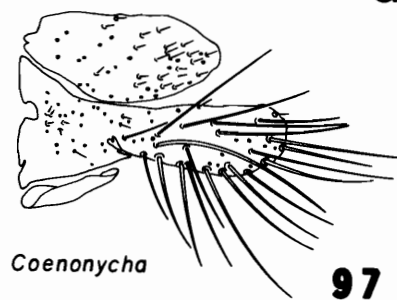
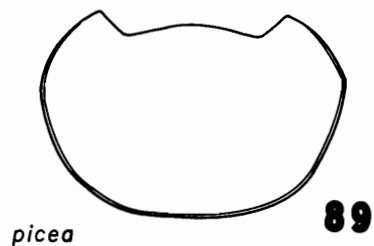
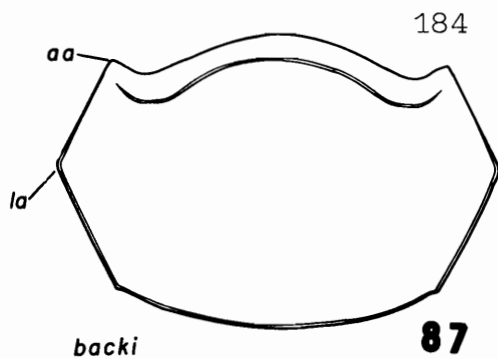
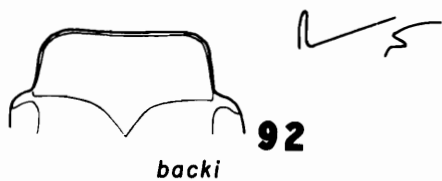
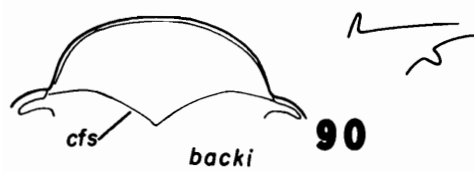
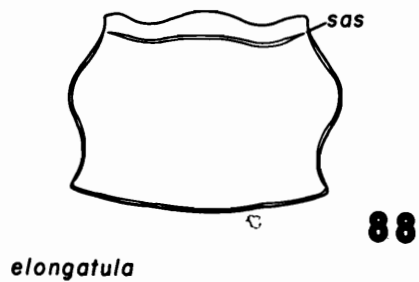
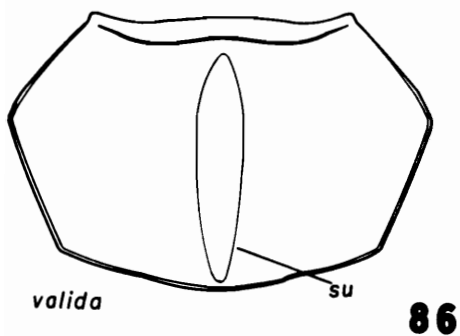
Figure 97. Female genitalic sclerites of Coenonycha species.

Figures 98-100. Metathoracic wings of Dichelonyx species.

98. Wing of D. picea.

99. Wing of D. vaga.

100. Wing of D. decolorata.

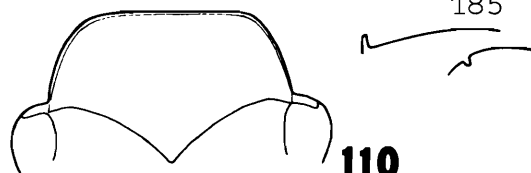


Figures 101-118. Clypeus of Dichelonyx species: above number, diagrammatic cross-section at about middle showing eye position and relative reflexion; to left, dorsal outline of clypeus.

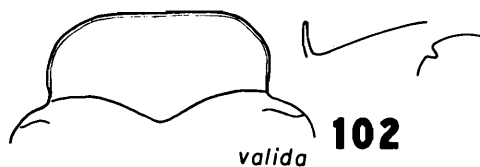
- 101. D. albicollis.
- 102. D. valida valida.
- 103. D. valida lateralis.
- 104. D. valida vicina (Oregon)
- 105. D. valida vicina (Calif.)
- 106. D. pusilla.
- 107. D. decolorata.
- 108. D. picea.
- 109. D. clypeata.
- 110. D. subvittata.
- 111. D. elongatula.
- 112. D. diluta.
- 113. D. canadensis canadensis.
- 114. D. canadensis kirbyi.
- 115. D. fuscula.
- 116. D. macclayi.
- 117. D. pallens.
- 118. D. robusta, a, Oregon, b, California



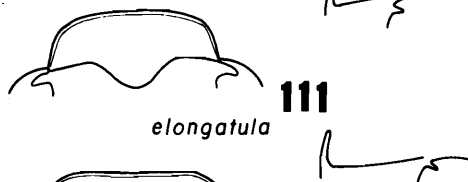
albicollis



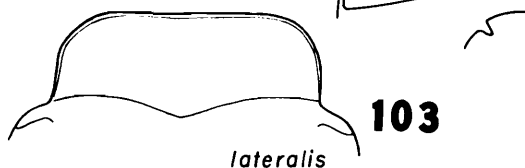
subvittata



valida



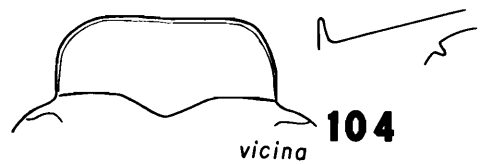
elongatula



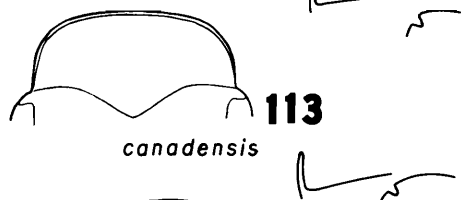
lateralis



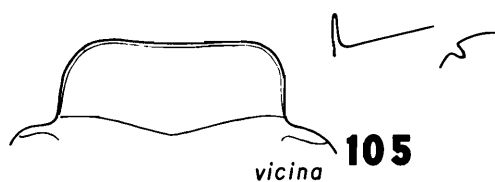
diluta



vicina



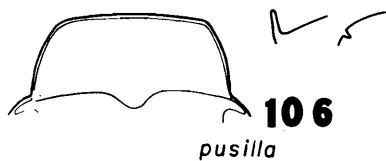
canadensis



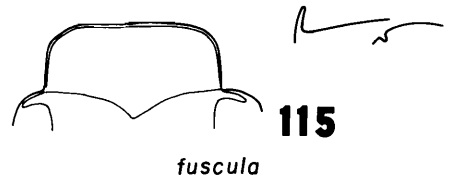
vicina



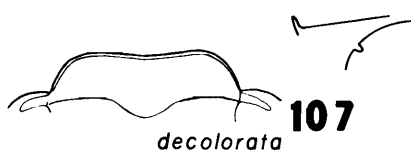
kirbyi



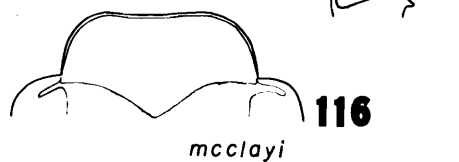
pusilla



fuscula



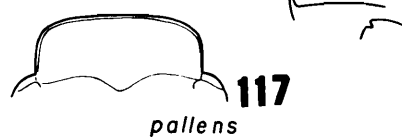
decolorata



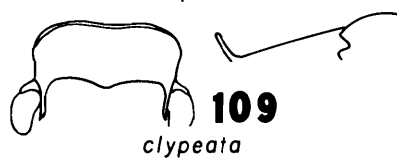
mcclayi



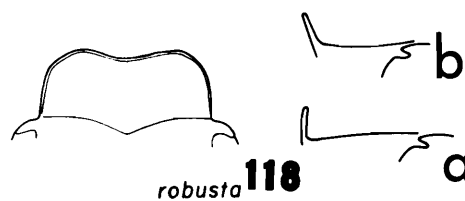
picea



pallens



clypeata



robusta

Figure 119. Distribution map of Dichelonyx backi.

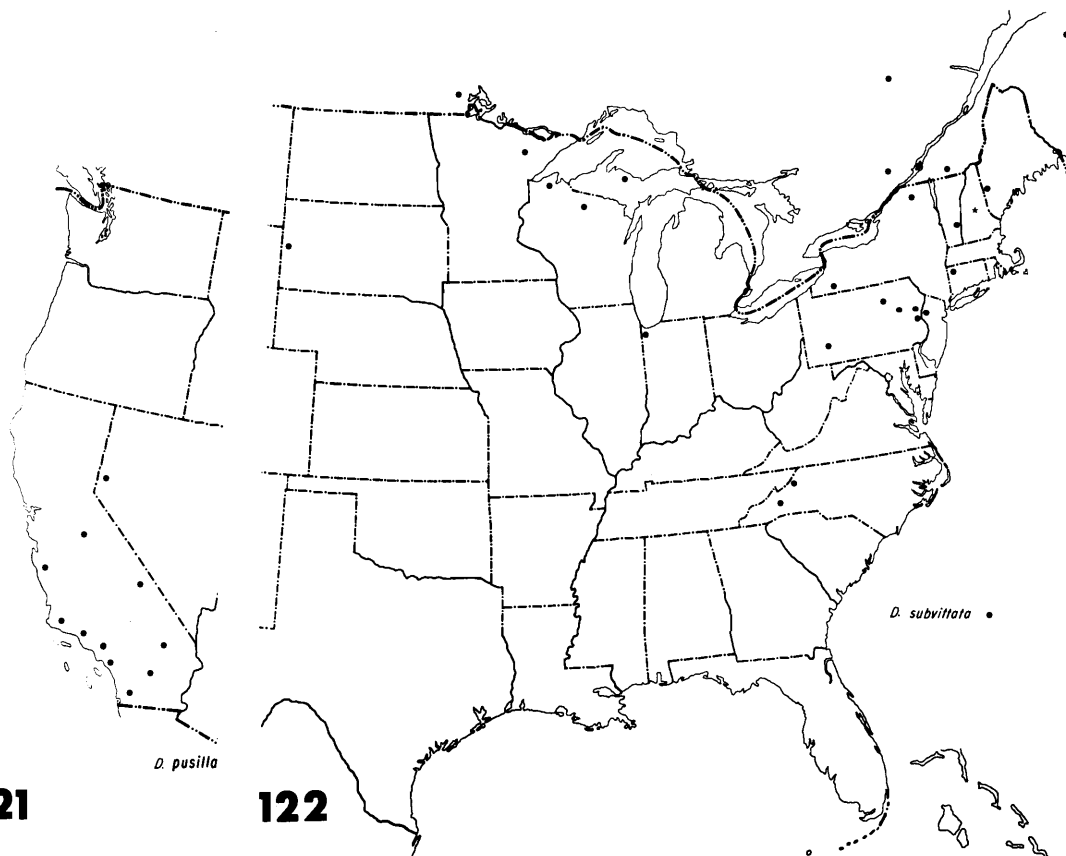
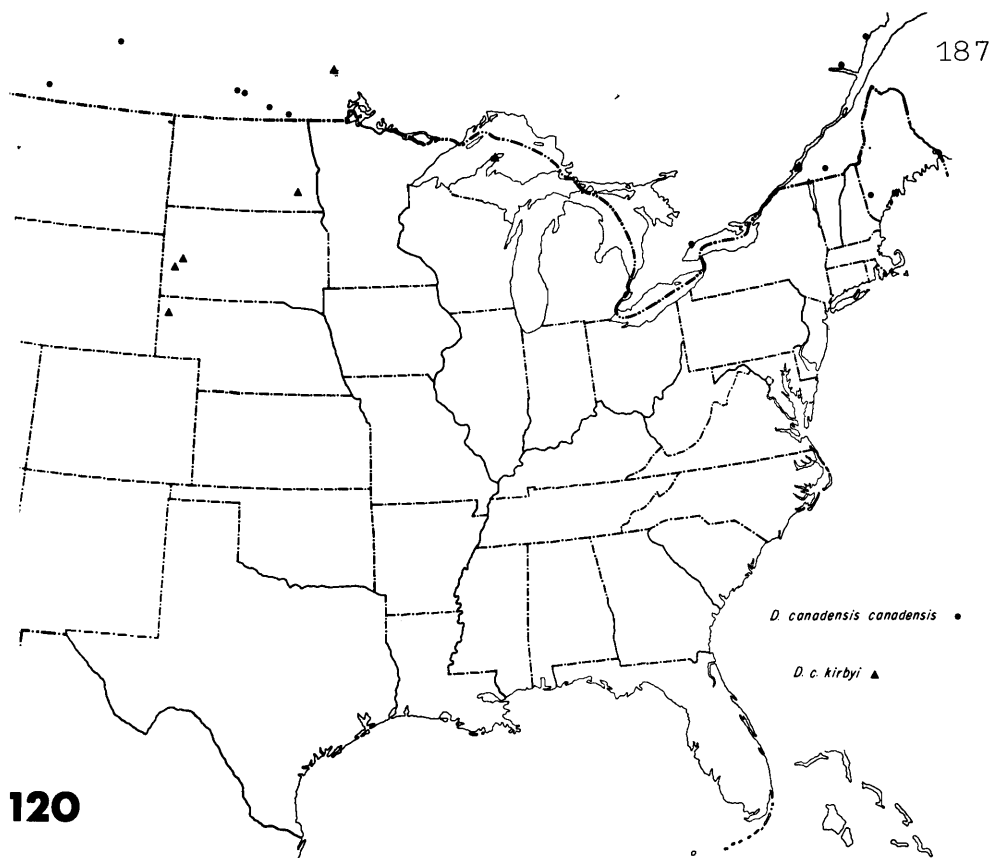


Figures 120-122. Distribution maps of Dichelonyx species.

120. D. canadensis canadensis, D. c. kirbyi.

121. D. pusilla.

122. D. subvittata.



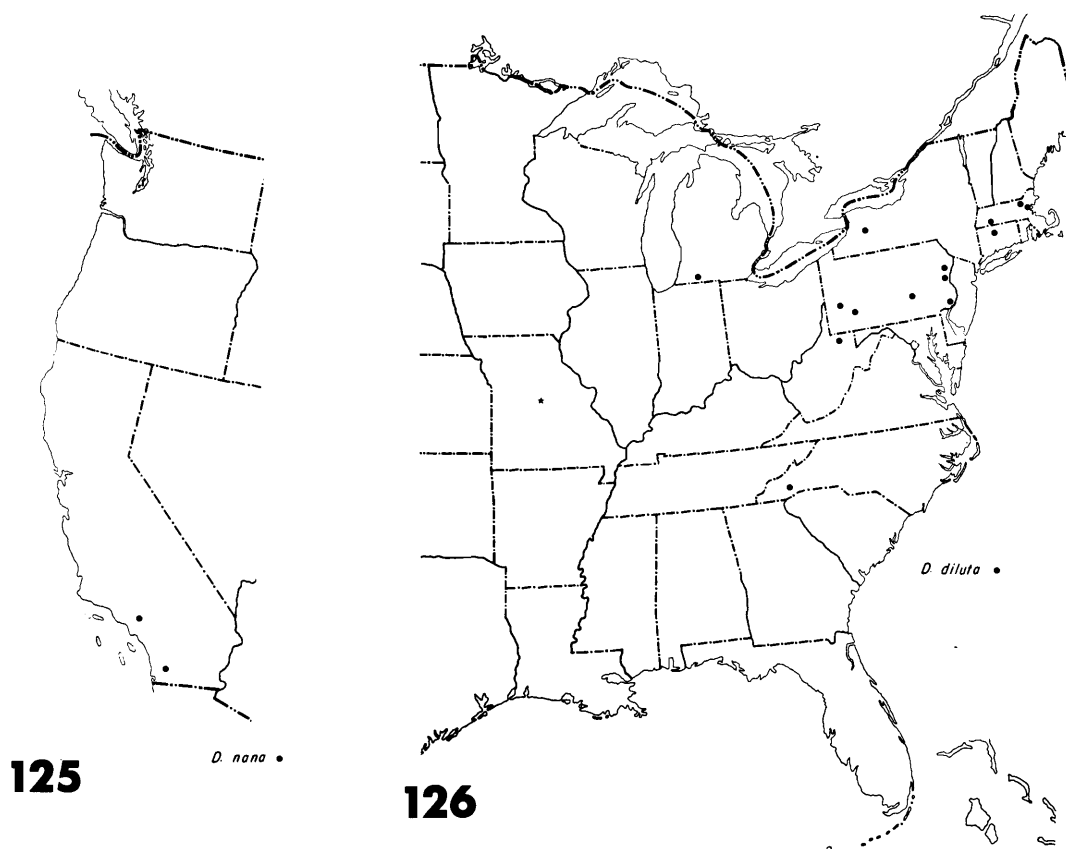
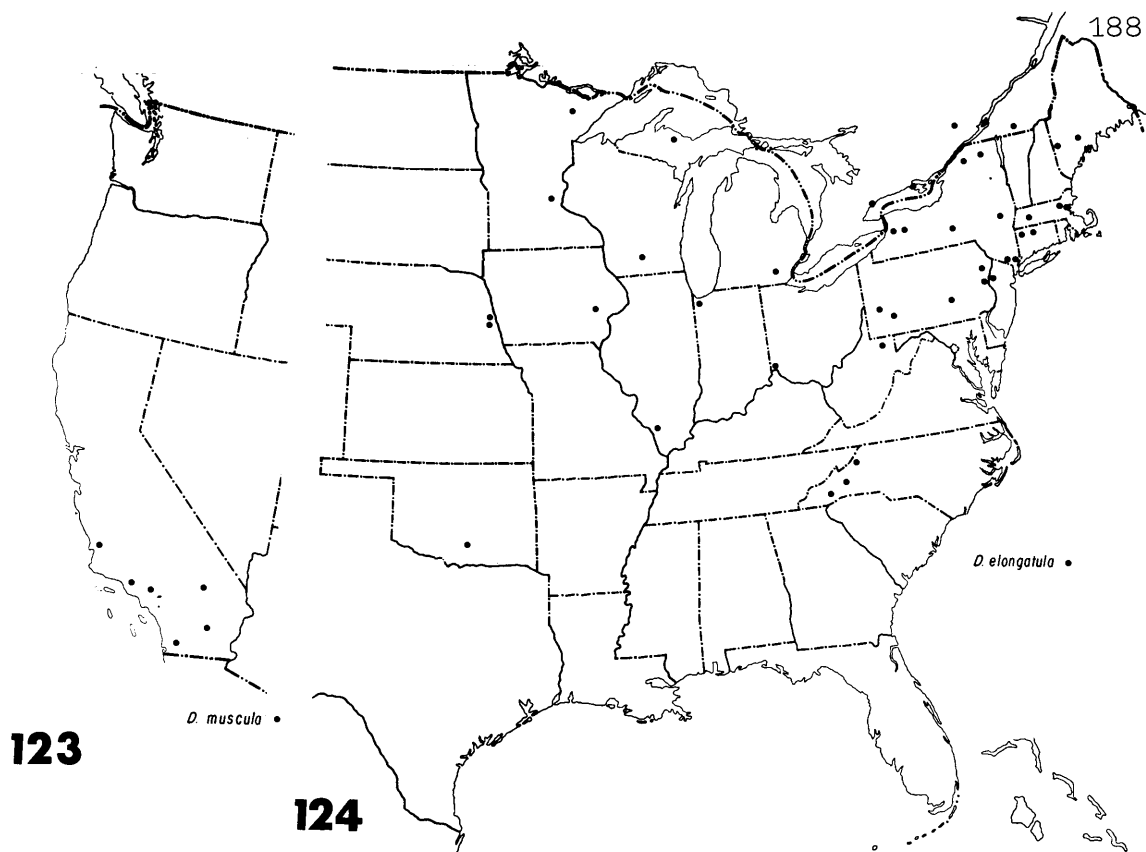
Figures 123-126. Distribution maps of Dichelonyx species.

123. D. muscula.

124. D. elongatula.

125. D. nana.

126. D. diluta.



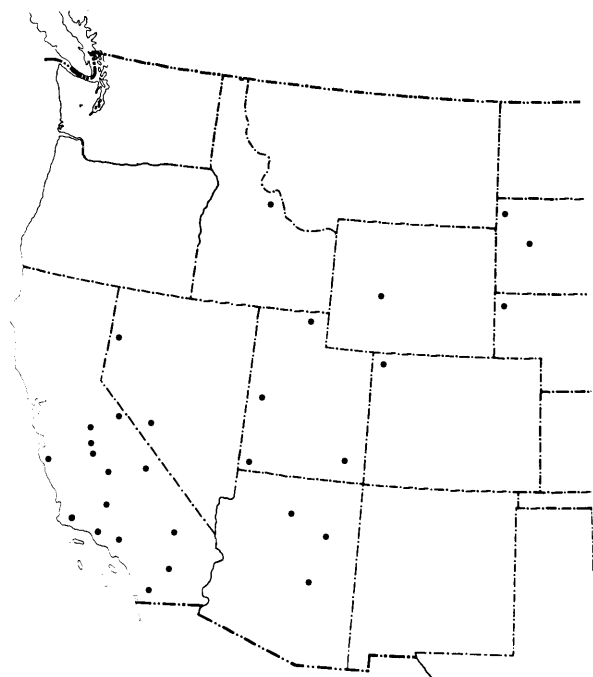
Figures 127-130. Distribution maps of Dichelonyx species.

127. D. truncata.

128. D. fuscula.

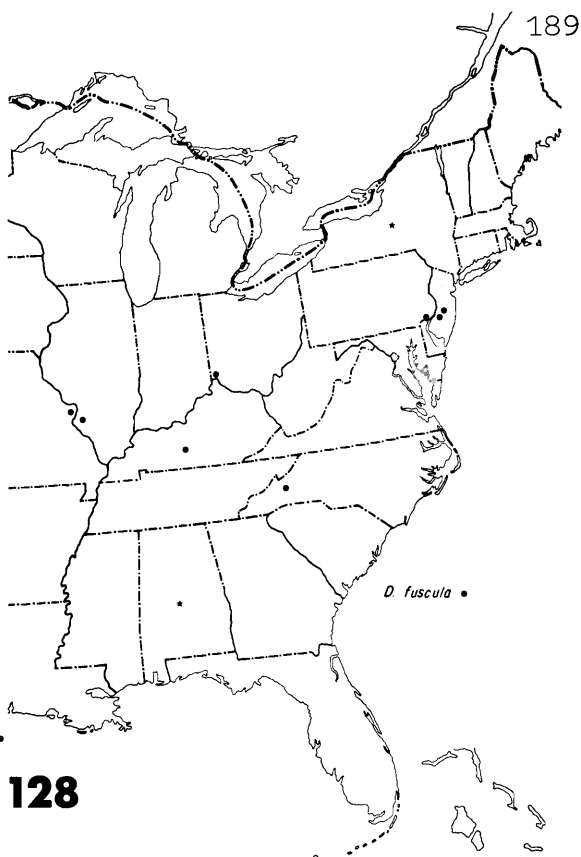
129. D. vaga.

130. D. albicollis.



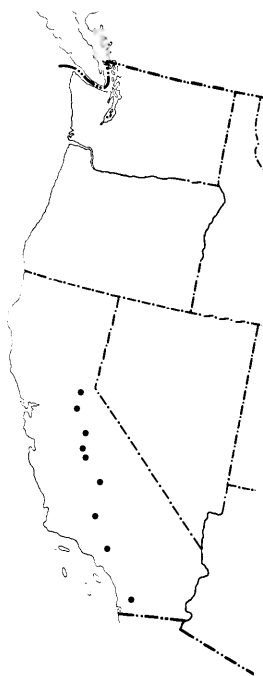
127

D. truncata •



128

D. fuscata •



129

D. vaga •



130

D. albicollis •

Figure 131. Distribution Map of Dichelonyx species.

D. valida valida.

D. v. vicina.

D. v. sulcata.

D. v. lateralis.

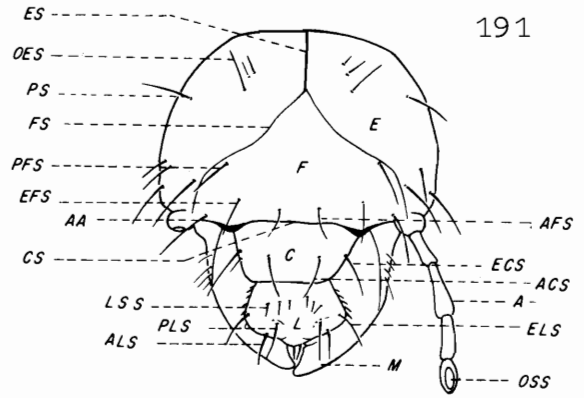


D. v. valida valida ● *D. v. lateralis* ◆

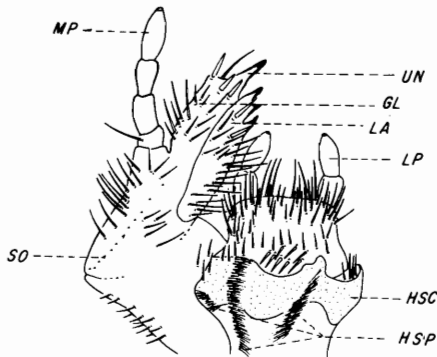
D. v. vicina ■ *D. v. sulcata* ▲

Figures 132-136. Head and mouth parts of Dichelonyx third stage larvae.

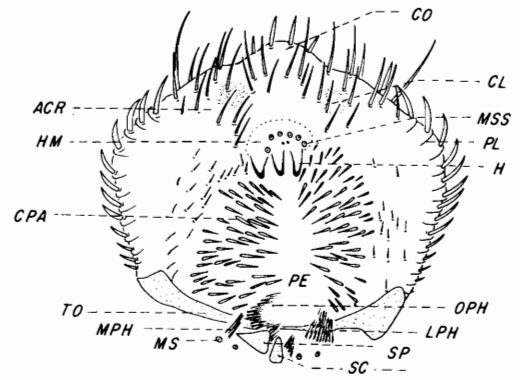
- 132. Head capsule of D. valida vicina larva.
- 133. Maxilla and hypopharynx of D. v. vicina larva.
- 134. Epipharynx of D. v. vicina larva.
- 135. Right mandible of D. elongatula larva, ventral view.
- 136. Left mandible of D. elongatula larva, ventral view.



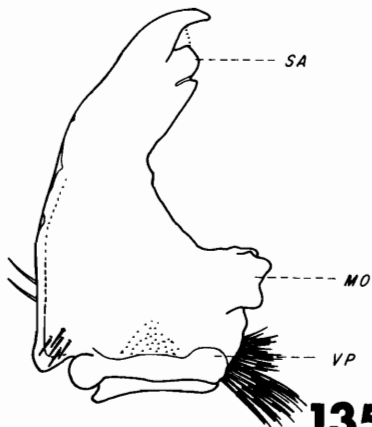
132



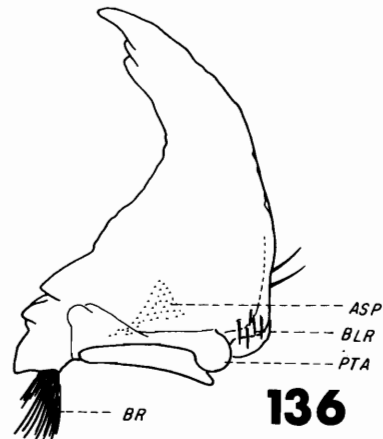
133



134



135



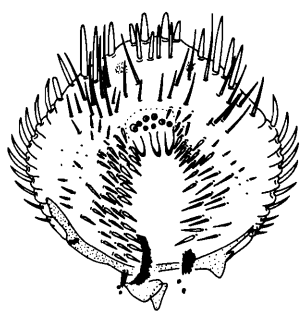
136

Figures 137-145. Epipharynxes of Dichelonyx larvae.

- 137. D. pusilla.
- 138. D. albicollis.
- 139. D. valida vicina.
- 140. D. decolorada.
- 141. D. truncata.
- 142. D. elongatula.
- 143. D. robusta.
- 144. D. muscula.
- 145. D. backi.

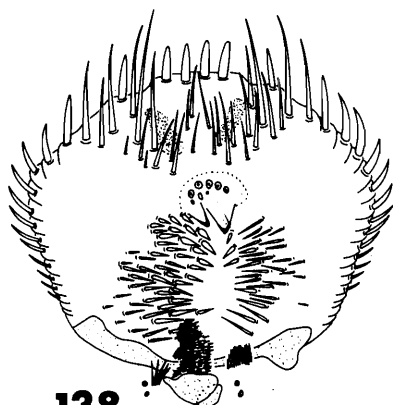
Figures 146-148. Maxillae of Dichelonyx larvae.

- 146. D. valida vicina.
- 147. D. albicollis.
- 148. D. pusilla.



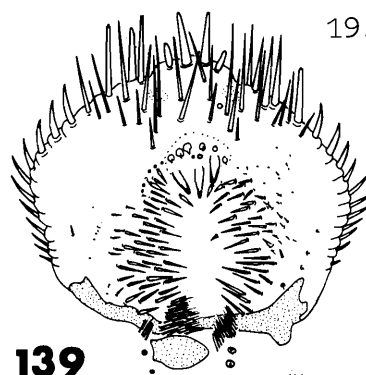
137

pusilla



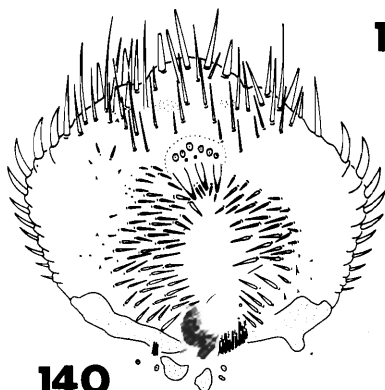
138

albicollis



139

valida vicina



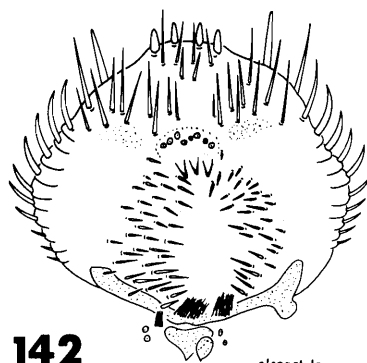
140

decolorata



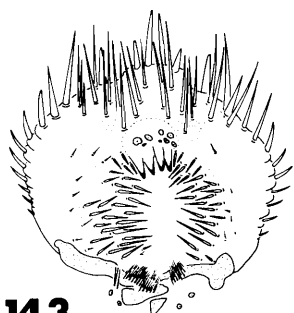
141

truncata



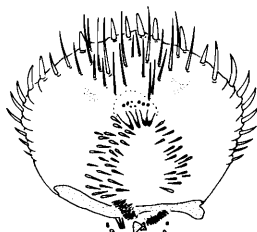
142

elongatula



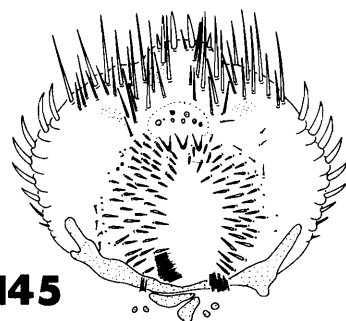
143

robusta



144

muscula



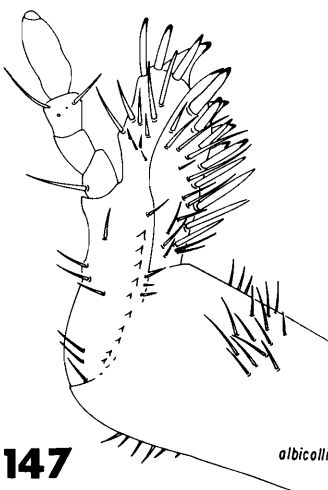
145

backi



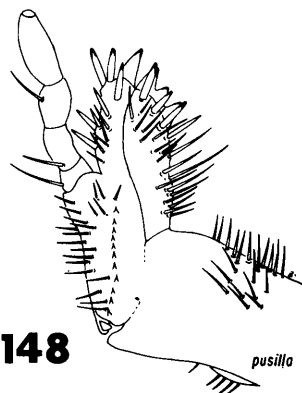
146

valida vicina



147

albicollis



148

pusilla

Figures 149-154. Maxillae of Dichelonyx larvae.

149. D. decolorata.

150. D. robusta.

151. D. muscula.

152. D. backi.

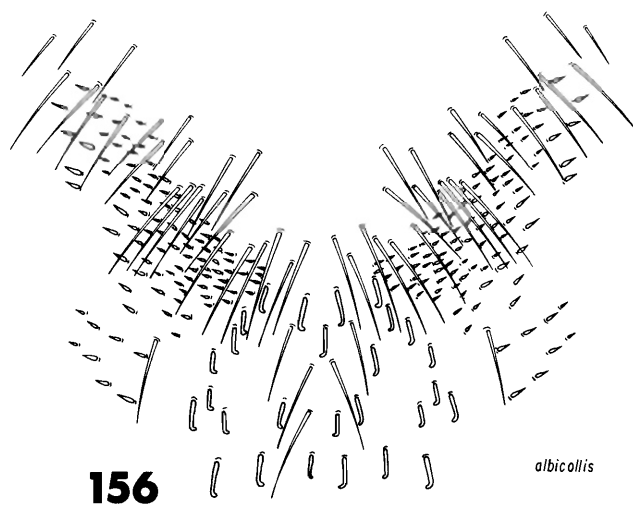
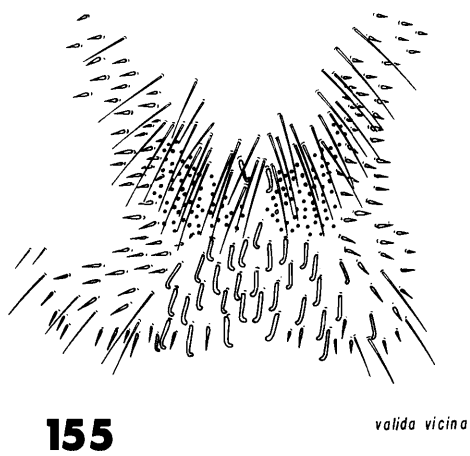
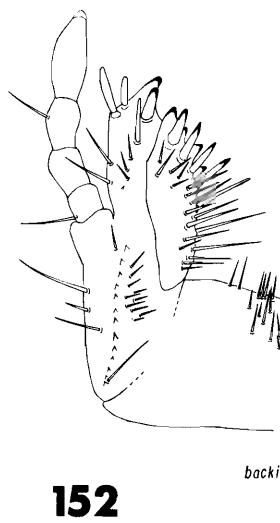
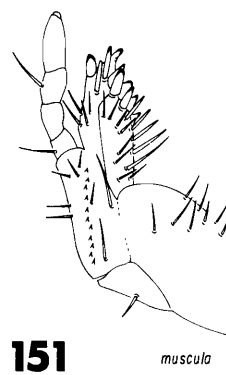
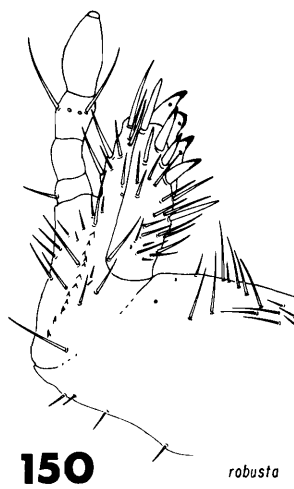
153. D. elongatula.

154. D. truncata.

Figures 155-156. Rasters of Dichelonyx larvae.

155. D. valida vicina.

156. D. albicollis.



Figures 157-163. Rasters of Dichelonyx larvae.

157. D. decolorata.

158. D. backi.

159. D. robusta.

160. D. truncata.

161. D. muscula.

162. D. pusilla.

163. D. elongatula.

Figures 164-165. Caudal view of Anal Lobes of Dichelonyx larvae.

164. D. backi.

165. D. valida vicina.

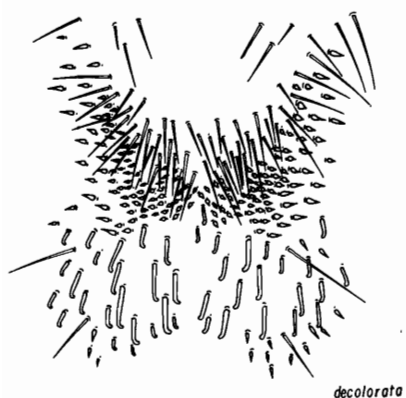
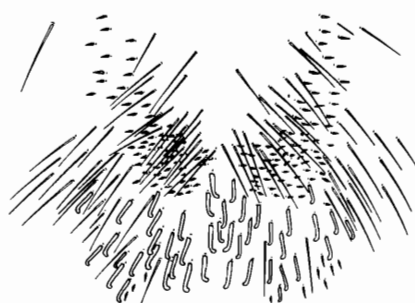
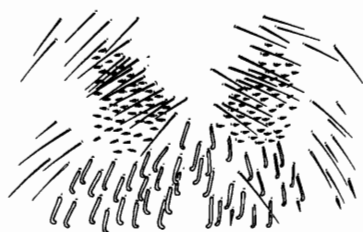
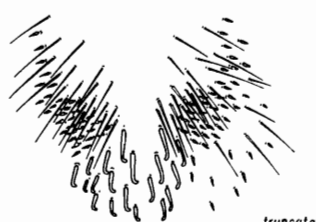
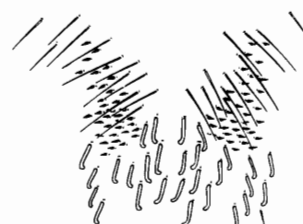
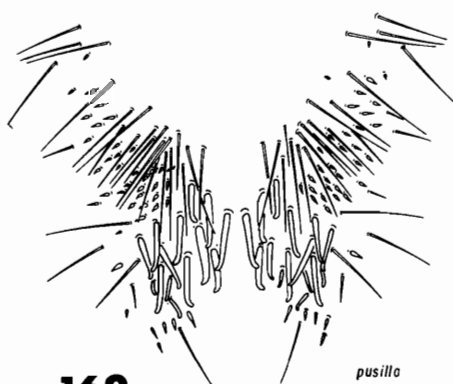
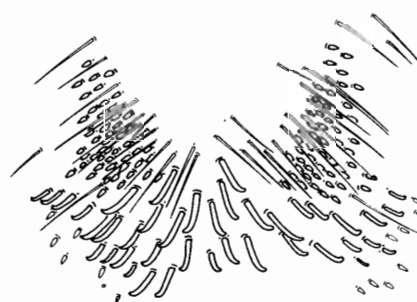
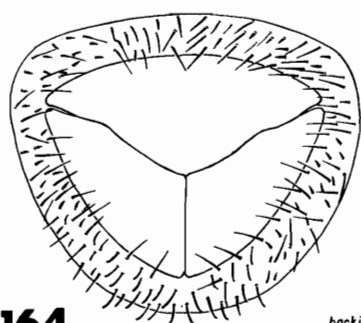
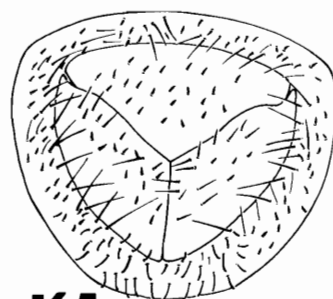
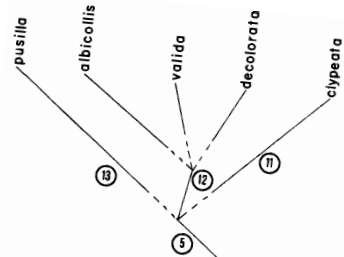
**157***decolorata***158***backi***159***robusta***160***truncata***161***muscula***162***pusilla***163***elongatula***164***backi***165***valida vicina*

Figure 166. Phenetic relationships among species and species groups in the genus Dichelonyx.

Numbers in circles on the figure refer to characteristics shared by the various species.

1. Adult without pronotal sulcus; female with divided coxite; larva with setose anal lobes.
2. Adult without pronotal sulcus; larva with non-setose anal lobes. (The non-sulcate group).
3. Larva with setose anal lobes.
4. Adult without pronotal sulcus; female with undivided coxite; male internal sac without distinct sclerites (The Picea Group).
5. Adult with pronotal sulcus; female with undivided coxite. (The Sulcate Group).
6. Adult female with undivided coxite; male genital sac with a setal patch and a single sclerite.
7. Adult female with divided coxite; male with one or more sclerites on internal sac.
8. Male with two sclerites on internal sac; species with an eastern distribution.
9. Male with three sclerites on internal sac; species with an eastern distribution.
10. Male with one or two, often hooklike, sclerites on internal sac; species with a western distribution.
11. Male with a single beaklike sclerite on internal sac.
12. Male with three sclerites on internal sac.
13. Male with a single straplike sclerite on internal sac.



picea



Dichelonyx



truncata

robusta

diluta

fuscula

elongatula

subvittata

canadensis

maculayi

nana

vaga

backi

muscula

pallens

Coenonycha

Locality Data from Specimens Examined

Dichelonyx albicollis (Burmeister), 1855

Canada:

New Brunswick, Bathurst, VI-27 (1);

Ontario, Hastings Co., VI-6-37 (4), Prince Edward Co.,

V-27-20, VI-26 (2), Ridgeway, VI-29-13 (1);

Quebec, Queens Park, VII-10-1922 (2);

United States:

Connecticut:

Litchfield Co., Cornwall, VI-29-23 (4);

Indiana:

No county, Pine, IV-3-1926 (3);

Massachusetts:

Barnstable Co., Dennis, VII-4-54 (4);

Franklin Co., Charlemont, VII (1);

Hampden Co., Chicopee, VI (1);

Hampshire Co., Amherst, V-25-22 (1),

Haydenville, VI-21-59 (1), Northampton,

V-13-44 (1);

Middlesex Co., Concord, VI (1), Sherborn,

VI-8 (1);

Suffolk Co., Boston, VII-13-1915 (1);

Worcester Co., n.d. (1);

No county: Beach Bluff, VI-21-16 (1);

Michigan:

Cheboygan Co., (only), VI-19-49 (1);
Marquette Co., Marquette, VI-28 (3);
Oceana Co., Pentwater, VII-2-7-1947 (1);
No county: Michigan (only), n.d. (3),
Horn Mt. Club, VI (5);

Minnesota:

Saint Louis Co., Duluth, n.d. (1);

New Hampshire:

No county, Squam Lake, VI-11-37 (3);

New Jersey:

Burlington Co., Medford, V-26-29 (1);
Gloucester Co., Malaga, V-24-19 (1);
Ocean Co., Seaside Park, VI-8-25, VI-20-26 (3);
No county: Atsion, VI-16-29 (2);

New York:

Clinton Co., Upper Saranac, VII-6-28 (2);
Erie Co., Buffalo, n.d. (1);
Tompkins Co., (only), VI-3-57, VI-9-60 (4),
Ithaca, VI-19-07 (1);
No county, New York only, n.d. (1);

North Carolina:

Jackson Co., Balsam, VI-1-15-65 (2);

Pennsylvania:

Franklin Co., Mt. Alto, VII-32 (1);
 Dauphin Co., VI-16-28 (1);
 Monroe Co., Effort, VII-20-31 (1); Pocono
 Lake, VI-11-11 (1), Tannersville,
 VI-2-49, VI-8-50 (2);

Vermont:

Windsor Co., Quechee, VII-4-35, VII-14-37 (8);

Wisconsin:

Oneida Co., Minocqua, VII-26-96 (1);

Dichelonyx backi (Kirby)

Canada:

Alberta, Banff, VI (1), Bilby, VI-20-24; VI-22 (4),
 Cypress Hills, VI-26-1929, VII-11-1934 (20),
 Edmonton, VI-19-15, VI-28-19 (23), Meadows,
 VII-20-04 (1), Waterson Lake, VII-10-49 (1);
 British Columbia, Ashcroft, VI-23-30 (8), Aspen
 Grove, V-7-34, VI-4-31 (4) (hosts: Populus
tremuloides), Briscoe, VI-10-32 (1), Chilcotin,
 V-28-21, VI-2-21 (9), Christina (Sheep Cr.),
 VI-23-25 (1), Copper Mt., VI-22-28 (2) (host:
 on Pseudotsuga mucronata), Creston, VII-1-30,
 VII-20-27 (75) (host: Psycomp opilfolus),
 Edgewater, VII-2-29 (1), Fernie, VI-6-35,

VI-20-35 (6), Grindrod, V-24-1953 (1), Kaotenay
 Park, VII-5-29 (1), Kingvale, VI-1-1922 (1),
 Langley Prairie, V-8-32 (3), Lumby, VI-31-32
 (29), same, (Creighton U.), V-18-22 (1),
 Mabel Lake V-25-41, VII-1-29 (5), Mara,
 V-1920, VIII-22 (3), Merritt (Midday Val.),
 VI-1-24, VII-3-24 (10), Morrissey, VI-5-46 (1),
 Nanaimo (Biol. Sta.), VI-23-20, VI-27 (4),
 Pender Harbor, V-24-28, V-27 (4), same (Hotel
 Lake), V-10-26 (6), Pillar Lake, VI-19-27 (1),
 Salmon Arm, IV-1-35, VI-30-31 (12), Shuswap
 Falls, VI-20-1920 (2), Sicamous, 1911 (1)
 (host: Douglas Fir), Sanich Dist., V-26-17
 (1), Sidney, V-8-1926, V-18-26 (4), Spious
 Creek, VII-11-1922 (11), Trinity Valley, VI-2-
 29, VII-20-29 (35), Vernon, V-11-32, VI-26-20
 (38), same (23 mi. E.), V-1956 (2), same (Cold
 Stream) V-29-1926 (2) (host: On Cherry Apple),
 same (Whitemans Creek), VI-12-1920, VI-13-1920
 (15), Victoria, VI-27-18 (1), Yale Region,
 (4 mi. W. Princeton), VI-3-1957 (1), Yauk,
 VI-15-1953 (2);
 Manitoba, Aweme, VII (4), Brandon, VI-17-1948 (1),
 Russel, VII-17-1954 (1);

Ontario, Toronto, VI-8-1927 (1), Wawa, VII-4-1961
(6);

Quebec, Duparquet (Lakeshore), VII-1-1941 (1),
Knowlton, VI-12-1928 (1), Roberval, VI-16-38,
VII-1-1938 (5), Sanmaur, VI-13 (1), Wright,
VI-27-1933 (1).

United States:

Arizona:

Apache Co., Alpine, VI-4-37 (9), Greer, VI-16-
1937, VII-13-1953 (2), White Mtns., VI-
18-38, VII-13-1933 (36);

Coconino Co.; Grand Canyon, VI-1-1946, VI-16-
1930 (11), San Francisco Mts., VII-1-1959
(5);

California:

Alpine Co., (only), VI-16-1960, VI-23-1961 (5),
Ebbetts Pass, VI-25-60, VI-30-60 (4),
Levantian Peak, VI-23-62 (1), Marklee-
ville, VII-12-50 (10) (at light), same
(8 mi. S.), VI-22-62 (2), Winne Mucca Lake,
VII-14-1948 (1), Woods Lake, VII-17-1960,
VII-18-1960 (2);

Butte Co., Big Bend Mtn., V-8-28 (16), Chico
(nr.), IV-25-1922 (8), Pentz, IV-5-1928,
V-14-1928 (4);

Calaveras Co., Arndd, V-24-1961, V-29-1957 (3),
Dorrington, VI-11-56 (1);

Eldorado Co., (only), VI-34, VII (5), China
Flat, VI-28-1948 (3), Echo Lake, VI-16-
1946 (1), Georgetown, VI-23-51 (1),
Grass Lake, VI-29-57 (2), Lake Tahoe,
Bajou, VI-30-1929, VII-14-1927 (15),
Fallen Leaf Lake, Lake Tahoe, V-17-30,
VII-25-35 (28), McKinnys, VII-06 (2),
Meyrs, VI-16-1926, VII-26-1952 (13),
Pollock Pines, VI-22-1948, VII-8-1939
(37), Pyrami R., VII- 12-1948 (2),
Rockbound Valley, VII-23-41 (1), Snowline
Camp, VI-25-48 (12), Strawberry, VII-6-
1951 (3), Tallac, VII-20-21 (14), Vade,
VI-3-37 (1), nr. Whitehall VI-21-31 (9),
Wrights Lake, VII-2-48 (2);

Fresno Co., Evolution Meadows, VII-7-1952 (2),
Huckleberry Meadow (6500'), V-29-11,
VII-25-11 (9), Huntington Lake, VI-27-1948,
VIII-18-1933 (95), Lodgepole Pine,
IV-21-34 (1), Mt. Karser, VII-19-19 (1),
Piute Creek, VII-20-1952 (1), Summit
Meadows, VII-13-11, VII-21-11 (3);

Humboldt Co., Green Point, VI-5-16, VI-7-16 (8);

Inyo Co., Big Pine Creek (7500'), VI-16-1942
 (3), Mono Pass, VII-5-56 (2), Rock Creek,
 VI-16-54 (1), Whitney Portal, VI-28-1962
 (3);

Lassen Co., Black Mts., VI-20-50-, VII-27-50
 (46), Bridge Creek Camp, V-1-1947 (6),
 Chester, VII-14-34 (1), Facht, V-25-24,
 VII-17-21 (89), Martin Springs, VII-4-22,
 VII-10-22 (2), Norval Flats, VI-5-20,
 VI-18-20 (4);

Madera Co., Bass Lake, VI-18-1934 (1);

Marin Co., Mill Valley, IV-28-13 (1);

Mariposa Co. Miami Ranger Station, VII-5-46
 (2), Pothole Meadow (7750'), VII-3-1946
 (4), Yosemite Valley, V-20-31, VII-30-45
 (40), same (Boundary Hill), VII-10-54 (2),
 same (Gaylor Lakes), VII-8-46 (1), same
 (Tilden Lake), IX-29-38 (2), same (Tioga
 Rd.), VI-24-1957 (4), same (R. R. Camp),
 VII-9-37 (2), White Wolf, VII-5 (9);

Mendocino Co., Rijan Creek, VI-1-52 (1);

Modoc Co., Devils Garden, V-18-31 (3), Lily
 Lake, VII-11-59 (2), Lost Lake (8000'),
 VI-14-34 (1), Modoc N. F., VI-15-34 (1),
 Nackamore, VI-15-31 (1);

Mono Co., (only), VI-17-17, VI-18-17 (7),
 Coleville, VI-15-47 (3), Leavitt Meadows,
 VI-30-1925 (1), Mammoth Lake, VII-23-57
 (1), Monitor Pass, VI-23-62 (1), same
 (4 mi. E.), VI-24-62, VI-30-62 (4),
 Sardine Creek, VI-27-57 (7), Sonora Pass
 (2 mi. E.), VI-22-60 (19), Tioga Pass,
 VI-18-57 (3);

Nevada Co., (only), V-30-1946 (10), Bow N. F.,
 V-21-41 (1), C. B. P., VI-20-52, VII-2-52
 (3), Norden (5800'), VII-10-1956, VII-16-
 1952 (3), Sagehen Creek, (Upper, near
 Hobart Mills), V-18-62, VII-14-1962 (70),
 Shotgun Lake (Bowman Mt., 6500'), VII-13-
 23 (2), Truckee, VI-19-1927, VII-5-1927
 (35), Washington, V-30-46 (7), Cisco, VI-
 1911 (4);

Placer Co., (only), V-19-18, VI (12), Brockway,
 VI-20-41, VII-15-41 (3), Emigrant Gap,
 VI-27-37, VI-1937 (3), Lake Tahoe, VI-25-
 1936, VII-31 (13), same (Carnelian Bay),
 VI-24-1964 (9), same (Lakeside), VII-23-
 1927 (1), Phillips Station, VII-25-21 (5),
 Sugarbowl, VII-5-55 (1), Tahoe (Angora
 Lake), VI-22-15, VI-26-1915 (23), Tahoe
 City, VI-13-66, VII-4-09 (49);

Plumas Co., Chester (8 mi. N.), VI-25-60 (2),
 Johnsville, VI-7-1964, VII-10-1962 (11),
 Meadows (3500'4000'), VI-2-1924, VI-31
 (2), Nelson Creek, VII-27-04 (1), Onion
 Valley, VII-6-1952, VII-22-1951 (9);

Riverside Co., Idyllwild (Idlewild sic),
 VII-5-28 (1), Santa Clara, X-15-61 (1);

San Bernardino Co., Barton Flats, VI-15-66 (2),
 Forest Home, VI-23-32 (11), same (1 mi.
 W.), VI-20-62 (2), Hanna Flats, VI-21-54
 (1), San Bernardino Mts., 7500', VII-2-
 17 (6), Summit, VII-4-1898 (2);

San Diego Co., Mount Palomar, VI-23-62, VII-18-
 63 (7);

Santa Cruz Co., Santa Cruz Island, VIII-16-39
 (7);

Shasta Co., Bumps Heel, VII-2-47 (1), Burney
 Springs, (2 mi. W.), VI-24-47 (1), Fall
 River Mills, VII-11-23(1), Kings Creek
 Meadow, VI-2-47 (6), Lassen National
 Park, VI-15-1947, VII-19-45 (52), same
 (Bridge Camp), VI-2-1946 (2), same (15
 mi. N. E.), VII-1-1960 (8), same (Cinder
 Cone), VI-19-41 (1), same (Hat Creek),
 V-19-37, VII-10-1955 (13), same (Hat Lake),

VI-20 (1), same (Lassen Peak Trail),
 VII-14-47 (2), same (Manzanita Lake)
 V-23-44, VII-19-45 (55), same (Old
 Station) VI-24-1955 (2), same (Ponderosa),
 VI-2-1946 (1), McArthur Burney Falls St.
 Pk., VI-22-24-1960 (3), Mt. Lassen,
 VII-8-1955 (5), Shingletown, V-24-41,
 VI-7 (2), Summit Lake VII-1947 (1);
 Sierra Co., Bassets (3.5 mi. E.), VI-19-60
 (1), Gold Lake, VI-6-34, VI-21-21 (7),
 La Pass, VII-3-1960 (2);
 Siskiyou Co., (only), VI-2-11, VII-19 (5),
 Fowlers Camp, VI-12-1946 (24), Horse
 Creek, V-10-1952 (1), McCloud, (9 mi. E.),
 V-30-52, VI-20-1914 (12), Mt. Shasta,
 VI-3-37, VII-1-1941 (164), same (8000'),
 VIII-3-58 (10, same (7000')), VIII-13-58
 (3), same (Panther Meadow), VIII-8-1956
 (1), Mt. Shasta City, VI-15-60, VI-21-24-
 1958 (11), Shasta Springs, VI-21-20,
 VI-27-51 (4);
 Tehama Co., Mineral VI-25-63, VI-30-1962 (2);
 Trinity Co., Carrville, V-17-1934, VI-30-13
 (20), Coffee Creek, V-17-1934 (1), same

(Big Flat), VI-21-1934, VI-22-1934 (11),
Nash Mine, VI-12-1913 (1), Zenia, VI-19-
35 (1);

Tuolumne Co., (only), VII (10), Bumble Bee,
VI-23-1951 (2), Dardanelles, VI-26-1951
(1), same (5 mi. S.), VI-30-1964 (4),
Douglas Station, VII-12-1937 (14), Pine
Crest, VI-22-29, VI-29-1965 (3), nr.
Sonora, VI-21-30 (3), Sonora Pass, VII-6-
51, VIII-27-1951 (4), Strawberry, VI-4-
1951, VII-1-1951 (60), Tuolumne Meadows,
VI-29-16 (2), Twain Harte, V-28-55 (1);

Tulare Co., (only), VI-19-1953 (4), Beach
Ridge, VII-24-30-1965 (4), Camp Sierra,
(6400'), VII (1), Kaweah, (7500'), VI-20
(4), Kings Canyon, VII-4-56, VII-6-1961
(4), Mineralking, VII-1-1935 (1), Sequoia
National Park, V-27-29, VIII-2-1929 (28),
same (2-3000'), VI-12-1929, VI-14-1929
(5), same (7-9000'), VI-17-1929 (2),
same (Giant Forest), VI-20-51, VII-1915
(14), same (Lodgepole), VI-25-1944 (8);

No county: Badger Flat, VII-22-1937, VII-26-
1937 (16), Bear Lake, VII-4-19 (2),
Buiff Lake, n. d. (1), Camp Sacramento,

VI-7-1948 (1), Carabau, VI-1-46 (1),
 Diamond O. (Mather B. A.), VII-4-44,
 VIII-14-44 (12), Donner Lake, VIII-3-
 37 (1), Echo Summit, VII-8-38 (7), Fallen
 Heart Lake, V-30 (2), Feather River, VI-9
 44 (5), Glacier Nat. Falls, VII-30-30 (1),
 Glacier Pt., VI-22-31 (1), Kaiser Pass,
 VII-21-1937, VII-27-1937 (8), Mt. Ralston,
 VIII (1), Mt. Springs, V-21-34 (1),
 Nevada Falls, VII-29-1946 (1), Pohono
 Trail, VI-18-1931 (1), Riverton, VII-6-
 1931 (2), Sentinel Drive, VII-3-46 (5),
 Tahquitz Canyon, VI-30-48 (9), Tassararo,
 V-25-64 (1);

Colorado:

Clear Creek Co., VI-16-33 (1);
 Eagle Co., Avon, VI-26-32 (1), Edwards, VI-25-32
 (2);
 Gunnison Co., Gothic VI-26, VII-1-1962 (2);
 Park Co., Fairplay, VI-29-38 (1);
 Pitkin Co., Aspen (2 mi. N.), VII-13-1963 (3);
 Routt Co., Steamboat Springs, VII-1-1944 (36);
 No county: Kenosha (10,000'), VI-29-38 (1),
 Rabbit Ears Pass (9000'), VI-20-1950
 (1), Red Feather, VI-14-37 (1);

Idaho:

Bonner Co., Priest Lake, VII-4-54, VII-15-
1927 (6);

Camas Co., Fairfield, VI-24-60 (6) (host:
Pseudotsuga menziesii);

Clark Co., Dubois, VII-6-1960 (30);

Latah Co., Cedar Mt. (Moscow), VI-9-35, VI-24-
20 (6);

No county: Snake R., Divide Cr., V-16-25 (2);

Montana:

Cascade Co., Monarch, VI-1930 (8);

Lincoln Co., West Fork Yaak R., VII-2-66 (1);

Madison Co., Ennis, VII-3-59 (1);

No county: Bitterroot Nat. Forest, VII-1965
(1), Glacier National Park, VI-3-1930,
VII-19-1950 (45), Picnic Derby, VI-15-
1949 (1);

Nevada:

Elko Co., E. Slope Spruce Mtn., VI-26-56 (1);

Ormsby Co., Carson City, VII-6-34 (1);

Washoe Co., Mt. Rose, VI-9-1958, VII-28-62 (13);

New Mexico:

Otero Co., Cloudcroft (9000'), VI-12-1905,
VIII-12-05 (15);

Sandoval Co., Jemez Mts., VI-4 (1),

Santa Fe Co., VI-14-35 (17);

Oregon:

Baker Co., Anthony Lake, VI-24-60, VII-12-53
 (29), Baker, VI-2-39, VII-4-38 (12),
 Baker, Spring Creek, V-25-42 (1), Crane
 Flats, Whitman N. F., VII-26-45 (1),
 Durkee, VI-17-41 (2), Durkee, (Powell Cr.),
 VI-21-48 (1), Pine Creek (Baker), V-12-1940,
 VII-7-46 (11), Spring Creek, VI-12-55
 (8), Sumpter, VII-32 (2), Marys Peak,
 VI-1-1946, VII-6-1956 (4);

Benton Co., Corvallis (14 mi. W.), VI-19-32,
 VIII-11-53 (22), Corvallis, MacDonald
 Forest, X-7-54 (reared larva) (1), same,
 X-9-60 (in soil) (1), Mary's Peak (Meadow),
 V-30-1964, VIII-4-1946 (207) (hosts:
 sweeping Rumex acetosa, Noble Fir),
 Philomath (Wood Cr. Rd.), V-30-1960 (1);

Clackamas Co., Government Camp, VII-7-38,
 VII-22-62 (3), Timberline, n.d. (2);

Coos Co., Bandon, V-10-46 (3), Coos Head,
 V-7-39 (1), Hauser, V-6-39 (13), North
 Bend, V-6-39 (2);

Crook Co., Ochoco, 1914 (1), Prineville (28
 mi. E.), VI-8-62 (2);

Deschutes Co., Bond, VI-1-25 (1), same, (7 mi. S.), IX-14-53 (4), same (10 mi. W.) VI-21-39 (3), same (11 mi. W., Tumalo Cr.), VI-29-64 (1), La Pine, VI-26-57 (4), same (6 mi. N. E.) IX-1958 (1), same, (9 mi. W., Pringle Falls), VII-25-57 (2), Sisters, (10 mi. S.), VI-15-40 (2), same (Greenlake), VIII-28 (1), Three Sisters, n.d. (1), same (Scott Lake, 4650'), VII-17-27 (1), same (White Branch Mdw., 5500'), VII-19-27 (1);

Douglas Co. Bradley Creek, VI-23-56 (4), Camas Valley, V-7-39 (2), Crystal Springs (E. of Lomola), VII-4-64 (1), Diamond Lake, VII-2-50 (2), East Oakland, V-15-49 (1), Elkhead, V-15-49 (1), Kelsey Valley, VI-20-62 (VI-26-62 (30), Lemola (Tokatee), VI-26-62 (1), Winchester, V-19-54 (1);

Grant Co., (only), IV-5-14, VII-11-14 (7), Dixie Pass, VII-10-1953 (2), Rooney Camp Springs, VII-19-36 (1);

Harney Co., Devine Canyon (10 mi. W. Burns), VI-13-64 (3), Fish Lake, VI-11-39 (6), Glen Aspen Grove (2.5 mi. S.), VI-18-25-54 (1), Ochoco N. F., VI-30-1946 (1), Steens, (8000'), VII-15-53 (2);

Hood River Co., Mt. Hood, VI-20-1925, VII-27

(14), same (Cloud Cap Inn, 6-7000')

VI-6-1930, VI-22-1935 (2), same (Homestead Inn), VI-30-1927, VII-7-1927 (62),

Parkdale (20 mi. S.), VI-23-38 (1),

Riodan Hill, I-20-60, IX-15-60 (6) in soil, Still Creek, VII-14-56 (4);

Jackson Co., Butte Falls, VI-7-41, VI-27-57

(52), same (8 mi. S. E. R4E, T35S Sec30),

X-11-1960 (3), same (10 mi. E.), V-11-1960 (1) (in soil), same (13 mi. E.),

V-10-61 (2), Deerberry Creek, VII-8-1962

(1), Fish Lake, VI-12-1938 (2), Griffin

Creek, IV-25-1946 (1), Jacksonville,

V-3-1956 (2), Medford, VI-27-41 (1),

Pinehurst, V-21-61, VI-5-1959 (4), same

(5 mi. W.), V-24-58 (3), Prospect, VI-11-

38 (3), Prospect, (10 mi. E., Bessie

Creek), VI-25-64 (1), Ruch, V-19-1962 (2),

Talent, VI-9-1936, VI-15-36 (8), Union

Creek, VI-17-61, VII-5-1941 (23), Whiskey

Springs Campground (nr. Butte Falls),

VI-28-29-67 (180);

Jefferson Co., Blue Lake Trail No. 91, VII-13-63

(8), Metolius River Headwaters, VI-15-16-

1966 (75) (u.v. light), Suttle Lake
(5 mi. W.), VII-8-39 (1);

Josephine Co., Applegate River (7 mi. S. Grants
Pass), V-18-62 (5), (only), VI-11-1910
(9), Kirby, VI-11-1910 (1), Illinois
River, V-18-62 (2), Selma (N. W.),
V-18-62 (1);

Klamath Co., (only), VII-6-1941, VII-19-1938
(98), Beaver Marsh, VIII-5-1955 (5),
Bly, (3 mi. N. W.), VI-1-62, VI-5-55 (9),
same (11 mi. E.), V-22-58 (1), Chemult,
VII-28-1959 (12) (at light), same (20
mi. S.), VII-10-46 (1), Cherry Creek,
VI-12-62 (13), Crater Lake, VI-16-58,
IX-1 (77), Crescent Lake, VII-2-52,
VII-14-62 (4), Denny Creek, V-27-58,
V-30-1960 (16), Diamond Lake, VI-6-1957,
VII-16-1939 (13), Fort Klamath, VI-26-62
(2), Fremont Nat. Forest, 5000', VI-18-
1922 (1), Gearhart Mt., VII-19-1958 (3),
Keno (Topsy Grade), V-18-58, V-21-30 (5),
same (Klamath River), V-21-50 (2), Klamath
Falls, V-16-1924 (2), same (Geary Ranch),
V-17-61, V-23-58 (14), Lake O'Woods,
V-29-54, VII-4 (77), Merritt Creek, VI-6-55

- (1), Mt. Pitt (base), VII-12-58 (7),
 Odessa Creek, VI-15-62 (4), Pelican Butte,
 VII-8-1960 (20), Saddle Mt. (3 mi. S.),
 VI-7-62 (5), Spencer Creek, VI-1-56,
 VI-15-58 (22), Summit Lake, VI-20-62,
 VII-23-62 (7), Sun Creek, VI-10-62 (2),
 Whitefish Creek, VII-17-62 (1);
- Lake Co., Fossil Lake, V-16-57 (1), Hart Mtn.,
 VI-17-36 (2), Hart Mt. Antelope Refuge,
 VI-25-54 (6) (sweeping meadow), Hot
 Springs Camp, VI-14-61 (8), Lakeview
 (Prairie Summit), VII-12-62 (3), LaPine
 (13 mi. SE), IX-12-58 (3), Quartz Mt.,
 V-22-58 (1), Silver Lake, (13 mi. N.),
 VI-13-61 (1), Warner Mtns. VI-18-1922,
 VI-20-1922 (7);
- Lane Co., Eugene, IV-15-34, V-2-62 (2),
 Florence, V-19-47 (1), same (7 mi. S.),
 IV-23-56, V-3-67 (4), Junction City,
 V-15-61 (1), Sunrise Shelter, VIII-1-1959
 (3);
- Lincoln Co., Newport, VI-8-25 (1), Waldport,
 VI-10-25 (1);
- Linn Co., Alsea, V-25-30 (1), Hoodoo Ski Bowl,
 VII-25-66 (8), Iron Mt., VII-17-61 (1),

Linn Co. Monument Pk., VI-16-60 (1),
 N. Fork Santiam River, Linn Co., V-16-
 54 (2), Lost Prairie Campground (45 mi.
 E. Sweethome), V-19-66 (1), Santiam High-
 way, Big Meadow, VI-14-40, (1), Santiam
 Pass, VI-24-54, VII-9-53 (2), Santiam
 Summit, VII-24-54 (1) (host: Ponderosa
 pine), Santiam River, North (10 mi. N.
 Highway 20), VI-24-1955 (5), Tombstone
 (Prairie), VII-1-1962 (1), McKenzie Pass,
 VII-18-27 (1), same (Adler Springs,
 3025'), VI-20-27 (1), Mills Creek, VII-4
 1962 (1);

Marion Co., Breitenbush Hot Spring (8 mi. E.),
 VII-11-1964 (4), Detroit, VI-6-27 (3),
 Idaho, VII-22-46 (2);

Tillamook Co., Island Camp, F. C. (2 mi. N.
 Tierra del Mar), V-11-60 (1), Sand Lake,
 V-7-39, V-12-40 (14);

Umatilla Co., Blue Mts., VI-11-40 (3), same
 (Bone Springs), VI-7-38, VI-18-35 (14),
 same (Moffet Mead), VI-7-38 (9), Meacham,
 V-26-36 (1), Tollgate, VI-19-49,
 VII-7-64 (6);

Union Co., Tollgate (4 mi. ESE), VI-26-60 (1);
 Wallowa Co., Flora (8 mi. N.), VI-7-63 (1),
 Lake Wallowa, VI-15-38 (47), Lostine (15 mi.
 S.), VII-12-64 (11), Lostine Creek, VII-
 12-64 (13);
 Wasco Co., Friend, XII-30-53 (2), Maupin, V-7-
 37 (2), The Dalles, VIII-28-56 (2);
 Washington Co., Hillsboro, V-12-36 (1) (light
 trap);
 Yamhill Co., Amith, VI-4-39 (1), Dayton, V-9-
 36 (1), McMinnville, V-2-36, V-28-27 (6);
 No county: Bear Springs, V-18-1940, VI-18-
 1939 (11), Swim, VII-2-42 (3);

Utah:

Cache Co., Cache N. P., FI-30-1953 (1), Logan,
 VII-15-1922 (11);
 Utah Co., Aspen Grove Camp, VII-6-1935 (4),
 Mt. Timopanoqos, VI-6-26 (7), Provo,
 VI-13-12, VI-20-12 (6), Provo Canyon,
 Washatch Mts. VI-11-1930 (2);
 Wasatch Co., Heber (Daniels Canyon), VII-5-1922
 (3);
 Weber Co., Willard Peak, VII-14-1953 (1);

No county: Dividen, VI-9 (3), Silver Lake,
n. d. (2), Rosevere Creek, Raft River
Mts., VI-1928 (3);

Washington:

Asotin Co., Field Springs St. Park, VII-4-46
(5);

Columbia Co., Dayton, V-13-27, VI-6-27 (2);

King Co., North Bend, VII-11-1920 (1), Seattle,
V-9-07, V-13-07 (12);

Klickitat Co., Easton, n.d. (10, Simcoe Mts.
Sotus Pass, V-31-64 (1);

Pierce Co., Fort Lewis, V-29-51 (3), Longmire
Springs, VI-26-49 (1), Mt. Ranier, VI-28-
1936, VII-20-35 (2), Spanaway, VI-10-39,
VI-21-40 (3);

Skamania Co., Mt. Adams, VI-24-1925, VII-27
(59);

Snohomish Co., Arlington, V-17-1928 (3);

Spokane Co., Spokane, VI-20 (1);

Yakima Co., American River, V-24-58 (1),
Naches River, VI-8-27 (3), Rimrock Lake,
V-18-1958 (1), Tieton, VI-15-35, VI-16-
1935 (3), Yakima Indian Forest Res.,
VI-30-25 (4);

No county: Boca, V-30-1946 (1), Grand Mound,
V-25-1929, V-30-1929 (2), Nile, VI-9-23
(1), Signal Peak, VI-21-1935, VII-24-36
(4);

Wyoming:

Teton Co., Jennies Lake, V-32 (3), Teton N. P.,
VI-18-63, VII-1947 (4);
Yellowstone National Park, V-4-27, VII-14-55
(59);

Dichelonyx canadensis canadensis (Horn)

Canada:

Ontario, Constance Bay, V-22-1933, VI-22-1960 (5),
Mer Bleue, VI-8-27 (1), Toronto, VI-8-37 (1);
Quebec, Duparquet, VI-15-41, VI-25-41 (10) (hosts:
Salix discolor), Ft. Coulonge, VI-8-1917,
VII-8-1917 (3), Forestville, VII-7-8-27 (5),
Kazubazun, VI-6-10-27 (8), Knowlton, VI-12-28
(10), Montreal Island, n. d. (1), Saquenary
River, VII-24-1906 (1), Thunder River, VI-13-30
(1);

United States:

Maine:

Oxford Co., Paris, VI-8-37, VII-7-1937 (24);

Minnesota:

No other data, (1)

Dichelonyx canadensis kirbyi Brown

Canada:

Alberta, Medicine Hat, VI-4-29, VI-21-30 (7);

Manitoba, Aweme, V-1-14 (2), Carberry, VI-14-53 (1),

Cartwright, n. d., (2) Onah, VI-15-20 (2),

Robin (30 mi. N.), VII-14-54, VII-15-54 (2),

Victoria Beach, VII-1-18 (2);

Saskatchewan, Canora, VII-10-54 (1), Lake Madge,

VII-7-1954 (1), Prince Albert, VII-3-54 (2);

United States:

Michigan:

Keweenaw Co., Eagle River, VI-15 (1);

Nebraska:

Sioux Co., VI-19-1911 (1);

North Dakota:

Ransom Co., McLeod, VI-8-62 (2);

South Dakota:

Custer Co., Custer, VII-3-32 (4), Pringle

(8 mi. N. at Flynn Creek, 5400'), VII-8-
9-1961 (2);

Pennington Co., Hill City, VI-8-46, VI-27-46
(3);

Dichelonyx diluta (Fall)

Canada:

Nova Scotia, VI-12-24 (1);

United States:

Connecticut:

Hartford Co., New Britain, n. d. (1);

Massachusetts:

(only), IX-15-24 (4);

Hampden Co., Chicopee, VI-2-1900 (2);

Middlesex Co., Framingham, V-26-12 (1)

(host: sweeping raspberry), Sherborn,

VI-12-15 (1), Tyngsboro, VI-5-03, VI-9-

15 (7);

Suffolk Co., Brookline, VI (1);

Michigan:

St. Joseph Co., Three Rivers Game Preserve,

IV-24-58 (5);

Missouri:

(only), n. d. (2);

New York:

Wyoming Co., Pike, n. d. (1);

North Carolina:

Jackson Co., Balsam, V-15-30-1967 (103)

(u. v. light);

Pennsylvania:

Allegheny Co., Aspinwall, VI-15-26 (1);
 Dauphin Co., VI-30-28 (1);
 Monroe Co., Tannersville, VI-2-49 (1);
 Northampton Co., Windgap, VI-18-31 (1);
 Philadelphia Co., Manayunk, n. d. (1);
 Westmoreland Co., Jeanette, V-29-32 (5);
 No county: Belfast, VI-4-49 (2), Castle
 Rock, VI-7 (1);

West Virginia:

Marion Co., Fairmont, V-25-29 (2);

Dichelonyx elongatula (Schönherr)

Canada:

Ontario, Brue Peam (?), Cape Croker, VI-2-46 (2),
 Ottawa, VI-12-1913 (1), Prince Edward Co.,
 V-9-22, VI-11 (4), Toronto, V-5-09, VI-30
 (7);

Quebec, Knowlton, V-21-22-27 (1), Montreal, n. d.
 (1), St. Martin, VI-26 (1);

United States:

Connecticut:

Hartford Co., New Britain, n. d. (1);
 Litchfield Co., Cornwall, VI-5-1921 (6);
 No county : Shore Beach, V-97 (5);

Illinois:

Jackson Co., Giant City State Park, V-5-6-61
(3);

Indiana:

Lake Co. (?), Miller(s), VII-11-1918 (1);

Iowa:

Johnson Co., Iowa City, V-20, V-28-11 (2);
No county: n. d. (2);

Maine:

Kennebec Co., Monmouth, VI-28-1906 (1);
Oxford Co., Paris, VI-4-45 (1);
No county: Wales, VI-15-06 (2);

Massachusetts:

Hampshire Co., Mt. T(o)m, VI-1-19 (2);
Middlesex Co., Concord, VI (1), Sherborn,
VI-12-20 (2), Tyngsboro, n.d. (7),
Framingham, V-30, VI-14-15 (3);
Suffolk Co., Brookline, VI (1), Milton,
VI-1-23 (1);
No county: Lenngton (?), VI-30 (4);

Michigan:

Marquette Co., Marquette, VI-28 (1);
Washtenaw Co., Ann Arbor, VI-2-34, VI-3-34
(23), Whitmore Lake, V-14-56 (2) (host:
beating Quercus);

No county: Horn Mt. Club, VI (9), Ag. Coll.,
V-23-22 (8);

Minnesota:

Ramsey Co., St. Paul, V-23-22 (1);
St. Louis Co., Duluth, n.d. (3);
No county, n.d. (1);

Nebraska:

Douglas Co., Omaha, V-9-1908 (1);
Sarpy Co., Bellevue, V-9 (1);
No county, n.d. (1);

New Jersey:

Warren Co., Phillipsburg, VI-8-18 (14);

New York:

Albany Co., Cohoes, VII-25-1950 (1);
Clinton Co., Upper Saranac, VII-2-28, VII-14-
28 (21);
Erie Co., Buffalo, VI-15-02 (1);
Rockland Co., Tompkins Cove, VI-5-97 (1);
St. Lawrence Co., Canton, VI-2-27 (1);
Tompkins Co., Ithaca, V-27-33, VII-5-95 (2);
Westchester Co., Scarsdale, VI-1-40 (1);
Wyoming Co., Pike, VI-1-1901 (2);
No county: Cent., n.d. (1), (H?)orns,
V-25-30 (1);

North Carolina:

Avery Co., Cranberry, VI-9 (1);

Buncombe Co., Asheville, VI (6), Black Mts.

n.d. (3);

Jackson Co., Balsam (4000'), V-1-30-1966

(282);

Ohio:

Hamilton Co., Cincinnati, V-28-62, VI-4 (4);

Oklahoma:

Murray Co., Davis, IV-30-62 (2);

Pennsylvania:

Allegheny Co., Aspinwall, V-27, VI-15-26 (7);

Dauphin Co., (only), VI-5-27, VI-30-28 (9),

Hummelstown, V-25-21 (1);

Monroe Co., Effort, VI-6-31 (1), Mt. Pocono,

VII-3-30 (1), Tannersville, VI-2-44,

VI-30-48 (7);

Northampton Co., Easton, VI-3-30, VI-4-30

(3), Windgap, VI-18-31 (5);

Westmoreland Co., Jeanette, VI, n.d. (4);

No county: Belfast, VI-4-49 (9), Castle Rock,

VI-7 (6), Edge Hill, VI-5-98 (2),

Hunters Run, VI-6-28 (4);

West Virginia:

Marion Co., Fairmont, V-25-29 (1);

Wisconsin:

Dane Co., Madison, V-24-51 (1);

Dichelonyx fuscula (LeConte)

Alabama:

No county, Monte Sano State Park, IV-9-1955 (4);

Illinois:

Saint Clair Co., Belleville, n.d. (3);

Kentucky:

Edmonson Co., Mammoth Cave N. P., IV-23-1961 (28)

(at light)

Missouri:

St. Louis Co., St. Louis, n.d. (1);

New Jersey:

Burlington Co., Palmyra, V-10-27, V-10-28 (9),

Riverside, VI-16-29 (4), Riverton, IV-23-25,

VII (6) (host: on oak);

Camden Co., Camden, V-2-12 (7);

No county: Atsion, VI-16-29 (1);

New York:

(only), n.d. (3);

North Carolina:

Buncombe Co., Asheville, V-4-13 (5);

Ohio:

Hamilton Co., (only), n.d. (1), Cincinnati, V-25-
.02 (3);

Pennsylvania:

Delaware Co., Philadelphia, V-6 (7);

No county: Angora, V-3, V-6 (10), Valley Stream,
VI-14-95 (1);

Dichelonyx muscula (Fall)

California:

Los Angeles Co., Azusa, June (1), Big Dalton Dam
VI-26-50 (1), Bouquet Canyon, n.d. (4), Camp
Baldy, VI-26 50, VII-2-50 (3) (hosts:
Eridogeton), Chilao Flats, VI-21-53 (1);
Crystal Lake, VI-11-38, VII-9-52 (12),
Glendale, IV-29-37, VII-11-56 (8), Mt. Wilson,
VI-19-37 (28), Newhall, V-41 (1), Pasadena,
IV-30-32, V-21-32 (16), Pasadena (Mt. Lowe),
VI (3), Pomona, V-16-30 (2), San Dimas,
IV-1-34 (4), San Gabriel Canyon, V-18-32 (3),
Tajunga, VI-5-45 (34), Tanbark Flats, V-24-50,
VII-7 (259) (hosts: Adenostoma, Quercus);

- Riverside Co., Banning, V-29-28, V-30-28 (3),
 Hurkey Creek (Camp), San Jacinto Mts., IV-30-37, VI-15-54 (4) (hosts: Beating Chamise,
 beating Adenostoma fascicularum, ex. Cercarpus),
 Idyllwild (14 mi. N. W.), VI-15-54 (1) (host:
 beating Adenostoma fascicularum), Keen Camp,
 San Jacinto Mts., V-31-39, VI-6-12-1912 (8),
 The Gavilan, VI-17-51 (2);
- San Bernardino Co., Cajon Jct., VI-7-58, (2), Cajon
 Pass, VII-26-30 (2), Camp Baldy (Mt. Baldy),
 V-26-34, VII-14-21-26 (28) (hosts: Ceanothus,
Chamisa), nr. Chilao Flats, San Gabriel Mts.,
 VI-5-62 (8), Cola Creek Ranch San Bernardino
 Mts., VII-1-22 (1), Lake Arrowhead, V-25-33 (1),
 Lytle Creek, VI-8-28 (10), Redlands (10 mi. N.
 3500'), V-10-54, VI-5-54 (2) (host: beating
Adenostoma fascicularum), San Bernardino,
 V-20-1940 (4), San Bernardino Mts. 300',
 VI-5-52 (1), Victorville, VI-7-30 (4);
- San Diego Co., Warner Springs, VI-13-60 (3);
- San Luis Obispo Co., Oaks, Mint Canyon, IV-20-32
 (1) (host: Adenostoma);
- Ventura Co., Frazier Mt., V-30-19 (1);
- No county listed: Roberts Camp, V-5-34, V-16-34 (10),
 Saddle Peak, Santa Monica Mts., V-5-57 (2),

Sand Flat 5500', VI-2-30 (1), Tassajara
Hot Spr., V-25-54 (2), Waterman Canyon,
V-27-16, V-29-16 (12);

Dichelonyx nana (Pall)

California:

Los Angeles Co., Newton (?), V-26-1960, VI-24-1954
(4), Pasadena, April, May, 1897 (6);
San Diego Co., (only), V-6-97 (4), Jacumba, n.d.
(3);
No county: Hipass, V-11-27 (2).

Dichelonyx picea (Horn)

Mexico, Baja California:

(only), n.d. (4), Arroyo Seco, X-6-41 (5), Canipole,
X-2-41 (6), La Paz, X-7-41 (5), Las Animas, X-12-
41 (3), Miraflores, VII-29-19 (1), San Bartolo
(5 mi. W.), VII-13-38 (1), Santa Rosa, IX-01 (6),
Sierra Laguna, n.d. (2), Todos Santos, X-10-41
(9), Triunfo, VII-13-38 (3);

United States:

California:

One doubtful record only (label inverted),
Clear Lake, IX-13-42.

Dichelonyx pusilla (DeConte)

California:

- Inyo Co., Lone Pine, V-20-1951 (1);
- Los Angeles Co., (only), IV-1, VII-6-52 (13),
 Ahaden, VI-13-50, VI-19-60 (5), Alhambra,
 VI-25-19 (2), Benedict Canyon (5 mi. N.
 Beverly Hills), VI-5-1957 (1), Bouquet Canyon,
 VI-17-38, VIII-7-37 (10), Brentwood, VI-18-
 57 (1), Burbank, V-23-30, VI-21-30 (8), Camp
 Baldy, VII-2-1950, VII-11-1950 (2), Clare-
 mont, n.d. (1), Frenchman Flats, V-15-49 (5),
 La Canada, Tejuanga, VI-20-1954 (25), Glendale,
 VI-9-1950, VIII-25-1954 (70) (some at light),
 Glendora, VI-1-1950, VII-7-1950 (38) (some
 at light), Griffith Park, VI-19-1957 (1),
 Lake Hughes, V-2-1959 (1), Los Angeles, VI-1
 1924, VII-11-1930 (8), Mint Canyon, V-26-37,
 VI-21-49 (5), Pasadena, May, VII-16-30 (6),
 Pomona, VI-27-31 (1), Saugus, VI-18-31 (7),
 Sierra Madre, VII-31 to VIII-8-1911 (1),
 Tanbark Flats, VI-10-1950, IX-5-1950 (131),
 Topanga Canyon, VII-2-1957, VII-31-58 (6),
 Tujunga, VI-5-1945 (3);
- Mariposa Co., Fish Camp, VI-9-42 (1), (Miami?)
- Ranger Sta., VI-42, VI-5-42 (2);

Monterey Co., Arroyo Seco Camp, V-1-1960 (2),
 Bradley, III-22-1920 (1), Carmel, VI-15-1908
 (3);

Orange Co., Garden Grove, VI-18-1927 (1), Santa
 Ana Canyon, VI-20-30 (6);

Riverside Co., Banning, V-20-1941, V-30-1928 (3),
 Gilman Hot Spr., VI-19-1951 (1), Hurkey Creek,
 VI-3-1934 (1), Hermet Valley, V-30-31-1954
 (1), Keen Camp, VI-5-39, (1), Palm Springs,
 V-30-58, VII-6-1950 (5), Ribbonwood, VI-20-
 38 (1), Riverside, VII-20-1938 (1), The Gavilan,
 VI-17-1951 (24), Vandvanter Flat, VI-4-1940
 (3);

San Bernardino Co., Barton Flats, VI-15-66 (1),
 Cajon Pass, VI-24-1940, (4), Camp Baldy,
 VI-25-56, VI-27-1956 (5), Forest Home, VI-17-
 28, VI-18-28 (2), Lytle Creek, VI-6-28, VI-8
 21 (12), Morongo Valley, V-19-1951 (2),
 Ontario, VII-2-1931 (1), San Bernardino,
 V-20-40, VII-2-1956 (8), Upland, VII-4-1952,
 VII-6-1952 (43), Victorville, VI-7-30 (1),
 Wrightwood (6 mi. N.E.), VI-7-54 (3);

San Diego Co., Carlsbad, VII-3-1954 (2), Coronado,
 V-1-1896, V-7-1890 (7), Del Mar, V-14-45,
 VIII-30-1942 (18), Dripping Sp. C. G.,

VI-24-1954 (2), Encinitas, VI-22-32 (1), La Jolla, VI-17-1963, VI-18-1963 (3), Oak Grove, V-28-1966, VII-7-1956 (5), Pine Valley, VI-27-1962, (6), Poway, VI-12-17 (3), San Diego, IV-23-20, VI-6-28 (80) (hosts: Adenostoma, and at light), Warner Spr. VI-10-1956 (1); Santa Barbara Co., Buellton, VI-17-37 (2), Goleta, VI-17-1965, VII-23-1965 (65), Les Prietos, VI-25-1965 (2), Refugio Beach (3 mi. N.), VII-4-1965 (2), San Marcos Ranch H. Q., VII-5-1956 (1), Santa Barbara, VI-16-1951 (4); Ventura Co., Ojai (8, 10, 12), Jeope Cr. V-30-49 (3), Piru, V-24-37 (1);

Nevada:

Storey Co., Dayton, VI-20-58 (5);

Mexico:

Baja California, Ensenada, VI-27-25 (2), Sierra, Las Encinas, VI-3-1958 (1);

Questionable Records:

Colorado:

Allison, 29-VII-1935 (1);

Oregon:

Yamhill Co., Dayton, 7-2-39 (1)

Dichelonyx subvittata (DeConte)

Canada:

Manitoba, Winnipeg, n.d. (1);
 New Brunswick, Bathurst, VI-15, VI-22 (2);
 Ontario, Algonquin, V-20-1923 (2); Brule Lake,
 VIII-3-11 (1); Priva, VI-11, VII-7-17 (6);
 Rainy R. Dist., n.d. (1); Trenton, VI-23 (2);
 Quebec, Duparquet, VI-4-31, VII-1-36 (53) (hosts:
Betula, Corylus rostrata, Acer, Populus
tremuloides, Salix, wild raspberry), Knowlton,
 VI-21-22-27 (2); Lake Opasatika, VI-1 (1);
 Montreal, n.d. (2), Montreal Island, n.d. (2)
 (host: Larix); Perkins Mills, VI-23-36 (1),
 Woburn, VI-19-23 (1);

United States:

Connecticut:

Litchfield Co., Cornwall, VI-18-24 (4);

Indiana:

Lake Co. (?), Millers, VII-11-1918 (2);

Maine:

Oxford Co., Rumford, VI-11-45 (1);

Michigan:

Marquette Co., Marquette, VI-28 (4);

No county: Horn Mt. Club, June (19)

Minnesota:

St. Louis Co., Duluth, n.d. (18);

New Hampshire:

No county: n.d. (2)

New Jersey:

Warren Co., Phillipsburg, VI-16-18 (4);

New York:

Cattaraugus Co., Oldain, VIII-5-17 (1);

Franklin Co. (?), Upper Saranac, VII-8-29,
VII-14-28 (4);

North Carolina:

Avery Co., Cranberry, VI-8, VI-9 (2);

Buncombe Co., Black Mt., n.d. (2);

Pennsylvania:

Luzerne Co., Hazelton, n.d. (1);

Monroe Co., Pocono Lake, VI-11-11 (1);

Northampton Co., Easton, VI-6-22 (1), Windgap,
VI-2-30 (1);

Sullivan Co., La(p)orte, VI-6-9-39 (1);

Westmoreland Co., Jeanette, n.d. (1);

South Dakota:

Lawrence Co., Lead, VI-18-1934 (7);

No county: Englewood, VI-18-1935 (4);

Vermont:

Windsor Co., Quechee, VII-14-37 (1);

Wisconsin:

Oneida Co., Minocqua, VI-23-35(1);

Bayfield Co., Bayfield, n.d. (3)

Dichelonyx truncata (LeConte)

Canada:

Saskatchewan, Pennant, VII-13-1935 (1);

United States:

Arizona:

Coconino Co., Oak Cr., VI-14-1948 (1), Oak Cr.
Canyon, (5200'), VI-11-1958 (1);

Gila Co., Christopher Cr. Mogollon Rim, 5800',
VI-16-1957 (25), Payson, n.d. (1), Sierra
Ancha Mts., IX-1930 (4), Tonto Cr.,
VI-3-27 (5);

Navajo Co., Kayenta (19 mi. S.W. 6500'), VI-
20-33 (2), same (20 mi. W.N.W. 8200'),
VII-30-33 (1), Betatakin Canyon, Navajo
National Monument, VI-VII-1935 (5);

No county: Diamond Creek, White Mts. n.d. (1);

California:

Fresno Co., Friant, IV-2-34 (1) (host: oak),
Huckleberry Meadow, VI-21 (1), Mammoth
Pool, San Joaquin R., VI-11-17 (1),
Sanger, VII-29-10 (1);

Inyo Co., Panamint Mts., V-29-37 (2), Wyman
Canyon, White Mts., 8500', VI-27-61 (6);

Kern Co., Frazier Park, V-18-1940, VI-21-1948
(64), Lebec, V-13-28, VI-15-28 (115),
Lebec, Tejon Pass, 1000', V-14-28, VI-
15-04 (9) (host: Premontia), Mount
Pinos, VI-8-04, VI-15-04 (11), Kern
State Park, VI-16-47 (7);

Los Angeles Co., Altadena, IV-28-56 (6),
Arcadia, IV-15-39 (2), Azusa, IV-17,
April (4), Burbank, V-23-30 (1), Camp
Baldy, VI-26-50, VII-2-50 (25) (hosts:
Fremontodendron, Ceanothus), Chiliao Flats,
San Gabriel Mts., V-5-62 (1), Claremont,
IV-3-26 (1), Crystal Lake, VI-29-50,
VII-9-52 (7), Desert Sun, V-24-50 (1),
Glendale, V-25-51, VI-30-50 (19),
Irwindale, IV-19-50 (1), Mint Canyon
(6 mi. N.), IV-20-32 (1), Mount Baldy
Canyon, V-26-34 (1), Palmdale, V-16-37
(1), Pasadena, n.d. (1), Pomona, VI-3-29
(1), San Gabriel Canyon, VI-24-33 (2),
Sierra Madre, VI-5-24 (1), Tanbark Flats,
VI-13-50, VII-12-52 (24), Tie Can, San
Gabriel Mts., VI-14-58 (1), Valyermo
(2 mi. S.S.W.), VI-11-64, VI-13-64 (2);

Madera Co., Ahwahnee, May (2), Coarse Gold.

V-12-42 (3) (host: Ceanothus), Oakhurst,

V-19-42 (1), O'Neals, IV-25-47 (2);

Mariposa Co., Miami Ranger Sta., VI-42 (1),

Mariposa, IV-27-47 (2);

Mono Co., Blanco's Corral, White Mt. (10,000'),

VII-20-56 (8), Cottonwood Basin, VI-22-54

(9), Crooked Cr. Res. Station, White Mts.,

(10,150') (flight trap), VIII-20-63 (1),

Leevining, VII-28-53 (1), Tioga Pass

(1 mi. N.E.), VI-18-51 (1) (host:

Ceanothus), Twin Lakes, VI-24-37 (3),

Wyman Canyon (2 airline mi. S. Inyo Co.

Line, 3000' to 10,000'), VI-27-61 (11);

Monterey Co., Arroyo Seco (Campground),

V-1-1960, V-24-1958 (7) (at u.v. light,

host: Mt. Mahogany);

Riverside Co., Banning, III-22-40 (2), Cabazon,

III-30-26 (4), Chino Canyon nr. Palm

Sprs., IV-19-1960, IV-20-60 (9) (some at

u.v. light), Idyllwild, San Jacinto Mts.,

V-12-34, VII-6-1950 (16) (hosts:

Arctostaphylos, Ceanothus, Pinus ponderosa),

Keen Camp (8 mi. N.E.) San Jacinto Mts.,

VI-17-39 (1) (host: Chama); Palm Canyon,

IV-13-38 (1), Palm Springs, III-25-17,
 IV-21-51 (10), Pinon Flat, VI-18-41 (1),
 Pine Flats, VI-13-40, VII-2 (4) (host:
Ceanothus), San Jacinto Mts., VII-1912 (1),
 Taquitz Canyon, IV-16-38 (1);

San Bernardino Co., Arrowhead Lake, VI-15-60,
 VI-25-36 (2), Banning Canyon, V-18-51 (5),
 Big Bear Lake, VI-5-19, VI-25-36 (11),
 Big Bear Valley, VII-13-66 (2), Cajon,
 V-31 (1), Camp Baldy, VI-26-50, VI-28-36
 (5), Fontana (9 mi. N.), VI-12-32,
 VI-14-28 (16), Lytle Cr., VI-6-66,
 VI-8-28 (19), Miller Canyon, V-19-41 (1),
 Snow Crest Camp, VI-20-37, VII-7-52 (4),
 Victorville, V-30-57, VI-7-30 (2),
 Wrightwood, V-22-54, VI-16-64 (17) (host:
Fremontia californica);

San Diego Co., Poway, n.d. (1), Mount Palomar,
 VI-21-59, VI-29-59 (3), Warners Springs,
 V-15-34 (1);

Santa Barbara Co., San Marcos Pass (1 mi. N.E.
 1500'), VII-4-65 (1);

Tulare Co., Cedar Cr. (4500'), N. Fork Kaweah
 R., IV-30-40 (6), Fairview (9 mi. S.W.),
 IV-29-64, V-1-64 (85), Kaweah, (1000'),

IV-12, IV-28-03 (22), Sequoia N.P.
 (2-3000'), IV-9-34, V-24-29 (9), same
 (Ash Mt. Forebay), VI-12-37, VI-14-37
 (35), same (Ash Mt., 1380'), IV-19-33 (1),
 same (Ash Mt. Rd.), IV-21-50, V-1-55 (24),
 same (Paradise Valley 2-3000'), V-22-29,
 same (Potwisha), IV-21-21, VI-14-29 (21);
 Ventura Co., only, V-18-1940 (2), Piru Cr.
 (N.E. base Alamo Mts.), V-3-59 (15) (hosts:
 burrowing in dry stalks of Yucca whipplei,
 on Haplopappus cooperi, on Salix),
 Frazier Mt. (sp.? Fraser Mt.), V-30-1919
 (16);

Colorado:

Moffat Co. VI-24-1960 (2)

No county: Great Sand Dunes, VI-23-44 (2);

Idaho:

Lemhi Co., Salmon R. Gorge, VI-20-1952 (3);

Nebraska:

Sioux Co., Prairie Dog Cr., VII-18-1917 (1);

Nevada:

Esmeralda Co., Goldfield, VI-28 (1);

Washoe Co., Pyramid Lake, VI-6-11, VI-9-11 (5);

South Dakota:

Harding Co., Buffalo, VI-27-1950, VI-28-1947

(7);

Meade Co., Faith, VI-28-1947 (1);

No county: Edson, VI-27-1947 (2), Fox Ridge,

VI-28-1947 (1);

Utah:

Cache Co., Logan, VI-28-04 (1);

Millard Co., Fillmore, VI-16-1953 (1);

San Juan Co., Navaho Mt. (9500'), VI-13-36 (1);

Washington Co., Zion Canyon, VI-20-38 (3),

Zion Nat. Park, VI-19-1940, VI-24-1949

(6);

Wyoming:

Fremont Co., L. I., VII-25-47 (1).

Dichelonyx vaga (Fall)

California:

Calaveras Co., Mokelumne Hill, V (2);

Eldorado Co., nr. Whitehall, VI-21-31 (2);

Fresno Co., S. Fork Kings River Canyon (5000'),

VII-4-10 (1);

Kern Co., Lebec, VI-13-37 (1);

Los Angeles Co., Crystal Lake, VI-29-50 (1);

Madera Co., Bass Lake, VI-3-42 (5), Oakhurst,

VI-1-42, VI-19-42 (13);

Mariposa Co., Miami Ranger Station, VI-4-42, VI-1942

(3), Wawona, VI-20-57 (1), Yosemite, V-15-31,
VI-15-33 (4), Yosemite National Park, V-31-52,
VI-14-21 (2), Yosemite Valley, V-16-21, VI-21
21 (3);

San Diego Co., Campo, IV-27-39 (1), Warners Springs,
VI-25-25 (1);

Tulare Co., Atwoods Mill, VI-29-13, VII-6-1913 (16),
Bear Camp, VI-1916 (1), Cedar Creek, IV-30-03
(2), Grouse Meadow, VI-28-13 (14), Hot Springs,
VI-3-39, VII-9-25 (10), Kaweah, V-15-1902,
VI-18-03 (5), same (6000'), VI-18 (11), Lake
Cannon, V-16-19 (1), Sequoia National Park
(2-3000'), V-17-29, VI-14-29 (54), same (Ash
Mt.), IV-27-50, V-14-1937 (11), same (Crescent
Meadow to Hamilton Lake), VII-20-55 (1), same
(Potwisha 3-5000'), V-8-31, VI-19-53 (8);

Dichelonyx valida valida (LeConte)

California:

Alameda Co., Alameda (Mts. back of), IV-22-28 (2),
Berkeley, V-30-48 (1), Oakland Hills, IV-24-48
(1), Redwood Reg. Pk., V-8-51 (4), Redwood
Peak, III-22-08 (4);

Contra Costa Co., Redwood Park, V-16-09 (1);

Humboldt Co., Hydesville, June (1);

Marin Co., (only), IV-27-31, VI-6-01 (7), Alpine Lake, IV-9-58 (21), Bear Valley, IV-18-20, V-25-19 (2), Cypress Ridge, III-30-21, IV-10-21 (6), Fairfax, IV-12-25, IV-14-28 (4), Inverness, III-28-64, V-14-61 (17), Lagunitas, II-4-26, IV-30-05 (10), same (Lake Lagunitas) III-30-61 (8), same (Lagunitas Canyon) IV-23-16 (6), Mill Valley, III-13-49, VIII-6-48 (119), Muir Woods, V-2-09 (2), Novato, IV-2-50 (3), Phoenix Lake, III-31-61 (1), Ross, IV-15-40 (3);

Mendocino Co., (only), IV-23-41 (3), Fort Bragg, V-8-36 (26), same (12 mi. E. at Caspar Lumber Camp), IV-4-38, V-20-38 (5), Leech Lake Mtn. (6000'), VI-20-52 (2), Mendocino, IV-14-58, IV-28-57 (2), Yorkville, V-17-29 (1);

Napa Co., Mt. St. Helena, III-11-32, III-21-32 (11) (host: Umbellularia californica);

San Mateo Co., La Honda, IV-25-48 (1), Lake Pillar-citas, IV-16-39 (5);

Santa Cruz Co., Ben Lomond, IV-1-32, V-25-31 (34), Big Basin, IV-12-29 (3), Santa Cruz, IV-20-30, IV-25-19 (2);

Sonoma Co., Eldridge, V-1914 (1), Spring Mtn.,
IV-10-38 (4).

Dichelonyx valida lateralis (Fall)
New Status, New Combination

California:

Amador Co., T7NR15E, V-14-36 (1);
Calaveras Co., Arnold, V-29-57 (1);
Eldorado Co., Pollock Pines, V-6-37, VI-29-38 (7),
Pyramid R.S., VII-12-48 (1), Snowline Camp,
VI-21-48, VI-28-48 (4) (at light), Whitehall
(nr.), VI-21-31 (3);
Nevada Co., Bear Valley, V-30-46 (3), Hobart Mills
(nr.), VI-18-62 (1), Lake Vera, July, 1942 (1),
Nevada City, V-27-41 (2);
Placer Co., (only), April, V-19-18 (10), Alta,
IV-7-39 (1), Baxters, VI-3-45 (6), Colfax
(Sagehen Cr.), V-20-52 (1), Dutch Flat, V-29-
54 (1), Emigrant Gap, VI-26-37 (1), Forest Hill,
VI-10-31 (1), Lake Tahoe, VII-31 (1);
Plumas Co., Meadow Valley (3000-5000'), VI-1-24,
VI-21-24 (21);
Shasta Co., Viola, V-1-47 (1);

Nevada:

Ormsby Co., Carson City, VI-26-29 (1);
Washoe Co., Verdi, n.d. (2);

Utah:

One doubtful specimen labeled only "Ut.", in CAS.

Dichelonyx valida sulcata (LeConte)
New Status, New Combination

Canada:

British Columbia; Copper Mountain, IV-25-28, IV-28-28 (2) (on cordwood), Hedley, V-7-23 (1), Midway, V-13-32 (1), Salmon Arm, V-1-32, V-13-29 (2) (on green branch, Pseudotsuga taxifolia), Skookumchuck, V-1-32 (1), Winfield, V-15-32 (1);

United States:

Arizona:

Apache Co., Greer, VI-15-37, VII-10-53 (3), White Mtns., VI, IX (16), same (Diamond Cr.), June (13);

Cochise Co., Chiracahua Mts., Rustler Park, (8700'), VI-7-57 (2), Portal (9 mi. W. at East Turkey Cr.), VII-9-67 (25) (u.v. light);

Coconino Co., Flagstaff (San Francisco Peak), VI-23-47 (1), Navajo Mt. (Rainbow Lodge), VII-6-33, VII-15-33 (4), Oak Creek Canyon, VI-11-40 (1);

Gila Co.; Christopher Cr. (Mogollon Rim, 5800'),
VI-16-57 (1);

Grand Canyon N. P., (only) VI-2-36, VI-30 (3),
same, Bright Angel Pt., VI-11-56 (4),
same (Grand View (7400'), VI-14-16 (2)
(host: Pinon Pine), same (North Rim),
VI-16-30 (5);

Greenlee Co., K.P. Cienega (5 mi. S. Hannagan
Mdws., 9000') VI-6-1959 (1);

Navajo Co., Betatakin Canyon, Navajo National
Monument, VI-VIII-35 (11), Kayenta (15 mi.
NNW, 6650') VII-21-33 (1), same (15 mi. WNW,
6650') VII-21-33 (1), same (15 mi. WNW,
7200'), VI-24-33 (2), same (19 mi. SW
6500') VI-20-33 (1), same (23 mi. W.,
6900') VI-23-33 (12), Navajo Mt., VI-13-33,
VII-14-33 (33),

Pima Co., Huachuca Mts., n.d. (4), Sta.
Catalina Mts., VII-36 (1), same (Bear
Wallow Campground), VI-12-47 (1);

Colorado:

Conejos Co. (?), Menkhaven (on Conejo River),
VI-23-35 (1);

El Paso Co., Manitou, VI-11-17, VI-23-26 (38);

Larimer Co., Estes Park, VI-10-49 (3), same
(Tuxedo Park, 7900'), V-27-34 (1), Teds
Place (24 mi. W.), VII-2-1960 (1);

No county: Cheyenne Mts. (6800'), VI-3-39,
VI-5-39 (33), Poudre Canyon, VI-6-34 (1);

Idaho:

Latah Co., Moscow (2000'), V-3-29 (2);

Nevada:

Clark Co., Lake Mead, VI-11-52 (1);

Ormsby Co., Carson City, VI-25-29 (2);

New Mexico:

Sandoval Co., Jemez Mts. V-25, VI-12 (18), same
(Valle Grande), VII-6-30 (1);

Santa Fe Co., Santa Fe (Little Tesequa Canyon),
VI-14-35 (4);

Utah:

San Juan Co., Navaho Mtn. (8500'), VI-13-36
(4);

Wyoming:

Albany Co., Laramie, VI-30-93 (1);

Teton Co., Teton N. P., String Lake, VI-18-63
(1);

Yellowstone N. P., Geyser Basin, VI-16-30,
VI-19-30 (14).

Dichelonyx valida vicina (Fall)
New Status, New Combination

California:

Alpine Co., Blue Lakes, VI-12-1960 (4), Ebbetts Pass
 (8730'), VI-30-60 (2), Woodfords, VI-17-58 (1),
 Woods Lake, VII-16-60 (2);

Butte Co., N. Fork Feather River, VII-12-64 (4);

Calaveras Co., Arnold, V-29-1957 (4), Camp Wolfboro,
 V-28-39 (1);

El Dorado Co., (only), VI-12-96, July (3), same
 (½ mi. W. stateline) VI-12-60 (2), Echo Lake,
 VII-7-55 (4), Fallen Leaf Lake, VI-21-15 (2),
 Phillips, VI-9-1940 (2), Pollock Pines, VI-24-
 48, VII-21-38 (3), Riverton, IV-30-54 (1),
 Snowline Camp, VI-27-48 (1) (at lights), Straw-
 berry, VI-6-58, VI-16-46 (3), Whitehall (nr.),
 VI-21-31 (1), Wright's Lake, VII-2-45 (3)
 (Abies magnifica, Pinus Murrayana),

Fresno Co., (only), n.d. (1), Evolution Meadow
 (9500'), VII-7-52 (1), Huckleberry Meadow
 (6500'), VI-30-1911, VII-1912 (5), Hume Lake,
 VI-25-64 (1), Huntington Lake (7000'), VI-28-
 48, VII-26-46 (40), same (Badger Flat), VII-
 20-37, VII-22-40 (3), same (Kaiser Pass),

VI-29-1961, VII-24-48 (4), Mount Kaiser, VII-19-19 (1), Stevenson Cr. (Sierra N.F.), V-27-15 (2);
 Humboldt Co., (only), IV-12-53 (1), Fort Seward, VI-1-35 (1), Green Point, VI-7-16 (4);
 Inyo Co., Bishop, VI-22-28 (2), Lone Pine, VI-9-37 (9), same (9 mi. W.), VI-15-64 (1), Whitney Portal, VI-16-58, VI-19-58 (2);
 Kern Co., Kern State Park, VI-16-48 (8);
 Lake Co., Middletown (6 mi. S.), IV-3-62 (1);
 Lassen Co., Black's Mtn., VI-20-50, VI-22-50 (16), Facht, V-3-23, VI-29-32 (8), Halls Flat, VI-14-53, VI-15-53 (6), Lassen N.F., IV-28-1915 (3) (Pinus jeffreyi), Little Hot Spr., VI-22-60 (1), Manzanita L. (4 mi. E.), VI-26-63 (1), McArthur, (13 mi. E.), VI-3-65 (1) (Juniperus occidentalis), Norval Flats (5500'), VI-5-20 (2), Pine Cr. (5000'), V-28-1950 (1), Susan River Camp, V-22-55 (1), Susanville, VI-21-46 (1), Willow Cr. Rs., VI-1-46 (1);
 Madera Co., Bass Lake, V-15-67 (1), Northfork, VI-9-33, VI-20-33 (5), Potters Vall., VI-1-29 (1);
 Mariposa Co., Fishcamp, VI-30-53 (1), Miami, June (1), Miami Ranger Sta., V-18-42, VII-25-46 (5),

Yosemite (3880-4000'), VII-3-48, VII-21-46
 (8) (electric light), Yosemite Valley, V-7-
 30, VII-11-25 (19), Yosemite N.P., V-15-31,
 VII-11-53 (13) (Heracleum), same (Falls Trail),
 VII-2-41 (1), same (Mariposa) Grove, 6500'),
 VI-30-37 (1), same (White Wolf Area), VII-
 6-55 (1), same (Yosemite Falls, top 6525'),
 VII-5-37 (1),

Mendocino Co., Laytonville, V-8-30 (1), Pygmy Forest
 (4 mi. E. Mendocino City), IV-4-38 (1), York-
 ville, V-1-24 (1);

Modoc Co., Alturas (4 mi. W.), VII-3-62 (1), same
 (15 mi. N.), VI-17-54 (1), Cedar Pass (W. of
 Cedarville, 6305'), VI-3-30, VI-29-55 (28)
 (Beating Abies), Cedarville (6 mi. NW) VII-2-
 67, VII-4-62 (12);

Mono Co., (only), VI-17-17 (4), Mammoth Lakes, VI-
 25-37, VII-25-33 (2), Sardine Cr., VI-27-57
 (1), Tioga Pass, VI-18-51 (1), White Mtns.
 (10,000'), VI-21-61, VI-28-62 (29), same
 (Blanco's Corral, 10,000'), VI-13-54, VII-4-53
 (19) (Pinus flexilis), same (Crooked Cr.,
 10,150'), VI-26-61 (1), same (Poison Cr.,
 10,000'), VI-26-61 (1);

Napa Co., Pope Valley, IV-16-32 (3);

Nevada Co., Shotgun L., VII-13-23 (1), Truckee

(.7 mi. SE), VI-24-54 (1), Washington, V-30-46 (1);

Placer Co., (only), June (5), Bijou, VI-30-29 (4),

Brockway, VII-15-41 (2), Emigrant Gap, VI-1937 (4), Lake Tahoe, VI-22-25, VII-1-36 (13), same (Angora L.), VI-11-30, VI-22-19 (11), same (Carnelian Bay), VI-24-64 (2), Phillips Station, VII-25-21 (3), Ward Cr. (2 mi. S. Tahoe City), n.d., (18);

Plumas Co., Belden, VI-8-41 (1), Chester (8 mi. NW),

VI-25-60 (1) (Ceanothus cuneatus), Johnsville, VI-1-63, VII-2-60 (8) (fluorescent black light), same (10 mi. S.), VI-12-61 (1), Nelson Cr., VII-26-40 (1);

Riverside Co., Idyllwild (6000'), VI-3-1940, VIII-

1946 (8) (Abies concolor, at lights), Marion Mt. Camp, San Jacinto Mts., VII-1-52 (4), San Jacinto Mt. Cr., San Jacinto Mts., VII-1-52 (1);

Santa Cruz Co., Ben Lomond, V-17-31 (3), Highland

Dist., V-6-56 (1), Santa Cruz, VI-12-36 (1), Santa Cruz Mts., n.d. (2), Soquel Cr., V-30-09 (1);

San Bernardino Co., Barton Flats, VI-4-5-55, VII-41
 (10), Crestline, VIII-3-48 (1), Forest Home,
 VI-13-66, VI-19-28 (4), Holcomb Valley Pub.
 Camp, VI-1-57 (3), Lake Arrowhead, VI-9-32,
 VIII-5-32 (32), San Bernardino Mts. (6200'),
 VI-28-06 (1), Seven Oaks, VI-15-66 (1),

San Diego Co., Mt. Laguna, VII-4-50 (1), Mt. Palomar,
 VI-21-59, VII-18-63 (13), same (1 mi. W.),
 VI-23-62 (13), same (Bailey Camp), VI-20-67
 (403) (u.v. light);

Sequoia N. P., (only, 3000-9000'), VI-11-29, VII-3-
 56 (27), same (Ashmount), VIII-1-40 (1), same
 (Great Forest), VI-30-52 (1), same (Lodgepole
 Camp), VI-25-48 (3), same (Marble Fork Bridge,
 3000'5000'), VI-11-29, VI-14-29 (5), same
 (Potwisha) VI-14-29 (11), same (Wolverton,
 7000-9000'), VI-7-29, VI-20-29 (25);

Shasta Co., (only), July, 1903 (1), Bridge Camp,
 V-5-47, VI-2-46 (4), Campbell Cr., VI-4-5-53
 (1), Hat Creek, VI-1-41, VII-16-55 (30)
 (Pinus ponderosa), Moose Camp, VI-19-54 (1),
 Old Station, V-1-51, VI-15-41 (2) (Pinus
ponderosa), Shasta Springs, VI-12-28 (3),
 Shingletown, VI-2-41 (1), Viola (4 mi. W.),
 V-20-41, (1);

Siskiyou Co., (only), n.d. (1), Big Flat Pub.

Camp (26 mi. NW Trinity Center) VI-19-62 (20),
Dunsmuir, V-8-32, VI-25-28-1914 (3), Grass
Lake, VI-3-46 (4), Macdoel, V-3-66 (1),
McCloud (9 mi. E.), V-30-52 (2), Mt. Hebron
(Butte Cr., 5 mi. S.), IV-8-58, VI-7-60 (3)
(beating yellow pine), Mt. Shasta, VI-3-37,
VII-1-41 (50), Seiad (Valley ?), VI-7-52 (1),
Walker, V-30-20 (1);

Sonoma Co., (only), n.d. (1), Duncan Mills, VI-29--
1908 (1), Guerneville, V-30-08, VI-1-55 (14),
Occidental, IV-15-61, V-17-37 (12), Plantation,
IV-15-55 (1), Stillwater Cove, V-23-1954 (2);

Stanislaus Co., Modesto, IV-17-30 (1);

Trinity Co., Carrville (2400'2500'), VI-4-34 (1),
Coffe Creek, V-17-34, VII-29-31 (2), same
(Big Flat), VI-21-34, VI-22-34 (4), Nash Mine,
VI-12-1913 (1), Weaver Campground (E.), VI-18-
60 (1);

Tulare Co., Camp Sierra (6400'), July (2), Dinuba,
VIII-26-57 (1), Giant Forest (6460'), VI-25--
30-05, VIII-20-03 (6), same (Round Meadow,
6400'), July, 1915 (4), Hassock Mdw., VI-25 (2),
Kaweah (7500'), June 18, June 25, (6), Meyers,
VI-19-55, VII-4 (3);

Tuolumne Co., (only, 6400'), VI-20-31, July (7),
 Ackerson Mdw. (3 mi. S. Mather, 4700'), VI-11-
 60 (1), Dardanelles, VI-26-51 (1), Mather,
 VI-7-61, VI-8-61 (3), Mill (6400'), VI-20-31
 (1), Strawberry, VI-15-51, VI-25-51 (9) (at
 light), Tuolumne Meadows, VI-29-16 (1);

Nevada:

Ormsby Co., Clear Cr. Grd., Tahoe, VI-27-19 (2);
 Washoe Co., Mt. Rose, VII-8-63 (2) (Pinus
washoensis).

Oregon:

Benton Co., Alsea Mt., V-15-29 (1), Alsea Mt. Rd.
 (nr. US 34), IV-12-65, V-2-66 (2), Corvallis,
 IV-8-28, V-15-64 (5), same (5 mi. W.), IV-13-
 63 (1), same (MacDonald Forest), IV-15-56,
 V-6-55 (5) (in flight), same (MacDonald Forest),
 IX-1955, X-18-61 (9) (reared, in soil), Marys
 Peak, V-16-63, VI-9-64 (14) (in flight among
 Douglas Fir, 2000', in rotary trap), Philomath
 (9 mi. W), V-27-62, Prairie Mt., IV-1-29 (1),
 Sulfur Springs, IV-4-63 (1);

Clackamas Co., Colton, IV-34 (1);

Columbia Co., St. Helens, V-2-37 (1) (Light trap),;

Coos Co., Fairview (5 mi. NE Coquille), V-16-31-1958
 (2), Remote (2 mi. E.), V-14-49 (1);

Curry Co., Mouth of Pistol River, V-28-52 (2)

(on beach);

Deschutes Co., China Hat, IV-23-57 (1);

Douglas Co., Camas Valley, V-7-39 (1), Roseburg,

(7 mi. NW), VI-12-66, VII-11-64 (67) (at light);

Jackson Co., Ashland, IV-12-36 (1) (flying), Ashland

Mt., VII-14-43 (1), Butte Falls, IV-27-41 (1),

same (site 3, 13 mi. E.), I-3-61 (1) (in soil),

Copper (4 mi. N), V-19-62 (1) (beating pine),

Evans Creek, IV-23-46 (1), Griffin Cr., IV-25-

46 (24), Medford, IV-25-46, VI-15-43 (23),

Pinehurst (5 mi. W., 4526'), V-24-58 (1),

Ruch (8-14 mi. S.), V-24-58 (2), Savage Cr.,

III-21-43 (1);

Jefferson Co., Sisters (17 mi. N.), IV-21-52 (1);

Josephine Co., Cave Jct., V-3-46 (1);

Klamath Co., (only), VI-5-41 (1), Bly (11 mi. E.,

5400'), IV-30-61, V-22-58 (55) (beating yellow

pine), Bly Mt., VI-5-55 (1), Keno (10 mi. W.,

4600') V-24-58 (1), same (3 mi. W.), V-15-60

(1), same (12 mi. SW), V-16-63 (1), same (at

Klamath River), V-21-50 (1), Merritt Cr. (1 mi.

E), VI-5-55 (1), Meryl Cr. (7 mi. NW Bly),

VI-1-62, VI-15-62 (5) (meadow, Ponderosa Pine),

- Saddle Mt. (3 mi. S.), VI-7-62 (4) (Pinus ponderosa), Sun Creek, VI-10-62 (1), Upper Klamath Lake (Dennie Cr.), V-12-53 (2);
- Lake Co., Quartz Cr. (16 mi. E. Bly, 5500'), V-22-58 (4), Quartz Mt., V-16-61 (28) (yellow pine), Warner Mts., VI-18-22 (1);
- Linn Co., Cascadia Pk., VI-17-61 (1) (at light);
- Multnomah Co., Gresham, III-17-47 (1), Portland, III-10-34, IV-22-47 (5) (on deodar cedar);
- Union Co., Jct. Little Antone Cr. and Anthony Cr., V-19-64 (15);
- Yamhill Co., McMinnville, IV-10-36, V-13-39 (3);
- No county: Bear Springs, IV-30-39, VI-9-39 (22), Tollgate, VI-19-49 (1), Wolf Cr., V-24-64 (1);
- Washington:
- Columbia Co., Indian Flat Camp, Dayton, V-13-27 (1);
- Kittitas Co., Cle Elum, V-21-33 (1);
- Klickitat Co., Satus Pass, Simcoe Mts., V-15-64 (2);
- Spokane Co., Cheney, V-4-49, V-7-50 (2);
- Thurston Co., Rainier N.P., V-26-39 (1);
- Wyoming:
- Teton Co., Grand Teton N.P., VII-1947 (1), Yellowstone N. P., VI-16-63 (1).