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Synopsis of Scarab Beetle Tribe Valgini (Coleoptera: Scarabaeidae: Cetoniinae) in the New World

MARY LIZ JAMESON¹ AND KATHARINE ANNE SWOBODA²

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ABSTRACT Two genera and five species of valgine scarabs (Cetoniinae: Valgini) are found in the New World, including the introduced European species, *Valgus hemipterus* L. *Valgus mexicanus* Cazier is transferred to the genus *Dasyvalgus* Kolbe, and characters that support this transfer are discussed. Based on shared morphological characters, *Valgus minutus* Casey and *V. serricollis* Fitch are synonymized with *V. canaliculatus* (Olivier). Neotypes are designated for *V. serricollis* Fitch and *Cetonia canaliculata* Olivier. A key to the genera and species of New World Valgini is provided. Species are redescribed and information about geographic and phenology, biology, and larvae is provided.

KEY WORDS Scarabaeidae, Cetoniinae, Valgini, *Dasyvalgus*, *Valgus*

VALGINE SCARABS (Coleoptera: Scarabaeidae: Cetoniinae) are small (≈ 2.0 – 15.0 mm), possess a vestiture of scale-like setae, and are most diverse in the Old World tropics. Unusual life histories and morphological traits make species in the group biologically interesting. A firm foundation in the taxonomy and systematics of the group will allow for a better understanding of evolutionary processes and patterns, including coevolutionary relationships between valgine scarabs and termites, dispersal of adventive species in the New World, and evolutionary mechanisms that affect high intraspecific variation. We provide an overview of the valgine species in the New World, thus creating the foundation for additional evolutionary research.

The tribe Valgini is comprised of ≈ 335 species worldwide (Krajcik 1999, Antoine 2002). As characterized herein, the New World valgine fauna is small, comprised of only two genera and five species that are distributed in Mexico, the United States, and southeastern Canada (Figs. 1–9): *Dasyvalgus mexicanus* (Cazier), *Valgus californicus* Horn, *V. canaliculatus* (Olivier), *V. hemipterus* Linnaeus, and *V. seticollis* (Palisot de Beauvois). The Old World species *V. hemipterus* is adventive in the New World.

Valgine scarabs possess numerous behaviors and traits that attract investigation. Valgines are among the few scarabs that possess dorsal and ventral scale-like setae, a trait shared with the monkey beetles (Scarabaeidae: Melolonthinae: Hopliini). Some valgine species possess beautifully colored setae and bizarre setal tufts. According to Crowson (1981), setae may play a part in creating a cryptic or adaptive color pattern in beetles. Some female valgine beetles possess an ex-

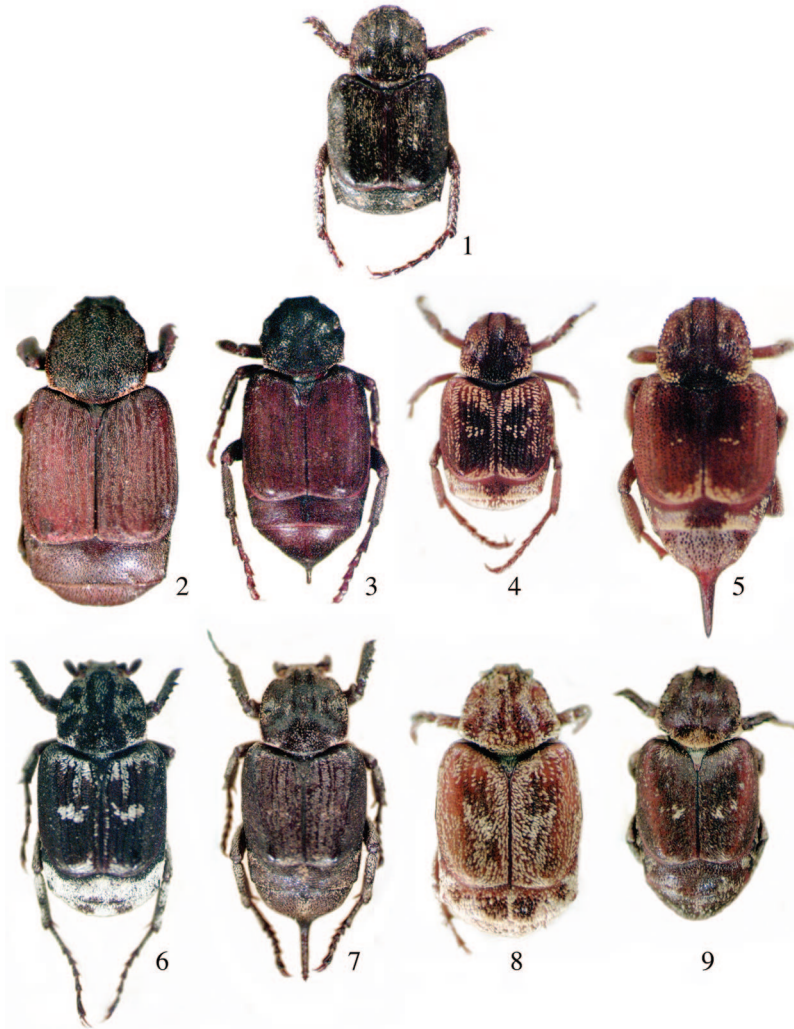
ternal ovipositor at the apex of the pygidium (herein referred to as a pygidial spine [Figs. 19–24]). This character is unique within the Scarabaeoidea. Elongate ovipositors, such as those in the Valgini, are characteristic of beetles whose larvae live in dead wood (e.g., Cerambycidae, Cupedidae, Oedimeridae) (Crowson 1981). Ricchiardi (2000) noted that the pygidial spine in valgine scarabs is not used to deposit eggs deep into substrate. Rather, he postulated that the pygidial spine is used to manipulate the substrate where the egg will be laid.

Most adult valgine scarabs are nectivorous and are associated with many kinds of shrubs and flowering trees (Krikken 1978), and some species are associated with termites (Isoptera) (Linsley and Michener 1943, Ritche 1958, Evans 1986). In the New World, species of *Valgus* are associated with two genera of termites: *Reticulitermes* (Rhinotermitidae) and *Zootermopsis* (Termopsidae). *Valgus seticollis* and *V. canaliculatus* are associated with species of *Reticulitermes*; *V. californicus* is associated with species of *Zootermopsis*. The nature of the association between valgines and termites is not known. Valgines may be obligate termitophiles that coevolved with their hosts, or they may simply use termite colonies to take advantage of a stable environment and for access to a larval food source. Coevolutionary phylogenetic analyses of termites and valgine scarabs are necessary to address these interesting questions.

Monophyly of the Valgini is well established based on the widely separated hind coxae that are autapomorphic (Krikken 1984) and several apomorphic hindwing characters (Browne and Scholtz 1998). The tribe is a member of the scarab subfamily Cetoniinae which includes 12 tribes (Krikken 1984), including the tribes Cetoniini and Trichiini. Classification of the group, either as a subfamily or tribe, has varied. The valgine scarabs were considered to be a subfamily

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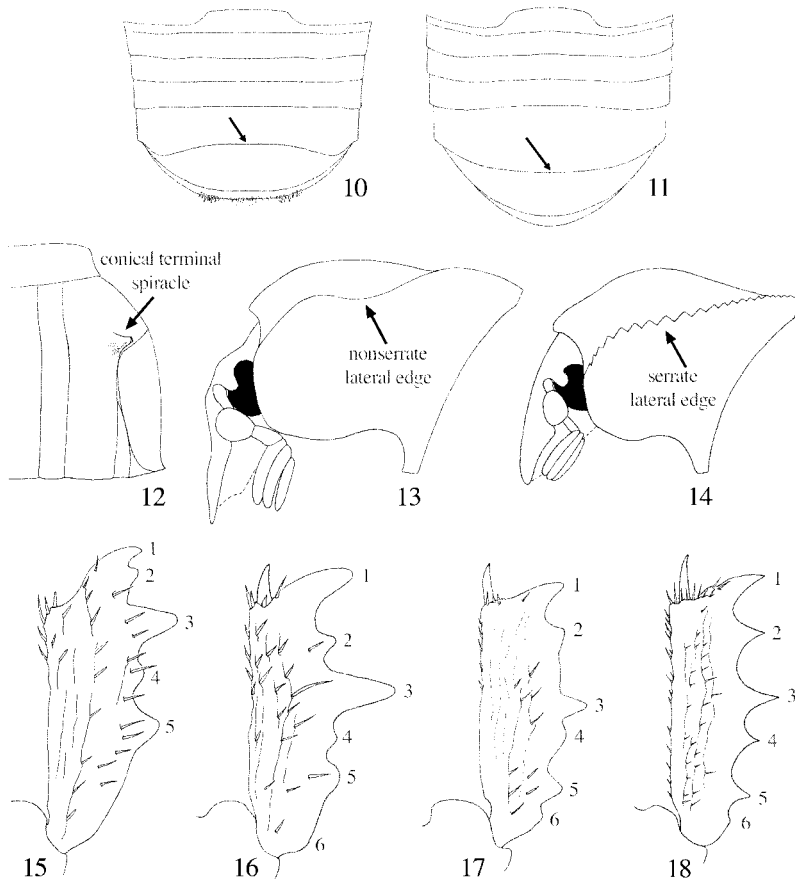


Figs. 1–9. New World valgine scarabs, left to right. 1) *D. mexicanus*, male; 2–3) *V. californicus*, male and female (respectively); 4–5) *V. canaliculatus*, male and female (respectively); 6–7) *V. hemipterus*, male and female (respectively); 8–9) *V. seticollis*, male and female (respectively).

within the Scarabaeidae, composed of the tribes Valgini and Microvalgini (Schenkling 1921, Krikken 1978, Ratcliffe 1991). However, recent work considered the group to be a tribe that is composed of the subtribes Valgina and Microvalgina (Krajcik 1999, Ratcliffe 2002). The Microvalgina includes 67 species in three genera found in the African, Australian, and Indomalaysian regions (Krajcik 1999). The Valgina includes ≈265 species in 32 genera found in all major biogeographic regions except the Australian region (Krajcik 1999, Antoine 2002). Based on the Afro-Australian distribution of the subtribe Microvalgina, Krikken (1984) hypothesized that the tribe Valgini is an ancient group that possibly dates to the Cretaceous (65–140 Mya).

Members of the Valgini have had a history of taxonomic strife due, in part, to character differences between males and females and due to the great

amount of intraspecific variation in the distribution and color of scales. Distribution of setae, color of setae, and setal patches all vary greatly within a species. Furthermore, setae are commonly abraded from specimens or discolored due to a build-up of fat. Thus, these characters are not entirely reliable for identification of species. In addition to variation in coloration and distribution of setae, males and females of the same species often share little resemblance. Females of some species possess a pygidial spine (lacking in males), may have stouter legs and tarsi (more gracile in males), may have stiff setae on the abdomen (scales in males), and may have poorly developed setal tufts on the apex of the pygidium and propygidium (well developed in males). Difficulty associating males with females led to the description of different species for the same taxon as well as multiple generic placements for a single taxon.



Figs. 10–18. 10–11) Ventral view of sternites in *V. seticollis*, male (10) and female (11) showing differences between the sexes. 12) Lateral view of abdomen of *D. mexicanus* showing conical terminal spiracle. 13–14) Lateral view of head and pronotum in *V. californicus* and *V. canaliculatus* (respectively) showing nonserrate (13) or serrate (14) pronotal margin. 15–18) Male foretibia (dorsal view) showing form and external teeth in *D. mexicanus* (15), *D. sellatus* (16), *V. canaliculatus* (17), and *V. hemipterus* (18).

We also observed variation in form of the male genitalia. The value of male genitalia in taxonomy and identification of species has long been recognized (Sharp and Muir 1912, d'Hotman and Scholtz 1990), and there is little variation within most species of scarab beetles (Endrödi 1985). However, one species of New World valgine, *V. seticollis*, has extremely variable male genitalia although there is an overall similarity in pattern (Figs. 31–35). Other characters that we examined are consistent within this species, including form of the tarsomeres, pygidial spine, pronotum, sternites, and spiracles. Lacking other morphological characters to separate the genitalic forms, we conservatively group all the forms as one species. A thorough study of the genitalic forms of *V. seticollis* would be an excellent topic for a molecular analysis and could reveal interesting evolutionary patterns.

Valgine scarabs are in need of a comprehensive taxonomic revision and phylogenetic analysis. Relationships among the genera of the subtribe Valgina have not been addressed. Phylogenetic analyses and morphological studies of world taxa would help to determine the relationship between genera and spe-

cies, create predictive classifications, and aid in the study of evolution and adaptation in the group. We provide a foundation for identification of New World Valgini and for future phylogenetic, ecological, and systematics studies on this interesting group of scarab beetles.

Contributions to New World Valgine Beetles

The biology of *V. canaliculatus* drew the interest of two prominent entomologists, Lee Townsend and Paul Ritcher. These entomologists intended to publish a synopsis of the valgine scarabs of North America. They amassed loans and literature for a work that never quite reached fruition. The materials that Townsend and Ritcher accumulated added greatly to our research. Townsend's handwritten notes and drawings helped to corroborate our hypotheses regarding taxonomic status of genera and species and posed alternative hypotheses that caused us to probe more deeply into some of the problems associated with the taxonomy, species concepts, and variation of the group. Materials from Townsend and Ritcher in-

cluded loans of specimens from many United States collections, translations of literature, distribution maps, and notes on problematic names and concepts. Also included was correspondence with prominent entomologists of the past: Gilbert J. Arrow (British Museum of Natural History, London), Edward A. Chapin (Smithsonian Institution, Washington, DC), and Herbert H. Ross (Natural History Survey, Urbana, IL). These materials are now archived at the University of Nebraska State Museum, Division of Entomology.

Townsend and Ritcher's interests in valgine scarabs began serendipitously. In the summer of 1944, Townsend (then Associate Professor of Entomology, University of Kentucky, Lexington, KY) and Ritcher (then Assistant Entomologist, Kentucky Agriculture Experiment Station) reared two unidentified larvae: "13 July 1944: Ritcher collected two larvae (third stage) from soil beneath dead log near Sacred Circle on North Elkhorn Creek. These were placed in a tin salve box for rearing. On 27 July 1944 a *Valgus canaliculatus* male was found in the box. The finding of these larvae was the stimulus which prompted more collecting" (from Townsend's handwritten notes). Townsend and Ritcher observed and reared *V. canaliculatus* for two summer seasons (1944–1945). Townsend's notes provide details on the daily and weekly development of larvae, dimensions of pupal cells, number of larvae in termite galleries (as many as 112), the bluish color of larvae, oviposition, mating (males lie on their back while mating due to the female's pygidial spine), and many other details. Townsend also noted that only males feed, and females could not be induced to feed.

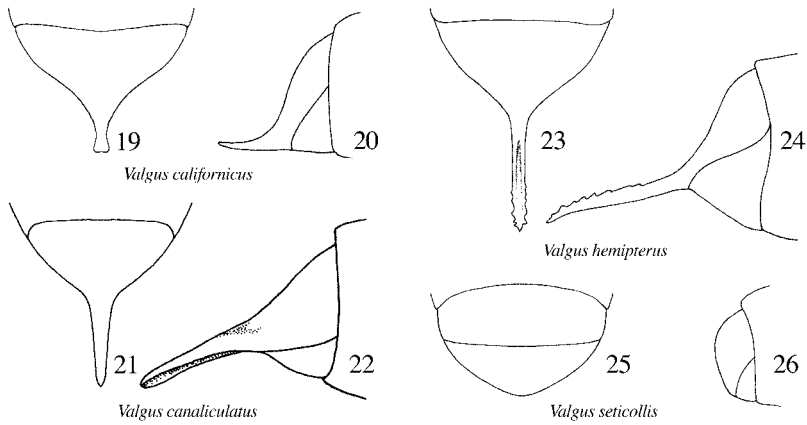
As a result of these collaborative endeavors, Ritcher (1966) published some biological and larval data, and Townsend began a manuscript on the biology and taxonomy of *Valgus* species. Townsend borrowed specimens, gathered literature, and inquired about the location of type specimens while his students were away during World War II. After his students returned from the war, Townsend was again occupied with teaching, and he had little time to devote to the *Valgus* project. Townsend retired in June 1973. He transferred correspondence, specimens, loan forms, notes, and literature to Ritcher and asked that Ritcher finish the manuscript (personal communication Townsend to Ritcher, 29 May 1973). Ritcher, who was then curator of the insect collection at Oregon State University (Corvallis, OR), agreed but did not complete the project before his retirement in 1974. Although he lived until 1991 and the age of 81, he no longer conducted research after his retirement. Thus, upon retirement, Ritcher passed the *Valgus* project and all its materials to Dave Carlson. Carlson completed his M.S. and Ph.D. with Ritcher (1973 and 1976, respectively). He contributed to the *Valgus* project by studying the structure of the male genitalia and internal sac of *Valgus* species and also by collecting *V. californicus* in California and Oregon. Carlson (now in Fair Oaks, CA) continues his avocation in scarab systematics, but limited time prevented him from working on the *Val-*

gus project. In 2002, Carlson passed the *Valgus* project and all its materials to us.

Materials and Methods

The results of this study are based on specimens from 28 institutions. We initiated loans during the course of this research, and we used material that was loaned to Townsend and Ritcher between 1944 and 1978. We made efforts to acknowledge the curators and personnel who loaned these specimens. Some of the original loan paperwork exists, and we have made efforts to return all specimens to the proper institutions. The collections and their acronyms are as follows: AMNH, American Museum of Natural History, New York, NY (J. G. Rozen, J. C. Pallister); BCRC, Brett C. Ratcliffe Collection, Lincoln, NE (B. C. Ratcliffe); BMNH, British Museum of Natural History, London, England (G. J. Arrow); CASC, California Academy of Sciences, San Francisco, CA (E. C. VanDyke, E. S. Ross, D. Kavanaugh, R. Brett); CDAE, California State Collection of Arthropods, Sacramento, CA (C. Bellamy, F. Andrews); CNCI, Canadian National Collection, Ottawa, ON (W. J. Brown); DCCC, Dave C. Carlson Collection, Fair Oaks, CA (D. Carlson); EMEC, University of California, Berkeley, CA (J. A. Chemsak); FMNH, Field Museum of Natural History, Chicago, IL (J. Boone, A. Newton, M. Thayer); INHS, Illinois Natural History Survey, Champaign, IL (H. H. Ross); IRCW, University of Wisconsin, Madison, WI (J. R. Baker, L. Bayer); KSEM, University of Kansas, Lawrence, KS (H. B. Hungerford, B. Beatty); LAGO, Paul Lago Collection, University, MS (P. Lago); LSAM Louisiana State University, Baton Rouge, LA (J. B. Chapin, C. Carlton); MCZC, Museum of Comparative Zoology, Harvard University, Cambridge, MA (E. O. Wilson); MEMU, Mississippi Entomological Collection, Mississippi State University, MS State, MS (T. Schiefer); MLUH, Martin-Luther-Universität, Wissenschaftsbereich Zoologie, Halle, Germany (K. Schneider); MSUC, Michigan State University, East Lansing, MI (R. L. Fischer); PURC, Purdue University, West Lafayette, IN (J. J. Davis); UCDC, University of California, Davis, CA (L. Kimsey); UGCA, University of Georgia, Athens, GA (W. T. Atyeo, H. H. Ross); UMMZ, University of Michigan, Ann Arbor, MI (C. Mickel); UNSM, University of Nebraska State Museum, Lincoln, NE (B. C. Ratcliffe, M. L. Jameson); USNM, United States National Museum, Washington, DC (E. A. Chapin, O. L. Cartwright, P. Spangler) (collection currently at University of Nebraska State Museum; B. C. Ratcliffe, M. L. Jameson); RHTC, Robert H. Turnbow Collection, Fort Rucker, AL (R. H. Turnbow); SSCC, S. Summerland Collection, Vincennes, IN (S. Summerland); OSUC, The Ohio State University, Columbus, OH (J. N. Knull); and ZMUC, Zoological Museum, University of Copenhagen, Denmark (O. Martin).

We observed a great amount of intraspecific variation in the form, color, and distribution of setae. Based on this variation, we do not rely solely on these characters (see discussion in *Introduction*). Body mea-



Figs. 19–26. Dorsal and lateral views (respectively) of female pygidium and pygidial spines in: 19–20) *V. californicus*, 21–22) *V. canaliculatus*, 23–24) *V. hemipterus*, and 25–26) *V. seticollis*.

surements and key characters are based on the following standards. *Body length* was measured from the apex of the pronotum to the apex of the pygidium. *Lateral edges of the pronotum* possessed obvious serrations (Fig. 14) or were lacking obvious serrations (Fig. 13). *Terminal spiracles* are described as distinctly produced and conical (“cone” produced more than two spiracle diameters; Fig. 12), weakly convex (produced less than one spiracle diameter), or flat. *Female pygidial spine* is described as it looks when viewed dorsally (Figs. 19 and 21, 23) or laterally (Figs. 20 and 22, 24). In descriptions and key couplets, *elytral cuticular color* is viewed using magnification and illumination. Elytral cuticular color describes the color of the cuticle rather than color of the setae and scales.

Locality data are included for each species. We record the country and state/province (Mexico and Canada) or state and county (United States) from which specimens were examined.

The phylogenetic species concept (Wheeler and Platnick 2000) was applied in this work: “A species is the smallest aggregation of (sexual) populations or (asexual) lineages diagnosable by a unique combination of character states.”

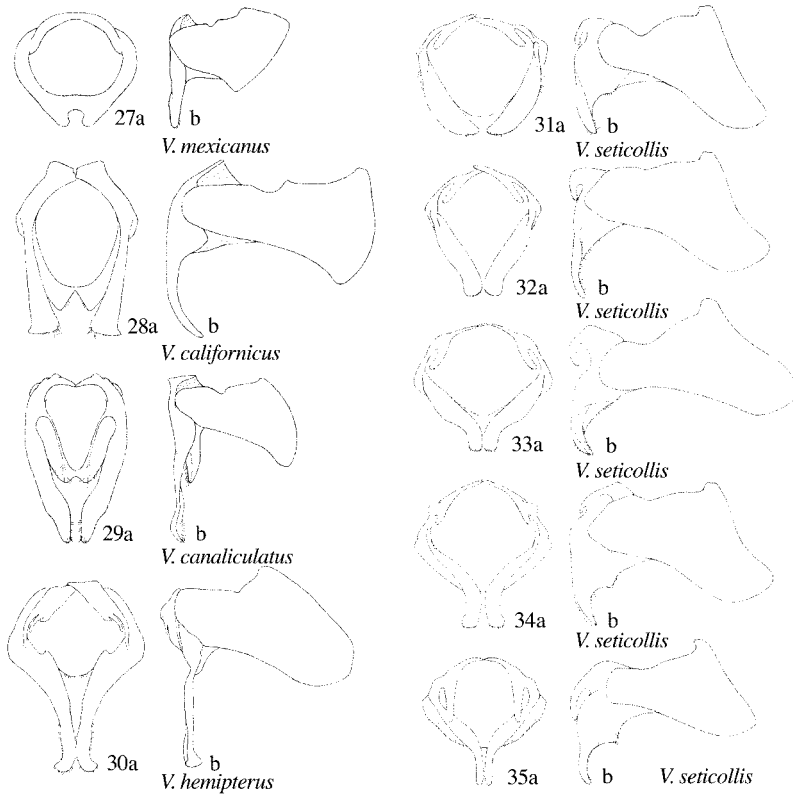
The International Commission of Zoological Nomenclature (ICZN) requires that neotype designation is valid only when there is “exceptional need,” and only when the need is “expressly stated” (Article 75.3; ICZN 1999). We designate neotype specimens for two species to preserve the stability of nomenclature by selecting one specimen as the name-bearing type because the original type specimens have been lost or destroyed. The neotype specimen ties the published name to an actual specimen and serves as a reference for the taxon. We designate a neotype for *Valgus serricollis* Fitch and *Cetonia canaliculata* Olivier to avoid taxonomic confusion of species and names for these taxa.

The following characters serve to separate male and female specimens. *Males*: Pygidial spine absent, apex of pygidium in ventral view with fringe of setae and/or border of penultimate sternite anteriorly sinuate at

middle (Fig. 10). *Females*: Pygidial spine present (Figs. 19–24) or, if lacking (Figs. 25–26; *V. seticollis*), then apex of pygidium in ventral view without fringe of setae and/or border of penultimate sternite posteriorly sinuate at middle (Fig. 11).

Key to Genera and Species of New World Valgini

1. Terminal spiracles conical, distinctly produced (Fig. 12). Posterior tarsomeres subequal in length *Dasyvalgus mexicanus* (Cazier)
- 1'. Terminal spiracles not distinctly produced. Posterior tarsus with first tarsomere as long as or longer than tarsomeres two and three combined 2
- 2(1'). Lateral edges of pronotum not serrate (Fig. 13; setae may need to be removed to view edge of pronotum). Female with short, scoop-like pygidial spine (Fig. 19); spine moderately recurved in lateral view (Fig. 20) . *Valgus californicus* Horn
- 2'. Lateral edges of pronotum serrate (Fig. 14; setae may need to be removed to view edge of pronotum). Female without pygidial spine (Fig. 25) or, if present, female with acuminate pygidial spine (Figs. 21 and 23); spine moderately decurved in lateral view (Figs. 22 and 24) 3
- 3(2'). Body length (as measured from apex of pronotum to apex of pygidium) 4.0–6.0 mm. Female without pygidial spine (Figs. 25–26) or pygidial spine of female without lateral serrations (Figs. 21–22). Elytral cuticular color reddish brown, brown, or castaneous 4
- 3'. Body length (as measured from apex of pronotum to apex of pygidium) 8.0–9.0 mm. Pygidial spine of female with irregular, lateral serrations (Figs. 23–24). Elytral cuticular color piceous *Valgus hemipterus* (L.)
- 4(3). Male with dense patch of overlapping yellow and cream-colored setae on ventral surface of abdomen. Female with acuminate pygidial spine (Fig. 21); spine decurved in lateral view (Fig.



Figs. 27–35. Dorsal view (a) and lateral view (b) of male genitalia in; 27) *D. mexicanus*, 28) *V. californicus*, 29) *V. canaliculatus*, 30) *V. hemipterus*, and 31–35) *V. seticollis*.

- 22). Elytral cuticular color reddish brown or brown *Valgus canaliculatus* (Olivier)
- 4'. Male with moderately dense, tawny setae on ventral surface of abdomen, setae not overlapping and dense. Female without acuminate pygidial spine (Figs. 25–26). Elytral cuticular color of male reddish brown; cuticular color of female castaneous *Valgus seticollis* (Palisot de Beauvois)

Genus *Dasyvalgus* Kolbe, 1904
(Figs. 1; 12; 15; 27a, b; 36)

- Dasyvalgus* Kolbe, 1904: 25, 34 (valid name). Type species: *V. sellatus* Kraatz 1883 (designated by Arrow 1944).
- Anepsiovalgus* Kolbe, 1904: 24, 30 (junior synonym).
- Nannovalgus* Kolbe, 1904: 24, 26 (junior synonym).
- Plocovalgus* Kolbe, 1904: 45 (junior synonym).
- Syngonvalgus* Kolbe, 1904: 24, 28 (junior synonym).
- Trichovalgus* Kolbe, 1904: 36, 44 (junior synonym).
- Nipponvalgus* Sawada, 1941: 1–14 (junior synonym).

Diagnosis (Fig. 1). The genus *Dasyvalgus* is characterized by the following morphological characters (based on Arrow 1944): propygidial spiracles distinctly produced and conical (Fig. 12) (simple in *Valgus*); sternite 6 of abdomen retractile and smooth

(with scales and not retractile in *Hybovalgus* Kolbe; retractile and smooth in *Valgus*); propygidial spiracles placed one to two spiracle diameters from basal border of pygidium (four to five spiracle diameters from basal border of pygidium in *Valgus*); foretibia with five external teeth (Figs. 15–16) (five to six teeth in *Valgus* [Figs. 17–18]); second elytral interval wider at elytral base than at elytral apex (elytral interval parallel in *Valgus*); elytral striae sinuous (straight in *Mimovalgus* Arrow; sinuous in *Valgus*); middle coxae separated by less than width of adjacent femora (more widely separated in *Chromovalgus* Kolbe; separated by less than width of adjacent femora in *Valgus*).

Distribution (Fig. 36). The genus *Dasyvalgus* contains 109 species found in the Palaearctic and Indomalaysian regions (Krajcik 1999). One species is found in the New World in southern Mexico.

Biology. Nothing is known of the natural history of the species in the New World. Females of most *Dasyvalgus* species are rare or unknown (Ricchiardi 1996).

Discussion. Species of *Dasyvalgus* are readily recognizable due to the conical form of the spiracles on the propygidium (Fig. 12). One species, *V. mexicanus*, possesses the character states that are consistent with characters shared with other species in the genus *Dasyvalgus*. We compared the New World species with *D. sellatus*, the type species of the genus. After careful analysis, we transfer *V. mexicanus* to the genus

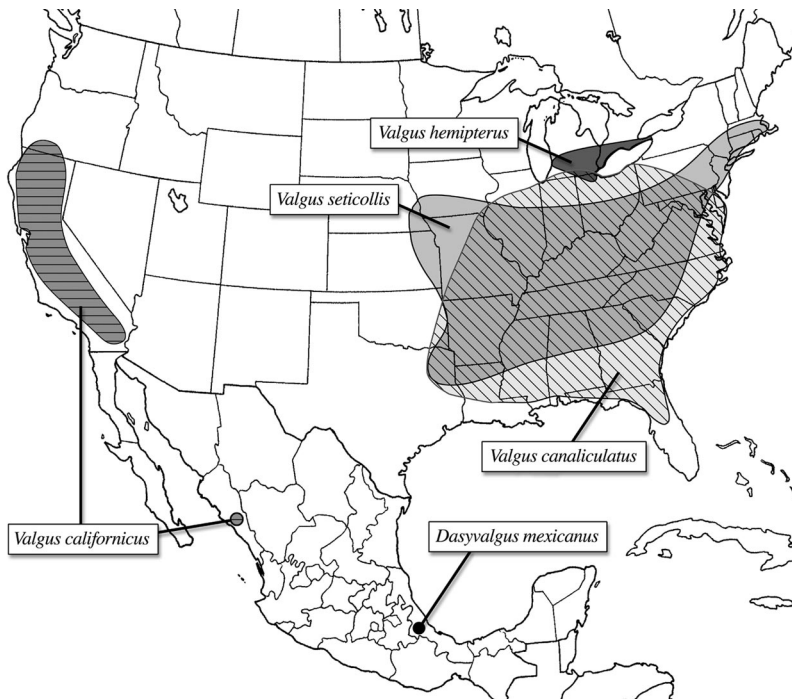


Fig. 36. Distribution of valgine scarabs in the New World.

Dasyvalgus based on the above characters. Arrow also believed that *V. mexicanus* seemed to be more appropriately placed in the genus *Dasyvalgus* (personal communication, Arrow to Townsend, 17 March 1947). Thus, one species of *Dasyvalgus* is found in the New World in southern Mexico.

Dasyvalgus mexicanus (Cazier, 1937)
New Combination
(Figs. 1; 12; 15; 27a, b; 36)

Dasyvalgus mexicanus (Cazier, 1937: 190–191) (valid name).

Valgus mexicanus Cazier, 1937: 190–191 (original combination).

Diagnosis (Fig. 1). Length 4.0–5.0 mm. Dorsal surface with sparse, castaneous setae. Ventral surface of abdominal sternites with sparse, tawny setae. Setae of elytra more or less parallel sided. Elytral cuticular color castaneous. Pronotum serrate on lateral edge; longitudinal medial ridge poorly developed; short carina present between longitudinal medial ridge and lateral edge of disc; basolateral angle square or weakly acute. Terminal spiracle distinctly produced and conical (Fig. 12). Posterior tarsomeres subequal in length. Male genitalia as in Fig. 27a, b. Female unknown.

Distribution (Fig. 36). The species is known only from Mt. Orizaba, suggesting a relictual distribution (Morón et al. 1997). Morón et al. (1997) stated that this species is found in montane forest, possibly between 1,500–1,600-m elevation.

Locality Records. MEXICO: VERACRUZ: Mt. Orizaba.

Phenology. June.

Biology. Larvae are not described. Natural history is unknown.

Discussion. Cazier (1937) described *D. mexicanus* based on seven specimens, all of which were collected in Orizaba, Mexico, by G. Trussel. During the course of this research, we examined four specimens from the type series. In his description, Cazier (1937) noted characters of the tarsi, thorax, and pygidium that differed from other New World Valgini, but he did not note the conical form of the pygidial spiracles. Female specimens of *D. mexicanus* are not known, but based on other species of *Dasyvalgus*, we hypothesize that the female will possess a pygidial spine.

Genus Valgus Scriba, 1790
(Figs. 2–9, 10–14, 17–18, 28–36)

Valgus Scriba, 1790: 66 (valid name). Type species: *Scarabaeus hemipterus* Linnaeus 1758: 351 (designated by Scriba 1790).

Acanthurus Kirby, 1827: 155 (junior synonym).

Homovalgus Kolbe, 1897: 214–215 (junior synonym).

Diagnosis (Figs. 2–9). The genus *Valgus* is characterized by the following morphological characters (based on Arrow 1944): propygidial spiracles not produced and conical (produced and conical in *Dasyvalgus* [Fig. 12]); sternite 6 of abdomen retractile, smooth, shining (with scales and not retractile in *Hy-*

bovalgus; retractile and smooth in *Dasyvalgus*); pygidial spiracles placed four to five spiracle diameters from basal border of pygidium (one to two spiracle diameters in *Dasyvalgus*); foretibia with five to six external teeth (Figs. 17–18) (foretibia with five teeth in *Dasyvalgus* [Figs. 15–16]); second elytral interval subequal in width at base and apex (broader at base than at apex in *Dasyvalgus*); elytral striae sinuous (straight in *Mimovalgus*; sinuous in *Dasyvalgus*); middle coxae separated by less than width of adjacent femora (more widely separated in *Chromovalgus*; separated by less than width of adjacent femora in *Dasyvalgus*).

Distribution (Fig. 36). The genus *Valgus* contains 20 species found in the Nearctic, Palaearctic, and Indomalaysian regions (Krajcik 1999). In the New World, species of *Valgus* are found in the United States, southeastern Canada, and Mexico.

Biology. *Valgus* species have a 1-yr life cycle (Ritcher 1958). Adults can be found on flowers in the spring and summer (Ratcliffe 1991, 2002). Mating has been observed in termite galleries in stumps or fallen trees (Ritcher 1958). Larvae, pupae, and adults are found in decaying wood associated with termite colonies (Ritcher 1958). Species in the genus are commonly found in colonies of *Reticulitermes* sp. in the eastern United States (Banks and Snyder 1920) and in association with *Zootermopsis* sp. (Banks and Snyder 1920, Linsley and Ross 1940, Linsley and Michener 1943, Evans 1986) in the western United States.

Females of most *Valgus* species possess an external ovipositor at the apex of the pygidium (Figs. 19–26; referred to here as a pygidial spine), which is used to create oviposition sites (Arrow 1944, Mahar 1989) or to manipulate the substrate in which the egg will be placed (Ricchiardi 2000). This morphological structure is unique within the Scarabaeoidea. Valgine larvae feed on the walls of termite burrows in logs or standing dead trees (Ritcher 1958). The larvae of three New World species have been described: *Valgus californicus* Horn (Ritcher 1966), *Valgus canaliculatus* (Olivier) (Ritcher 1945, 1966), and *Valgus hemipterus* L. (Medvedev 1969).

Discussion. The genus *Homovalgus* was synonymized with *Valgus* (Ratcliffe 1991). This genus contained only one species, *H. seticollis* (Palisot de Beauvois). Use of this monotypic genus was sporadic. Cazier (1937: 191) elected not to use the genus because it had “little value.” Krikken (1978) used one character (the weakly protuberant form of the pronotal base) to separate *Valgus* and *Homovalgus*. However, Krikken was dubious of the usage of the genus, and he stated (Krikken 1986: 16) “whether indeed *seticollis* deserves a separate generic position remains to be seen.” The genus was characterized based on two character states that are homoplastic within the Valgini: 1) lack of a pygidial spine in the female and 2) a weak basal pronotal protuberance. The female pygidial spine may be present or absent within valgine genera (e.g., *Oreoderus*; Ricchiardi 2000). Arrow (1944) noted that the pygidial spine may be present or absent between closely related species. Thus, this

character is not sufficient for separating genera. We found little difference in the form of the pronotal base and believe that this character is insufficient for separation of genera. Thus, based on the lack of shared, derived characters for the genus *Homovalgus*, we agree with the synonymy by Ratcliffe (1991).

Fossil or subfossil remains of two *Valgus* species have been described. *Valgus oeningensis* Heer (Heer 1862) was described from Miocene deposits (14.5 Mya) in Kesselstein, Germany (Krell 2000). Subfossil remains of *V. hemipterus* (foretibia and femur) found in southern Sweden and dated between 7000 and 5000 yr BP provide evidence that this region had habitat suitable for this species (Lemdahl 1990).

Taxonomic synopses of the New World species of *Valgus* were provided by Casey (1915), Cazier (1937), Arrow (1944), and Krikken (1978).

Valgus californicus Horn, 1870

(Figs. 2; 3; 13; 19; 20; 28a, b; 36)

Valgus californicus Horn, 1870: 78 (valid name).

Diagnosis (Figs. 2–3). Length 8.0–9.0 mm. Dorsal surface (male and female) with sparse, dark brown setae. Ventral surface of abdominal sternites (male and female) with sparse, dark brown setae. Setae of elytra broader at apex and narrowed at base. Elytral cuticular color (male and female) castaneous. Pronotum not serrate on lateral edge (Fig. 11); longitudinal, medial ridge poorly developed; short carina absent between longitudinal medial ridge and lateral edge of disc; basolateral angle square. Terminal spiracle not distinctly produced and not conical. Posterior tarsus (male and female) with first tarsomere as long as tarsomeres 2 to 3 combined. Female pygidial spine (dorsal view) short, scoop-like, lacking lateral serrations (Fig. 17); lacking longitudinal groove (ventral view); moderately reflexed (lateral view; Fig. 18). Male genitalia as in Fig. 26a, b.

Distribution (Fig. 37). Southern Oregon, California, and Sinaloa state in Mexico. The range of *V. californicus* includes the southern Cascades, Sierra Nevadas, San Jacintos Mountains, and the Coast Range (Santa Cruz) Mountains in California (Ritcher 1966). A 700-mile disjunction separates specimens recorded from southern California and one specimen (deposited at CASC) from Sinaloa, Mexico (Culiacán) and brings into question the validity of the collecting data on this specimen. It is possible that this disjunction is due to incorrect collecting data or lack of collecting between southern California and Sinaloa. The specimen from Sinaloa represents a new Mexican distributional record.

Locality Records. USA. CALIFORNIA: Alpine, Calaveras, El Dorado, Fresno, Lassen, Merced, Placer, Riverside, Santa Cruz, Siskiyou, Trinity, Tulare, Tuolumne. OREGON: Jackson, Klamath. MEXICO: SINALOA: Culiacán.

Phenology. May and June.

Biology. *V. californicus* is an inquiline in the nests of the large termites, *Z. angusticollis* Hagen (Banks and

Snyder 1920) and *Z. nevadensis* (Hagen) (Linsley and Michener 1943). Nests occur beneath the loose bark of trees and stumps or in damp, rotting wood at the base of trees. Pupae and larvae of *V. californicus* were found in small hollows or cells made from termite castings (Hinton 1930). Adults were collected in ponderosa pine (*Pinus ponderosa* Laws) (Linsley and Ross 1940) and fire-killed sugar pine (*Pinus lambertiana* Dougl.) (Hinton 1930) at elevations from 1,372 to 2,743 m.

Evans (1986) observed *V. californicus* in an area of forest that had been logged leaving a number of 0.60–0.91-m-tall stumps of ponderosa pine. These stumps were occupied by *Zootermopsis* sp. and *V. californicus*. Evans observed males, females, and copulating pairs in blind galleries in the dry upper portion of the stumps. Third stage larvae were also observed in loose cells constructed of termite castings. The third-stage larva was described by Ritcher (1966).

Valgus canaliculatus (Olivier, 1789)
(Figs. 4; 5; 14; 21; 22, 29a, b; 36)

Valgus canaliculatus (Olivier, 1789: 69) (valid name). Neotype male at UNSM labeled: a) "Virginia: Montgomery County; Blacksburg 37 N; 80 W; 14 June 1997 Sweeping Vegetation S. W. Lingafelter, Coll." (typeface), b) "*Valgus canaliculatus* (Olivier) det. K. A. Swoboda 2002" (typeface), c) "*Cetonia canaliculata* Olivier 1789: 69, Neotype det. M. E. Jameson 2004" (handwritten and typeface, red label). **Neotype here designated.** The location of the holotype is unknown. We searched the Olivier collection in the Museum National d'Histoire Naturelle, Paris, but we were unable to locate the type specimen. Because Fabricius apparently used the same specimen as Olivier for his description (that of Lee), we examined two specimens of *V. canaliculatus* from Fabricius' collection at ZMUC. Specimens were in bad condition (they could not be identified with certainty as *V. canaliculatus*) and lacked label data that might have indicated they were from the Lee collection. Thus, we selected a specimen from Virginia (representing "America boreali") to serve as the neotype.

Cetonia canaliculata Olivier, 1789: 69 (original combination).

Trichius variegatus Palisot de Beauvois, 1807: 59 (junior synonym).

Valgus serricollis Fitch, 1858: 697 (junior synonym). Neotype male at UNSM labeled: a) "Miss, Hinds Co., 23-V-1980, Clinton, B. Stark" (handwritten and typeface), b) "*Valgus serricollis* Fitch 1858: 697, Neotype det. M. E. Jameson 2004" (handwritten and typeface, red label). **Neotype here designated.** The location of the holotype of *V. serricollis* is unknown. We searched numerous collections for the type specimen, but were not able to locate it. Ritcher and Townsend attempted to find the type of *V. serricollis* at the New York State Museum, the Philadelphia Academy of Sciences, the MCZC, and UNSM [where the collection was deposited according to

Horn and Kahle (1935)]. According to correspondence to Townsend, Fitch's collection was lost due to neglect (personal communication, K. F. Chamberlain, 14 August 1945). After Fitch's death, his collection and books were acquired by Foote, a Philadelphia book dealer, and then lost. We can only conclude that the type has been lost. Fitch (1858) described the species based on one specimen and the abdomen of another from the vicinity of Jackson, MS (Hinds County). We selected a neotype from Hinds County that is similar all respects to Fitch's description. **New Synonym.**

Valgus minutus Casey, 1909: 283 (junior synonym). **New Synonym.**

Diagnosis (Figs. 4–5). Length 4.0–5.0 mm. Dorsal surface (male) with dense, tawny and dark brown setae; female with moderately dense, tawny and dark brown setae. Ventral surface of abdominal sternites (male) with dense, overlapping, tawny and yellow setae; female with sparse, tawny setae. Setae of elytra tear-dropped shaped. Elytral cuticular color (male and female) reddish brown to brown. Pronotum serrate on lateral edge (Fig. 14); longitudinal medial ridge well developed; short carina present between longitudinal medial ridge and lateral edge of disc; basolateral angle rounded. Terminal spiracle not produced and not conical. Posterior tarsus (male) with first tarsomere as long as tarsomeres 2 to 3 combined; posterior tarsus (female) with first tarsomere as long as tarsomeres 2–4 combined. Female pygidial spine (dorsal view) acuminate, lacking lateral serrations (Fig. 21); longitudinal ridge present (ventral view); moderately decurved (lateral view; Fig. 22). Male genitalia as in Fig. 29a, b.

Distribution (Fig. 36). Eastern half of the United States (from Pennsylvania and northern Florida in the east to Missouri and northeastern Texas in the west). Riley and Wolfe (2003) reported *V. canaliculatus* from Anderson, Brazos, and Smith counties in Texas. *Valgus canaliculatus* is broadly sympatric with *V. seticollis*.

Locality Records. USA. ALABAMA: Lee, Madison, Marion, Mobile. ARKANSAS: Benton. DELAWARE: New Castle, Sussex. DISTRICT OF COLUMBIA. FLORIDA: Highlands. GEORGIA: Chattooga, Clarke, Murray, White. ILLINOIS: Franklin, Jackson, Lawrence, Mason, Massac. INDIANA: Brown, Clark, Lawrence, Morgan, Tippecanoe, Vigo. IOWA: No data. KENTUCKY: Bell, Clark, Fayette, Henderson, Lincoln, Rockcastle, Trigg, Whitley, Woodford. LOUISIANA: Natchitoches, Ouachita, St. Landry. MARYLAND: Baltimore, Montgomery, Queen Anne's, Talbot. MICHIGAN: No data. MISSOURI: St. Louis. NEW JERSEY: No data. NORTH CAROLINA: Buncumbe, Chatham, Haywood, McDowell, Mitchell, Orange, Transylvania, Washington. OHIO: Ashtabula, Crawford, DE, Franklin, Hocking, Summit. OKLAHOMA: Le Flore. PENNSYLVANIA: Adams, Allegheny, Cumberland, Dauphin, Delaware, Fayette, Somerset, Washington, Westmoreland. SOUTH CAROLINA: Florence, Kershaw, Oconee, Saluda, Spartanburg, Sumter. TENNESSEE: Hamilton, Montgomery, Morgan,

Shelby, Stewart. TEXAS: Anderson, Brazos, Hunt, Smith. VIRGINIA: Arlington, Botetourt, Clarke, Fairfax, Fauquier, Fluvanna, James City, Loudoun, Montgomery, Nelson, Page, Prince William, Rockingham. WEST VIRGINIA: Kanawha, Ritchie.

Phenology. Adult specimens have been collected from March to early August (rarely recorded in February and November).

Biology. Adults of *V. canaliculatus* feed on the nectar of flowers (Ritcher 1958) from beech (*Fagus* sp.), buckthorn (*Ceanothus* sp.), dogwood (*Cornus* sp.), hawthorn (*Crataegus* sp.) (Blatchley 1910), and mock orange trees (*Philadelphus* sp.) (Ritcher 1966). Adults were observed on honeysuckle (*Viburnum* sp.), meadowsweet (*Spiraea* spp.), goat's beard (*Aruncus* sp.), blackberry (*Rubus* sp.), oswego tea (*Monarda didyma* L.), oxeye daisy (*Chrysanthemum leucanthemum* L.), Queen Anne's lace (*Daucus carota* L.), wild hydrangea (*Hydrangea arborescens* L.), yarrow (*Achillea millefolium* L.), hickory (*Carya* sp.), oak and white oak (*Quercus* sp. and *Quercus alba* L.), southern magnolia (*Magnolia grandiflora* L.), and pine and loblolly pine (*Pinus* sp. and *Pinus taeda* L.).

Townsend and Ritcher extensively studied the natural history of this species from 1944 to 1945 in Kentucky (Ritcher 1958, 1966; Townsend, unpublished manuscript). They observed large numbers of larvae in decaying maple logs. Adults passed the winter in termite galleries (Ritcher 1966). Males left the galleries in April and May, flying on warm, sunny days. During the study, Townsend and Ritcher found that only males visited flowers ($n = 44$). To address whether they consumed pollen or nectar, Townsend and Ritcher used binoculars to study activity on flowers. They observed males feeding: "21 May 1945: Seven males were taken on mock orange blossoms. The adults feeding in the mock orange blossoms were observed carefully. They feed on nectar and not on pollen. By means of the long hairs which form a brush on the distal end of each maxilla, the beetles lap the nectar from the bottom of the blossom." This observation demonstrated that males feed on nectar rather than pollen or floral parts. Mating was observed in laboratory conditions. Because of the female's well-developed pygidial spine, males laid on their back during copulation. Females laid eggs in cracks of the termite gallery with their ovipositor. Upon emerging, larvae immediately began to feed on surrounding wood. Larvae, which are bluish in color, developed in exposed termite galleries and did not disperse from their emergence site. Pupation occurred in July and early August in small oval cells constructed of wood fragments or soil (Ritcher 1958). Pupation began around 10 July in oval cells constructed of wood fragments or dirt adhering to the wood. Cells were 9.5–11.5 mm in length and 3.5–5.5 mm in width. Adults emerged between 20 July and 25 August.

V. canaliculatus is common in the nests of *Reticulitermes flavipes* (Kollar) (Ritcher 1958) and is frequently found with *V. seticollis* (Ratcliffe 1991). According to Banks and Snyder (1920), both *V.*

canaliculatus and *V. seticollis* are commonly found in association with *Reticulitermes* sp.

According to Ritcher (1958), logs with *V. canaliculatus* contain males and females in almost equal numbers. This contradicts the statement of Casey (1915) that males are more abundant than females.

Ritcher (1945, 1966) described the third-stage larva. According to Ritcher (1966), Boving and Craighead's (1931) illustration of *V. canaliculatus* is actually *V. seticollis*.

Discussion. Contradictions and confusion follow this species' name with regards to distribution, authorship, and synonymies. First, Olivier's (1789) description of *V. canaliculatus* stated that the species was from the Cape of Good Hope ("Cap de Bonne-Espérance," South Africa). Fabricius (1801), apparently using the same specimen as Olivier (from the collection of "Lee"), corrected Olivier's error and stated that the species was distributed in "America boreali." Some authors interpreted these as two different species. Thus, the species name *V. canaliculatus* has been attributed to both Olivier and Fabricius. Burmeister (1842), Casey (1915), Leng (1920), Dillon and Dillon (1961), and Harpootlian (2001) attributed the name to Fabricius. However, *V. canaliculatus* should be attributed to Olivier. It is clear in Fabricius' description (1792) that he attributed the name to Olivier, and the species was not meant to be new to science. Arrow (personal communication to Townsend, June 1945) believed that Fabricius (1801) corrected Olivier's error concerning the habitat of *V. canaliculatus* rather than describing a new species. Many old collectors had only a vague idea regarding the origin of their specimens. Lee, from whose collection the specimen came, was a British botanist who received specimens from all parts of the world (personal communication, Arrow to Townsend, June 1945). According to Arrow, the figure in Olivier (1789) "leaves no doubt in my mind that the specimen was actually the North American species to which the name is applied." Herein, we designate a neotype for *V. canaliculatus* to alleviate taxonomic confusion and stabilize the nomenclature.

Several synonymies with *V. canaliculatus* have caused confusion and nomenclatural instability. Several authors, including Schaum (1849), Melsheimer (1853), Fitch (1858), and Kraatz (1883) commented that Burmeister's concept of *V. squamiger* posed historical and nomenclatural problems. Burmeister's concept of *V. squamiger* was erroneously listed in synonymy even though Burmeister (1842) clearly credited Palisot de Beauvois as the author of *V. squamiger*. The problem originated due to the differences in coloration between male and female *V. seticollis* and Burmeister's incomplete knowledge of the variation in species of *Valgus*. Palisot de Beauvois (1807) described the male of *V. seticollis* as a distinct species, *V. squamiger*. Burmeister and Schaum (1840) diagnosed *V. canaliculatus*, and they believed that specimens identified as *V. seticollis* and *V. squamiger* (= *V. seticollis*) represented females of *V. canaliculatus*. In his treatment of the genus *Valgus*, Burmeister (1842) reviewed the known species of *Valgus* from North Amer-

ica. However, he did not have both male and female specimens of *V. canaliculatus* and *V. seticollis*. He examined specimens of male *V. canaliculatus* from the collections of Gory, Knoch, and Olivier; he relied on information from Schaum that female *V. canaliculatus* possess a pygidial spine. For *V. seticollis*, Burmeister (1842) stated that he studied only the female. With this incomplete basis for comparison, Burmeister (1842) redescribed *V. squamiger* Palisot de Beauvois (giving credit to Palisot de Beauvois), but he created several problems that have been perpetuated. Schaum (1849) clarified the resulting mishap. He stated that Burmeister's concept of female *V. seticollis* was correct; Burmeister's concept of male *V. squamiger* (= *V. seticollis*) was the male of *V. canaliculatus*; Burmeister's concept of female *V. squamiger* (= *V. seticollis*) was the male of *V. seticollis*. Fitch (1858: 696) confirmed Schaum's observations and added: "This will serve the reader some of the embarrassments which are frequently besetting ones' path in investigating this branch of nature's work."

Another synonym, *Valgus serricollis* was named by Fitch (1858) and was distinguished from *V. seticollis* and *V. canaliculatus* based on its small size (4.25 mm) and presence of "orange yellow" scales on the ventral surface of the abdomen. These characters are within the range of variation that is observed in *V. canaliculatus* and the name is here synonymized. Fitch's collection is lost or destroyed, thus we designate a neotype for *V. serricollis* to stabilize the nomenclature.

Yet another synonym, *Valgus minutus*, was named by Casey (1909) based on its small size ("3.9–4.2 mm") and reddish brown setal color. We examined paratypes of *V. minutus*, and, based on character examination and comparison with *V. canaliculatus*, we believe that these species are conspecific. We synonymize (herein) *V. minutus* with *V. canaliculatus*. Ritcher also believed that *V. minutus* was conspecific with *V. canaliculatus* due to size range and type locality in Jackson, MS (personal communication, Ritcher to J. B. Chapin, 26 September 1973).

***Valgus hemipterus* Linnaeus, 1758**

(Figs. 6; 7; 18; 23; 24, 30a, b; 36)

Valgus hemipterus Linnaeus, 1758: 351 (valid name).
Valgus hemipterus rufosquamatus Dalla Torre, 1879: 115 (junior synonym).

Valgus hemipterus rubi Baguena, 1955: 293 (junior synonym).

Diagnosis (Figs. 6–7). Length 8.0–9.0 mm. Dorsal surface (male) with dense, dark brown and tawny setae; female with moderately dense, dark brown and tawny setae. Ventral surface of abdominal sternites (male and female) with moderately dense, tawny setae. Setae of elytra oval. Elytral cuticular color (male and female) piceous. Pronotum serrate on lateral edge; longitudinal medial ridge well developed; short carina absent between longitudinal medial ridge and lateral edge of disc; basolateral angle rounded. Terminal spiracle not distinctly produced and not conical.

Posterior tarsus (male and female) with first tarsomere as long as tarsomeres 2–4 combined. Female pygidial spine (dorsal view) acuminate, with irregular lateral serrations (Fig. 23), longitudinal ridge absent (ventral view); weakly decurved (lateral view; Fig. 24). Male genitalia as in Fig. 30a–b.

Distribution (Fig. 36). In the Palearctic Region, *V. hemipterus* is found throughout Europe, Algeria, Tunisia (Schenkling 1922), Iran, Morocco, and southern Siberia (Krikken 1986). Fossil remains of this species that date from 7000 to 5000 BP were found in southern Sweden and indicate that this species once occupied a more northern latitude in Europe (Lemdahl 1990). Currently, this species is established within the Great Lakes region of the United States and Canada, and its range is possibly expanding.

V. hemipterus was first reported in the New World by Mahar and Oemke (1981) who collected specimens in Shiawassee County, Michigan, in 1980. They reported that a log of an American elm (*Ulmus americana* L.) contained >100 adults. In 1987, Mahar (1989) reported collecting a single female north of Martin, Allegan County, Michigan (113 km west of the first record). This suggested that *V. hemipterus* was spreading at low densities over lower Michigan (Mahar 1989). O'Brien and O'Brien (1994) reported three specimens from Ann Arbor, MI (Washtenaw County) where they were collected from flowers of dame's rocket (*Hesperis matronalis* L.) and lilac (*Syringa vulgaris* L.). In the 1990s, Steve Marshall (University of Guelph, Ontario), discovered one specimen of *V. hemipterus* near Niagara Falls, Ontario (personal communication, B. D. Gill to K.A.S., November 2002). In 2001, one specimen of *V. hemipterus* was trapped in a Lindgren funnel trap (baited with Ipslure) at the port of Toledo, OH (personal communication, E. Richard Hoebeke to M.L.J., October 2001). This specimen was deposited in the Cornell University Entomology Collections, Ithaca, NY. In 2002, inspectors in Sarnia, Ontario, discovered several specimens of *V. hemipterus* in firewood that was imported from Michigan (personal communication, B. D. Gill to M.L.J., November 2002). It is unclear if this species is established in Canada.

The exact year that the species entered the United States is unknown. Townsend and Ritcher discovered no specimens of *V. hemipterus* during their studies, collecting, and correspondence from 1944 to 1978. Krikken (1986) reported a male specimen of *V. hemipterus* collected at Rowley, MA in July 1921. However, we examined no specimens of *V. hemipterus* from this region and were unable to confirm this record.

Locality Records. CANADA. ONTARIO: Lambton, Niagara. USA. MICHIGAN: Allegan, Shiawassee, Washtenaw. OHIO: Lucas.

Phenology. Nearctic adult specimens are collected in May and June. Palearctic adult specimens are collected between April and June and in October and November.

Biology. Larvae have been collected in summer, and pupae and teneral adults in the early fall, suggesting a univoltine life cycle with adults and pupae overwintering (Mahar and Oemke 1981). Larvae are not as-

sociated with termites (Mahar and Oemke 1981). Fallou (1889) remarked on the similarity of larval galleries made by *V. hemipterus* to those formed by termites.

Adult females were attracted to moist, rotting wood to oviposit (Mahar and Oemke 1981), although oviposition has been observed in fairly dry wood and in living trees with the bark removed (Fallou 1889). Females leave occupied wood to seek out new oviposition sites in early summer (Mahar 1989) and use their pygidial spines to create such sites. Mahar and Oemke (1981) observed a female for 15 min that used her pygidial spine, held perpendicular to her body, to gouge a hole in rotten elm wood to create an oviposition site.

According to Mahar and Oemke (1981), the entire life cycle of *V. hemipterus* can be completed within a log. Nearctic specimens were collected from rotting wood of the American elm (*Ulmus americana* L.). Common host trees in France are oak (*Quercus* sp.), birch (*Betula* sp.), elm (*Ulmus* sp.), and chestnut (*Castanea* sp.) (Fallou 1889). Paulian and Baraud (1982) stated that males are found on the flowers of *Sorbus* sp. and *Spirea* sp. (both Rosaceae). Medvedev (1969) found larvae in large numbers on stumps of rotting apple (*Malus* sp.) in Lyubotina, Khar'kov Province, Russia. Medvedev (1969) described the third-stage larvae.

Discussion. Baguena (1955) described a variety, *V. hemipterus* variety *rubi*, from Cercedilla, Madrid, Spain based on two males and one female. He differentiated the variety based on an "intensely" red color of the elytra, legs, and sternites. Based on Article 45.6.4 of the *International Code of Nomenclature* (1999), varietal names that are published before 1961 should be treated as subspecies. Krajcik (1999) incorrectly treated the name as a species.

***Valgus seticollis* (Palisot de Beauvois, 1807)**

(Figs. 8–11, 25, 26, 31–36)

Valgus seticollis (Palisot de Beauvois, 1807: 59) (valid name).

Trichius seticollis Palisot de Beauvois, 1807: 59 (original combination).

Trichius squamiger Palisot de Beauvois, 1807: 60 (junior synonym).

Diagnosis (Figs. 8–9). Length 5.0–6.0 mm. Dorsal surface (male) with tawny (dense) and dark brown (sparse) setae; female dark brown (dense) and tawny (sparse) setae. Ventral surface (male) of abdominal sternites (male and female) with moderately dense, tawny setae (setae of male not overlapping). Setae of elytra oval. Elytral cuticular color (male) reddish brown; female castaneous. Pronotum serrate on lateral edge; longitudinal medial ridge well developed; short carina present between longitudinal medial ridge and lateral edge of disc; basolateral angle rounded. Terminal spiracle not distinctly produced and not conical. Posterior tarsus (male) with first tarsomere as long as tarsomeres 2–3 combined; posterior tarsus (female) as

long as tarsomeres 2–4 combined. Female pygidial spine lacking (Figs. 25–26). Male genitalia as in Figs. 31–35.

Distribution (Fig. 36). Eastern half of the United States (from Massachusetts and northern Georgia in the east to southeast Nebraska and northeast Texas in the west). Riley and Wolfe (2003) reported this species from Sabine county, TX. *Valgus seticollis* is broadly sympatric with *V. canaliculatus*.

Locality Records. USA. ARKANSAS: Washington. CONNECTICUT: No data. DISTRICT OF COLUMBIA. GEORGIA: Lamar, Paulding. ILLINOIS: Bond, Clark, Effingham, Schuyler, Vermillion, Williamson. INDIANA: Delaware, Orange, Tippecanoe, Vigo. KANSAS: Douglas, Shawnee. KENTUCKY: Fayette, Jefferson, Leslie, McCracken, Rockcastle, Union. MARYLAND: Anne Arundel, Baltimore, Charles, Montgomery, Prince George's. MASSACHUSETTS: Essex, Middlesex. MISSISSIPPI: No data. MISSOURI: St. Charles, St. Louis. NEBRASKA: Cass, Nemaha. NEW JERSEY: Bergen, Burlington, Camden, Gloucester, Monmouth, Passaic. NEW YORK: Orange, Putnam, Westchester. NORTH CAROLINA: Burke, McDowell, Moore, Wake. OHIO: Franklin, Madison. PENNSYLVANIA: Allegheny, Dauphin, Snyder. RHODE ISLAND: No data. SOUTH CAROLINA: Florence, Oconee, Pickins. TENNESSEE: Davidson, Morgan. TEXAS: Sabine, Smith. VIRGINIA: Fairfax. WEST VIRGINIA: Kanawha.

Phenology. Adults are collected from March to July and in October and November.

Biology. The life history of *V. seticollis* is probably similar to *V. canaliculatus* (Ratcliffe 1991). Adults and larvae are found in wood colonized with termites, such as *Reticulitermes flavipes* (Kollar) (Ritcher 1958, 1966). Specimens have been collected from logs or flowers of oak (*Quercus* sp.), pitch pine (*Pinus rigida* Mill.), American chestnut (*Castanea dentata* [Marsh.] Borkh.), and yellow-poplar (*Liriodendron tulipifera* L.), and from strawberry (*Fragaria* sp.). According to Ritcher (1958), logs usually contain a majority of females. This contradicts the statement of Casey (1915) that males and females are almost equal in numbers.

Ritcher (1945, 1966) described the third-stage larva. Boving and Craighead (1931) illustrate *V. seticollis* (incorrectly identified as *V. canaliculatus*).

Discussion. The nomenclatural history of *V. seticollis* has been fraught with confusion primarily due to the differences in color between males and females. As stated by Fitch (1858: 695): "The sexes of this insect differing so much in their colors, has caused great perplexity to authors and has led to much confusion in the few notices of it which have been published." The nomenclatural confusion has been embroiled with the history of *V. canaliculatus* (see "Discussion" under *V. canaliculatus*).

The unavailable name "*Trichius dispar* Harris" occurs in the literature (Gory and Percheron 1833, Burmeister and Schaum 1840, Burmeister 1842). Harris (1833) listed the name in "A catalog of the animals and plants in Massachusetts," but the species was never validly described.

The invalid name "*V. squamiger*" occurs in the literature and throughout collections. The species name is attributed to Palisot de Beauvois (1807) and Burmeister (1842). The correct author of the name is Palisot de Beauvois. Burmeister and Schaum (1840) synonymized *Trichius seticollis* Palisot de Beauvois and *T. squamiger* Palisot de Beauvois under *V. canaliculatus*, believing both to be female varieties of *V. canaliculatus* (see "Discussion" under *V. canaliculatus*). However, in the "*Handbuch der Entomologie*," Burmeister (1842) treated *V. seticollis*, *V. squamiger*, and *V. canaliculatus* all as separate species. He did not make reference to his publication with Schaum (Burmeister and Schaum 1840). Schaum (1849), in an attempt to clarify the nomenclature, made the problem even more unclear. With some diligence, one can discern that Schaum believed that *V. squamiger* was synonymous with *V. seticollis*, and he regarded *V. seticollis* as a valid name. Fitch (1858) reiterated the history of these names and tried to clarify Schaum's views. Fitch (1858) used the name *V. seticollis* as the valid name. Additionally, Kolbe (1897) referred to "*V. seticollis* Beauv." and "*squamiger* Palis." as the same entities when he created the genus *Homovalgus*.

In addition to sexual differences in cuticular color (male yellowish brown, female reddish brown), we observed a great amount of intraspecific variation in the form of the male genitalia (Figs. 31–35). For example, the genitalic form in Fig. 31 occurs in Missouri (St. Louis, St. Charles), Illinois (Rushville), Ohio, and Kentucky (Buechel); the form in Fig. 32 occurs in Indiana (Muncie) and Kansas (Douglas county); the form in Fig. 33 occurs in Kentucky (Mayfield); the form in Fig. 34 occurs in Tennessee (Nashville); and the form in Fig. 35 occurs in Washington, DC. Some forms (e.g., Figs. 33–34) apparently occur within similar habitats and within proximity of one another. Characters of the pronotum, pygidial spine, and tarsomeres are consistent within all forms. Based on the lack of morphological characters to separate genitalic forms, we conservatively consider all forms to be the same species.

High intraspecific variation is noted in other taxa from this region in North America, including *Nesticus* spiders (Hedin 1997) and trechine carabid beetles (Barr 1985). High intraspecific variation may be indicative of biogeographic response to glaciation along the Mississippi River valley (Gates 1993). During the Wisconsin maximum ($\approx 18,000$ yr BP), glacial-interglacial cycles triggered expansion and contraction of forest ecosystems, thus affecting dispersal, isolation, and hybridization of biotas (Gates 1993). Molecular and morphological analyses of forms of *V. seticollis* may provide valuable insights to the mechanisms of evolution, biogeography, and character plasticity.

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