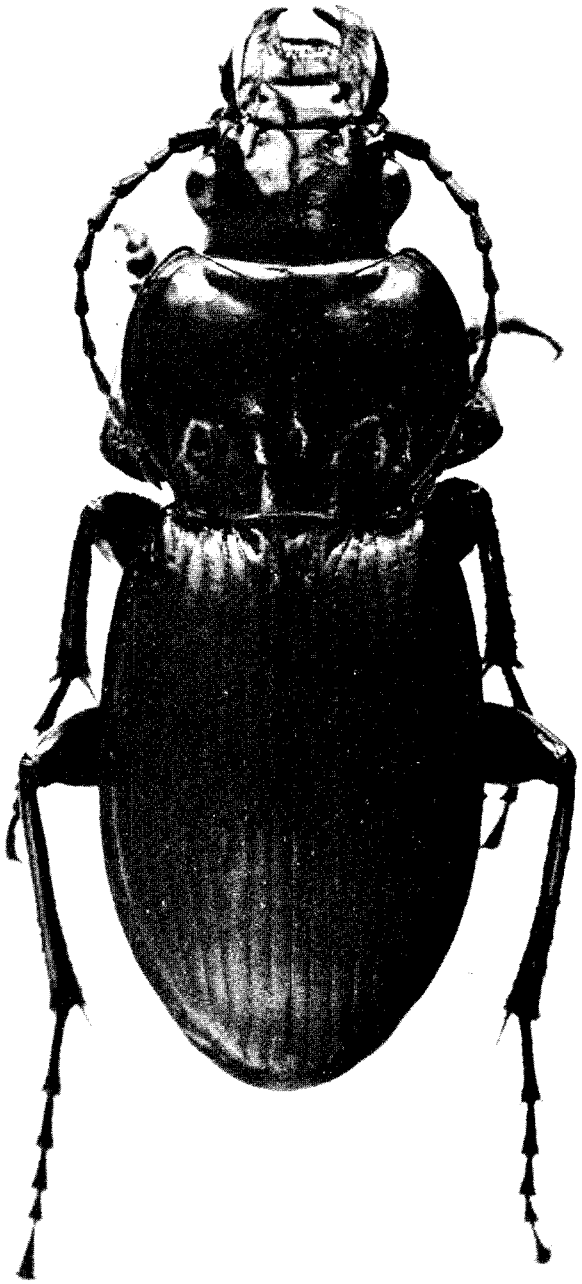

Evarthrus sodalis sodalis LeConte

Lexington, Kentucky

Photograph by J. Scott

A REVISION OF THE SPECIES OF THE GENUS *EVARTHRUS* LECONTE

(COLEOPTERA:CARABIDAE)

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Within the genus Evarthrus, *three subgenera, 43 species, and five subspecies are recognized. The genus* Evarthrus *is described, and evidence is presented which removes* Evarthrus *as a unit from the* Pterostichus *complex to a position near the genus* Molops *in the tribe Pterostichini. A key to the species and subspecies is given. Each subgenus, species group, and species is described and synonymies are listed. The distribution of each species is presented by locality records and distribution maps. Structures which are used in identification are illustrated.*

The subgenus Fortax *comprises six species of which one,* iuvenis, *is described as new. One genus group name and six species names are reduced to synonymy.*

The subgenus Cyclotrachelus *includes 12 species, of which five,* fucatus, macrovulum, texensis, parafaber, *and* levifaber *are described as new. Six species names are listed as synonyms.*

The subgenus Evarthrus *includes 25 species of which seven are new. The species* sodalis *LeConte and* torvus *LeConte are polytypic. Five genus group names and 26 species names are relegated to synonymy.*

A phylogeny is postulated for the subgenera, species groups and species. The geographical distribution of the genus is discussed.

The endemic flightless Pterostichini of eastern North America are arrayed in a series of supraspecific taxa each of which is more or less easily defined; however, the relationships of these groups are at best uncertain. The most diverse of these groups is the genus *Evarthrus*, a complex of species included by some (Csiki, 1930; Lindroth, 1966) in the genus *Pterostichus*, and by others (Casey, 1918) treated as a group of related genera. (Ball, 1967 drew attention to this problem). I decided to attempt to solve these problems of relationships and classification, but learned in the initial stages of the study that I would first have to undertake a revision of the species. The results of this investigation are presented in this paper.

The revision is based on a study of adult specimens. The species were defined on the basis of evaluation of morphological and geographical evidence. Names were applied on the basis of study of the relevant type material. Sixteen species names were found to be junior synonyms, and 13 previously undescribed species were discovered and named.

In addition to the formal taxonomic treatment of this group, I have presented my views on the phylogeny and geographical distribution of the extant species.

MATERIALS AND METHODS

Materials

The material examined consisted of 7,600 adult specimens, which included the type specimens of Casey and LeConte. I have also briefly examined external structures and male genitalia of species of an additional 35 Nearctic and Palearctic subgenera of *Pterostichus* Bonelli, and of *Abaris* Dejean, *Pseudabarys* Chaudoir, *Oxycrepis* Reiche, *Cratocerus* Dejean, *Catapiesis* Brullé, *Abax* Bonelli, *Molops* Bonelli, *Percus* Bonelli, *Lesticus* Dejean, *Piesmus* LeConte, *Stomis* Clairville and *Myas* Dejean.

Names of individuals and institutions from which material was borrowed are abbreviated in the text as follows: AMNH – American Museum of Natural History; ANSP – Academy of Natural Sciences; AU – Auburn University; BM – British Museum (Natural History); CAS – California Academy of Sciences; CM – Carnegie Museum; CNC – Canadian National Collection; CNHM – Chicago Natural History Museum; CU – Cornell University; DL – David Larson; DRW – D. R. Whitehead; FDPI – Florida Division of Plant Industry; GEB – G. E. Ball; INHS – Illinois Natural History Survey; ISU – Iowa State University; KLE – Kansas State University; MCZ – Museum of Comparative Zoology; MHNP – Museum d'Histoire Naturelle, Paris; MSU – Montana State University; NCSU – North Carolina State University; RCG – R. C. Graves; RF – R. Freitag; RTB – R. T. Bell; RU – Rutgers University; TAM – Texas A & M University; TCB – T. C. Barr; TE – T. Erwin; TH – T. Hlavac; UA – University of Arkansas; UASM – University of Alberta Strickland Museum; UK – University of Kansas; UL – University of Louisville; UMMZ – University of Michigan Museum of Zoology; UP – Purdue University; USNM – United States National Museum; UW – University of Wisconsin; VMK – V. M. Kirk.

Methods

General methods

By making comparisons among their characteristics, specimens were sorted into demes, subspecies, species, and species groups according to degree of similarity and difference. The characteristics used were arbitrarily weighed, and the same characteristics were given different weights in different situations. The relationships revealed by these comparisons were interpreted and the evolution of the species and species groups was then inferred.

Characters of adults

Some structures which are used in the identification of the species of *Evarthrus* are discussed below to facilitate their use in the text.

The lines of microsculpture of the integument of the dorsal surface are almost effaced, disoriented, and do not form meshes in specimens of some species. In specimens of other species the lines are close together and sinuate, but they do not form meshes. More frequently meshes are formed and are amorphic or isodiametric. The interspaces are flat or raised and bead-like. The lustre of the integument correlated with the microsculpture is as follows: shiny in the absence of meshes; dull with isodiametric meshes and flat interspaces; matte or velvet with isodiametric meshes and bead-like interspaces; iridescent with dense sinuate parallel lines. Females are always duller than males of the same species.

The frontal grooves of the head are usually of a particular shape, and are useful in recognizing specimens of a number of species. The grooves are straight, or crescent-shaped with the convexity directed medially or laterally (figs. 70-71).

The number of setae on the penultimate article of the labial palpus is useful in delimiting species. Two dorsal "primary" setae are always present near the halfway point of the article. Three "secondary" setae are also present. One is apical, and arises from the ventral side of the article. Another is near the apical end of the article. It is dorsolateral and directed dorsolaterally. In a complementary position is the third seta. It is also near the apical end of the article on the dorsomedial side and is directed dorsomedially. The truly apical seta occurs more frequently than the other "secondary" setae but it is not always present. Other setae occasionally occur here and there near the "primary" setae (figs. 66-69). Horn (1881) noted that the number of setae on the labial palpus are not constant in *Evarthrus* and suggested that two groups may be recognized: a group with bisetose labial palpi and a group with plurisetose labial palpi.

The mandibles of the type species, *sigillatus* Say, are illustrated (fig. 72).

Details of form and structure of the pronotum are useful in recognizing subgenera and species. The general outline of the pronotum ranges in form from rectangular to cordiform (figs. 1-62). Another useful structure is the shape of the basal lateral fovea, which is punctiform (figs. 1-7), monostriate or bistriate (figs. 8-20, 21-62). The position of the basal lateral seta is on (figs. 8-20), or beside the lateral bead (figs. 1-7 and 21-62). The lateral bead in specimens of a few species is broad posteriorly, but in most species it is narrow posteriorly as in fig. 25. The prosternal process which projects posteriorly between the front coxae has a longitudinal medial groove. This groove is deep or shallow. The apex of the prosternal process is or is not marginate.

At least four setae are present on the anterior face of the middle femur and always in the same positions. A proximal pair of setae are located near the ventral side of the femur, and a distal pair near the dorsal side. In specimens of some species additional setae usually occur near either pair. The total number of setae ranges from four to eleven in the genus and seems to be a good character for grouping species (figs. 74-76). Setae are absent from the lateroventral margin of the claw bearing tarsal articles in specimens of four species of the subgenus *Fortax*.

I have used the term "last abdominal sternum" in the text. This is morphological sternum VII, which is the apparent sternum VI in beetles (sternum 1 has disappeared).

The male genitalia are very important structures in defining species and species groups. In fact, it would be exceedingly difficult to recognize and classify the species of *Evarthrus* without reference to these structures. Two parameres and a median lobe which contains an internal sac constitute the external male genitalia. The median lobe is a tube with a central bend. The portion of the lobe posterior to the bend is referred to here as the apical half, and that anterior to the bend the basal half. The lobe is always bent dorsoventrally with the convexity directed dorsally. In specimens of some species the apical half of the median lobe is bent laterally. The posterior extremity of the median lobe is flattened and heavily sclerotized, and is called here the apical blade. The posterior edge of the apical blade is the apex. Within the median lobe is a membranous sac known as the internal sac, which is

everted during copulation. In studying this organ the following technique was used: the beetle was relaxed in boiling water; then by inserting a pair of fine forceps into the end of the abdomen the genitalia were grasped and pulled out; these structures were cleared in a hot 10% solution of potassium hydroxide for about 10 minutes and then washed in water; the internal sac was everted by gently pulling the sac through its open end with a pair of fine forceps. In specimens of some species the internal sac bears serrulate fields and an apical sclerite (the sclerite is apical when the sac is everted). The shape of the apical sclerite is commonly used for grouping species as well as separating closely related species. The shape of the whole everted internal sac is probably of taxonomic value but I have not used it here. Joined to the left and right sides of the basal portion of the median lobe near the anterior end are the parameres. The left paramere is broad and somewhat disc shaped in all of the known species of the genus. The right paramere varies in form among the species of the genus but does not vary interspecifically.

The sclerites of the female ovipositor exhibit slight variation. With the exception of the stylus they do not provide taxonomically useful features. Fig. 73 is a drawing of the ovipositor and bursa of *sigillatus*. The bursa copulatrix is short, and the anterior end is a flat, lightly sclerotized plate, which has a marked anteriorly-directed central mound. A small dark sclerite rests on the tip of the mound and is joined to the base of the spermathecal duct. The common oviduct enters the bursa beside the sclerite. A long accessory gland is joined to the spermathecal duct. The spermatheca is a simple sausage-shaped sac. The pygidial reservoir is rather large and it has a short thick duct which appears to open externally near the posterior end of the gonangulum. The pygidial gland duct is short and narrow. The stylus is typical of the genus. Slight variation in the form of the stylus occurs throughout the genus and is referred to in the text.

Measurements

The range of body size for each species was determined. A calibrated eyepiece in a Wild M5 stereoscopic binocular microscope was used. The body length is indicated by the sum of three measurements: length of head – distance from the base of the mandible to the hind margin of the eye; length of pronotum – distance between the anterior margin of the pronotum to the margin behind the basal angle; length of elytra – distance from the apex of the scutellum to the apical tip of an elytron. The widths of the head, pronotum, and abdomen are defined as follows: head – maximum distance behind the eyes dorsally; pronotum – maximum transverse distance; abdomen – maximum transverse distance across both elytra.

Illustrations and maps

The drawings were made with the aid of a Wild drawing tube, on the M5 stereo microscope.

Distribution maps are given for all species. Most maps comprise the distributions of species of a single species group.

Criteria for species and subspecies

Two forms with overlapping ranges are regarded as distinct species if they do not intergrade in at least one morphological character. If a clinal series of intermediate populations is intercalated between two morphologically distinct populations that are widely allopatric the entire complex is treated as a single variable species, but subspecific names are not assigned. Subspecies are recognized only in cases of steep clinal variation in at least one characteristic.

BIOLOGY

Little is known about the biology of this genus. Probably the members are omnivorous, as are most Carabidae. I have found spores of fungi in the gut of *E. faber* Germar, and ant remains in the gut of *E. sodalis colossus* LeConte.

All of the species are flightless: not only are the hind wings of all individuals atrophied, but the metathorax is reduced, and the elytra are fused along the suture. It is not surprizing, therefore, that geographical variation is marked, that most of the species have restricted ranges, and that closely related species are often allopatric – facts which indicate restricted powers of dispersal.

Members of the genus inhabit deciduous forests or open country. Those species which occur in open places are northern and western in distribution. Conversely, the ranges of the more numerous forest species are generally southern and east of the Mississippi River.

TAXONOMY

The Genus *Evarthrus* LeConte

Characteristics

Adults. – small to large Pterostichini (see Ball, 1966 for characterization of tribe); color of body black, legs usually black sometimes red; penultimate article of labial palpus plurisetose (usually) or bisetose; pronotum rectangular to cordate, basal lateral fovea of pronotum bistriate, monostriate, or a single puncture, always distinctly impressed; basal lateral seta of pronotum on lateral bead or beside it; elytron with seventh interval usually raised at base, 1-5 punctures on medial side of third interval; hind wings absent; metepisternum short, with lateral margin equal in length to anterior margin; article five of tarsus usually with a row of setae on each ventrolateral margin; venter impunctate, usually slightly rugose; females with two setae on last sternum of abdomen; eversion of internal sac of median lobe of male genitalia usually to right, less often dorsoapical, and rarely to left. Larva – Pterostichini; antenna with five articles; urogomphi short, terete, curved toward each other (Van Emden, 1942, and Böving and Craighead, 1930).

Type species. – *Evarthrus sigillatus* Say, 1823a (designated by Lindroth, 1966:473).

The species of *Pterostichus* Bonelli resemble species of *Evarthrus*, but in the former group the lateral areas of the ventral surface of the body are usually punctate, the eversion of the internal sac is to the left or dorsal, the females have usually four to eight setae on the last abdominal sternum, exceptionally two in some individuals and the larvae have four antennal articles and long multinodose urogomphi.

Some species of *Pseudabarys* and *Abaris* vaguely resemble species of *Evarthrus* in having a plurisetose penultimate labial palpus and a single puncture in the third interval of an elytron. Their general habitus is different, however. Species of *Abaris* have pectinate claws, and the internal sac seems to be telescopic rather than of the eversion type.

Members of the genus *Evarthrus* are like those of *Molops*. They have the following characteristics in common: Adult – similar body shape particularly the pronotum; ventral side of body not punctate; elytron usually with seventh interval raised at base; and setae usually present on each lateroventral side of the last tarsal article. Larvae – antenna with five articles. Specimens of *Molops* differ by having a ninth elytral interval which is lateral to the umbilicate series, setae on the dorsal side of the last tarsal article, and four setae on the last abdominal sternum of the females. The larvae of *Molops* and *Evarthrus* differ in characteristics of the urogomphi.

Schuler (1962, 1963a, 1963b) has studied the taxonomic importance of the spermatheca of female carabids. He points out that the spermatheca of *Molops* is a simple sac while that of *Pterostichus* is not. The spermatheca of *Evarthrus* is also a simple sausage-shaped sac, like that of *Molops*. This similarity may not be in itself important, but it adds to the characters that *Evarthrus* and *Molops* share.

Basford *et alii* (1968) used immunological techniques to investigate the classification of the Adephaga. Among other species of carabids, they studied *Evarthrus sodalis* LeConte and *Pterostichus chalcites*. They found the samples of these two species to be markedly different from one another, and this in itself could be accepted as additional evidence to support the ranking of *Evarthrus* as generically distinct from *Pterostichus*. However, this evidence is of doubtful value because the other results obtained are at such variance with the generally accepted classification. Indeed, these authors write that "(6) the distinct position of the genus *Harpalus* and the failure of the immunological results to cluster other Harpalinae with them suggested that, within the Carabidae, large amounts of random molecular variation exist (1968:405)."

I believe that the treatment of *Evarthrus*, *Pterostichus*, and *Molops* as separate genera in the tribe Pterostichini is justified. Simpson (1961) points out that criteria derived from relative divergence apply to the ranking of taxa, and he suggests several criteria of which one is as follows: in a group of related taxa it is desirable that differences between most similar taxa should be approximately equal. In addition to this the general feeling among taxonomists is that taxa of the same rank should have the same amount of diversity.

In treating *Evarthrus*, *Pterostichus*, and *Molops* as separate genera both of the above criteria are followed. The differences among the three genera are approximately the same in numbers of weighted characteristics, which are widespread in each genus. Each of the taxa contain many species, although *Pterostichus*, as regarded here, is the most diverse. The genus *Evarthrus* is a polythetic group, but nevertheless such groups are acceptable in taxonomic practice.

Subgenera and Species Groups

On the basis of similarities and differences of external structures and male genitalia the species are grouped into three subgenera. The species of each subgenus are arranged in species groups. The subgenus *Fortax* Motschulsky includes six species which constitute two species groups. The subgenus *Cyclotrachelus* Chaudoir contains 12 species which are arranged in three species groups. Twenty-five species are included in the subgenus *Evarthrus* and are placed in ten species groups. The names of most of the species groups are based on the name of the first described species contained in each. Two species groups have been given the names of the most well known species included in each: the *spoliatus* group and the *ovulum* group. The *gigas* group is so named because it includes *E. gigas* Casey, which was designated as the type species of *Megasteropus* Casey.

Key to the species and subspecies of the Genus *Evarthrus* LeConte

1 Plica of elytron present 2
– Plica of elytron absent ..... *E. gravesi* new species, p. 167
2(1) Basal setae of pronotum in lateral bead (figs. 8-20); basal foveae of pronotum monostriate 3
– Basal setae of pronotum beside lateral bead (figs. 1-7, 21-*61); basal foveae of pronotum punctiform *OR* bistriate 15
3(2) Gula with anterior end flanked by raised knobs (fig. 63); body longer than 17.7 mm ..... *E. unicolor* Say, p. 110
– Knobs absent; body shorter than 17.7 mm 4
4(3) Prosternal process with longitudinal groove deep and sharply defined 5
– Prosternal process with longitudinal groove shallow and not sharply defined ... 9
5(4) Penultimate article of labial palpus with two medial and two apical setae; pronotum circular (fig. 20); front tarsi of males with ventral rows of cup-like scales ..... *E. faber* Germar, p. 125
– Penultimate article of labial palpus with two medial setae only; pronotum cordiform *OR* sides not produced (figs. 15-16, 18-19); males with typical scales on front tarsi 6
6(5) Pronotum with basal angles sharp and produced (figs. 15-16); microsculpture open and not dense 7
– Pronotum with basal angles broadly rounded and not produced (figs. 18-19), microsculpture open but dense 8
7(6) Frontal grooves crescent-shaped, widely separated, and oblique (fig. 71); range, Florida and Georgia ..... *E. ovulum* Chaudoir, p. 118
– Frontal grooves straight, closer together, and more parallel (fig. 70); range, Mobile, Alabama area ..... *E. alabamensis* Casey, p. 117
8(6) Basal foveae of pronotum with almost effaced long and shallow anterior extensions that together form a lyre-shaped figure; pronotum oval shaped because of gradual constriction of anterior half (fig. 18); range, Mobile, Alabama area ..... *E. parafaber* new species, p. 122

*In a few specimens one seta on one side in bead.

– Basal foveae of pronotum without long anterior extensions; pronotum cordiform (fig. 19); range, Georgia, South Carolina, and North Carolina ..... *E. levifaber* new species, p. 123

9(4) Pronotum cordiform (figs. 14, 17) 10

– Pronotum more oval (figs. 9-13) 12

10(9) Range, Georgia, Mississippi, and Tennessee; pronotum with basal sinuations elongate (fig. 14); males with obsolete punctures in elytral striae ..... *E. vinctus* LeConte, p. 115

– Range, southern Alabama, Mississippi and Texas; pronotum with shorter basal sinuations; (fig. 17) males with large punctures in elytral striae 11

11(10) Range, northeastern Texas; male with apex of median lobe broader (fig. 95 e-g) ..... *E. texensis* new species, p. 121

– Range, coastal Alabama and Mississippi; male with apex of median lobe narrower (fig. 95 a-c) ..... *E. macrovulum* new species, p. 119

12(9) Range, east of the Appalachian Mountains 13

– Range, south and west of the Appalachian Mountains 14

13(12) Range, eastern South Carolina north to Maryland; male with apex of median lobe evenly rounded ..... *E. spoliatus* Newman, p. 113

– Range, western South Carolina southward; male with apex of median lobe truncate ..... *E. brevoorti* LeConte, p. 114

14(12) Range, northern Georgia, northern Alabama, Tennessee, Kentucky, Ohio, West Virginia, western Pennsylvania; apex of median lobe of male evenly rounded; pronotum of male glossy, microsculpture varying from open and sparse to obsolete ..... *E. fucatus* new species, p. 111

– Range, northern Georgia, northern Alabama, south to Florida, southern Alabama and southern Mississippi; apex of median lobe of male truncate; pronotum of male semi-glossy, microsculpture open but dense ..... *E. brevoorti* LeConte, p. 114

15(2) Basal foveae of pronotum punctiform (figs. 1-7) 16

– Basal foveae of pronotum bistriate (figs. 21-61) 21

16(15) Apex of prosternal process marginate ..... *E. hernandensis* Van Dyke, p. 101

– Prosternal process not marginate 17

17(16) Pronotum with incomplete marginal groove between lateral setae (fig. 2) ..... *E. morio* Dejean, p. 102

– Pronotum with complete marginal groove between lateral setae 18

18(17) Pronotum with basal setae near basal angles (figs. 3-4) ..... *E. laevipennis* LeConte, p. 103

– Pronotum with basal setae in front of basal angles (figs. 5-7) 19

19(18) Pronotum with anterior transverse impression complete (fig. 5) ..... *E. approximatus* LeConte p. 106

– Transverse impression incomplete (figs. 6-7) 20

20(19) East of the Appalachian Mountains, in North Carolina, and Virginia ..... *E. iuvenis* new species, p. 107

– West and South of the Appalachian Mountains, in Indiana, Illinois, Ohio, Michigan, Tennessee, Mississippi, Alabama, Georgia ..... *E. obsoletus* Say, p. 108

21(15) Elytron with 3-5 setae in third interval 22

– Elytron with one seta in third interval, occasionally one or two setae on one elytron and two setae on the other 26

22(21) Pronotum quadrate with smooth lateral margins (fig. 37); range, east of the Mississippi River ..... *E. hypherpiformis* new species, p. 145

– Pronotum more cordate *OR* quadrate with lateral crenulations (figs. 54, 57-58); range, west of the Mississippi River 23

23(22) Elytra with striae almost impunctate ..... *E. substriatus* LeConte, p. 156

– Striae distinct and deeply punctate 24

24(23) Pronotum 6-8 mm wide, quadrate, with lateral crenulations, particularly in basal sinuation (fig. 58) ..... *E. gravidus* Haldeman, p. 163

– Pronotum less than 6 mm wide, more cordiform without lateral crenulations (figs. 53, 57)..... 25

25(24) Elytra dull; range, Oklahoma, Texas ..... *E. torvus deceptus* Casey, p. 160

– Elytra glossy; range, Iowa, Minnesota, South Dakota ..... *E. iowensis* new species, p. 154

26(21) Pronotum with anterior transverse impression obsolete medially 27

– Pronotum with anterior transverse impression complete and clearly impressed *OR* complete with short interruptions 36

27(26) Middle femur with four setae on anterior face, occasionally four setae on one femur and five on other 28

– Five or more setae on anterior face of both middle femora 29

28(27) Median lobe of male strongly arcuate and apical blade short with edges only slightly bent (fig. 100); body length 11.4 – 15.4 mm; legs always black; pronotum (fig. 22); in Arkansas elytral intervals with micropunctures indistinct; range, Arkansas, Oklahoma ..... *E. whitcombi* new species, p. 129

– Median lobe of male moderately arcuate and apical blade long with edges strongly bent (fig. 99); total length 9.02 – 12.3 mm; legs black *OR* ferrugineous; pronotum (fig. 21); in Arkansas elytral intervals with distinct micropunctures; range, Arkansas, Iowa, Kansas, Missouri, Nebraska, Oklahoma, Pennsylvania, South Dakota ..... *E. incisus* LeConte, p. 127

29(27) Elytron with striae almost effaced; first three anterior umbilicate punctures with slight mounds between them ..... *E. substriatus* LeConte, p. 156

– Elytron with striae distinct, higher ridges present between first three umbilicate punctures 30

30(29) Body length 11.2 – 13.9 mm; pronotum (fig. 53); range, Iowa, Minnesota, South Dakota ..... *E. iowensis* new species, p. 154

– Body longer than 13.9 mm 31

31(30) Pronotum with longer constriction before basal angles which are about 90° or less (figs. 45–47, 52); range, mainly west of the Mississippi River 32

– Pronotum with basal angles shorter and greater than 90° (figs. 38-44, 48-51); range, mainly east of the Mississippi River *AND* eastern Iowa and Arkansas 33

32(31) Pronotum with basal angles laterally prominent; basal foveae more V-shaped than U-shaped, relatively short and inner edge anteriorly not markedly deflected laterally (figs. 45-47); range, mainly west and southwest of the Missouri River *AND* western Iowa ..... *E. sodalis colossus* LeConte, p. 146

– Pronotum with basal angles less produced laterally (fig. 52); basal foveae more U-shaped than V-shaped, relatively longer and anterior end of inner edge deflected laterally; range, Illinois, Iowa, Missouri, South Dakota, Wisconsin ..... *E. alternans* Casey, p. 153

33(31) Range, Arkansas; pronotum with basal angle obtuse (fig. 49) ..... *E. parasodalis* new species, p. 150

– Range, north and east of Arkansas; specimens near Arkansas have pronotum with more distinct sinuation and basal angles more acute (figs. 38-44, 50-51) 34

34(33) Elytra of male with microsculpture stretched transversely; pronotum (fig. 48); range Alabama, Tennessee ..... *E. sodalis lodingi* Van Dyke, p. 146

– Elytra of males with microsculpture isodiametric 35

35(34) Pronotum with basal angles round, and more obtuse in southern Pennsylvania (figs. 38-44); range, New York west to Iowa, and Minnesota south to northern Mississippi ..... *E. sodalis sodalis* LeConte, p. 146

– Pronotum with basal angles sharp in south Pennsylvania and more obtuse in Virginia (figs. 50-51); range, southern Pennsylvania, Virginia, Maryland, southern New Jersey ..... *E. furtivus* LeConte, p. 152

36(26) Apex of prosternal process with apical setae 37

– Prosternal process without setae 40

37(36) Pronotum with sides slightly sinuate near base, basal angles slightly obtuse and prominent (figs. 35-36) 38

– Pronotal sinuation obsolete, basal angles very obtuse, broadly rounded, not prominent (figs. 33-34) 39

38(37) Pronotum quadrate, margin slightly expanded near base (fig. 36); elytra dull, particularly in females; elytron of female with stria 8 and marginal groove widely separated; range, southern Arkansas, northern Louisiana, western Mississippi and northeastern Texas ..... *E. nonnitens* LeConte, p. 144

– Pronotum with sides more acutely sinuate near base, margin more broadly expanded near base (fig. 35); elytra slightly glossy; elytron of female with stria 8 and marginal groove approximate; range, southeastern Texas ..... *E. engelmanni* LeConte, p. 142

39(37) Pronotum at widest point 4-5 mm; body length 10.3 – 15.9 mm; legs black or red; pronotum more rectangular than circular (fig. 33); males almost always with flat elytral intervals ..... *E. seximpressus* LeConte, p. 139

– Pronotum at widest point 5.5 – 6.5 mm; body length 14.6 – 18.7 mm; legs black only; pronotum more circular than rectangular (fig. 34); males almost always with convex elytral intervals ..... *E. alabamae* Van Dyke, p. 141

40(36) Middle femur with four setae on anterior face *AND* pronotum typically cordiform, strongly constricted posteriorly (fig. 21) ..... *E. incisus* LeConte, p. 127
– Middle femur with more than four setae on anterior face *OR* pronotum not as in fig. 21 41
41(40) Range, east of the Mississippi River 42
– Range, west of the Mississippi River 47
42(41) Pronotum moderately sinuate near base (fig. 44); range, Tishomingo County, Mississippi ..... *E. sodalis sodalis* LeConte, p. 146
– Pronotum more quadrate, less sinuate near base (figs. 23-32) 43
43(42) Range, Florida east of the Suwannee River and coastal Georgia 44
– Range, other than above 45
44(43) Pronotum with the width of deplanate area between lateral ridge and disc nearly even throughout (fig. 23); body length 14.8 – 17.6 mm: elytron with two setae, in seventh stria near plica ..... *E. blatchleyi* Casey, p. 131
– Pronotum with deplanate area broad near base (fig. 24); body length 13–15 mm; elytron with one seta, rarely two, in seventh stria near plica ..... *E. floridensis* new species, p. 132
45(43) Range, mainly east of the Appalachian Mountains and southeastern Alabama, Florida west of the Suwannee River, eastern Tennessee*, Pennsylvania west to Pittsburg; Pennsylvania specimens with laterally arcuate and glossy elytra; pronotum (figs. 25-28); male genitalia (fig. 103) ..... *E. sigillatus* Say, p. 133
– Range, west of the Appalachian Mountains, Pennsylvania specimens with parallel and dull elytra; pronotum (figs. 29–32) 46
46(45) Pronotum bell-shaped (fig. 29); range, coastal Alabama and Mississippi ..... *E. sinus* new species, p. 136
– Pronotum rectangular (figs. 30-32); range, north of *E. sinus* ..... *E. convivus* LeConte, p. 137
47(41) Body length 9.5 – 14.5 mm 48
– Body longer than 14.5 mm 52
48(47) Elytra with striae almost effaced; range, Mexico, Texas, New Mexico ..... *E. substriatus* LeConte, p. 156
– Elytra with distinct impressed striae 49
49(48) Umbilicate series with first three anterior punctures small and separated from one another by low raised areas; pronotum strongly constricted at base (fig. 55) 50
– Umbilicate series with first three anterior punctures of normal size separate from one another by normal ridges; pronotum less strongly constricted at base (figs. 53, 57) 51
50(49) Plica large; last abdominal segment with prominent dorsal knob that fits onto plica, especially distinct in females (fig. 77); elytra markedly sinuate posteriorly (fig. 78) ..... *E. substriatus* LeConte, p. 156
– Plica small; knob obsolete (fig. 79); elytra not markedly sinuate (fig. 80) ..... *E. constrictus* Say, p. 158

*The geographic ranges of *convivus* and *sigillatus* are approximate in eastern Tennessee. For certain identification of specimens occurring in this region, examine the male genitalia.

51(49) Elytra dull; range, Oklahoma, Texas ..... *E. torvus deceptus* Casey, p. 160
– Elytra glossy; range, Iowa, Minnesota, South Dakota ..... *E. iowensis* new species, p. 154
52(47) Pronotum slightly or moderately constricted near base, sides not prominent (figs. 49, 56–58) 53
– Pronotum more strongly constricted near base, sides convex (figs. 45–47, 54, 59, 61) 56
53(52) Pronotum with posterior angles not prominent (fig. 49); range, Arkansas ..... *E. parasodalis* new species, p. 150
– Pronotum with posterior angles more prominent 54
54(53) Pronotum quadrate, lateral margin crenulate particularly in basal sinuation, basal foveae not complete (fig. 58) ..... *E. gravidus* Haldeman, p. 163
– Pronotum less quadrate and more constricted near base, lateral margin smooth or with indistinct crenulations, basal foveae complete (figs. 56–57) 55
55(54) Elytra dull; pronotum smooth (fig. 57) ..... *E. torvus deceptus* Casey, p. 160
– Elytra glossy; pronotum rugose (fig. 56) ..... *E. torvus torvus* LeConte, p. 160
56(52) Elytra with striae very shallow, almost effaced, impunctate, sometimes represented by a series of extremely shallow dashes rather than continuous lines, intervals always flat; pronotum (figs. 54, 60) 57
– Elytra with striae deeper, punctate, and sometimes represented by a row of punctures or distinctly impressed dashes; intervals flat or convex; pronotum (figs. 45–47, 59, 61) 58
57(56) Very large species; body length 19.4 – 23.8 mm; range, Texas ..... *E. gigas* Casey, p. 165
– Smaller; body length 9.5 – 14.5 mm; range Mexico, Texas, New Mexico ..... *E. substriatus* LeConte, p. 156
58(56) Elytron with scutellar stria long and always separated from stria 2; first complete stria (stria 2) begins at basal seta (fig. 65); elytra of females with intervals completely flat; stria 7 with four to five setae near apex; pronotum (fig. 61) ..... *E. heros* Say, p. 166
– Elytron with scutellar stria always joined to stria 2 and base of stria 2 indicated near basal seta or absent (fig. 64), elytra of females with raised intervals and striae more impressed, stria 7 with two to three, rarely four, setae near apex; pronotum (figs. 45–47, 59) 59
59(58) Elytra of males with transversely stretched microsculpture, pronotum with base of basal foveae straight (fig. 59) ..... *E. sallei* LeConte, p. 165
– Elytra of males with isodiametric microsculpture, pronotum with the base of the basal fovea curved (figs. 45–47) ..... *E. sodalis colossus* LeConte, p. 146

The Subgenus *Fortax* Motschulsky

Fortax Motschulsky, 1865:246. – Ball, 1960:129. TYPE SPECIES – *Evarthrus morio* Dejean, 1828 (here designated).

Ferestria Leng, 1915:576. TYPE SPECIES – *Evarthrus laevipennis* LeConte. 1848 (designated by Leng, 1915:576).

Characteristics. – The following combination of characteristics is diagnostic for the subgenus *Fortax*: species of small size (body length 7.1 – 12.8 mm); penultimate article of labial palpus bisetose (usually) to quadrisetose; pronotum with sides strongly constricted posteriorly, posterior lateral foveae each completely punctiform or punctiform posteriorly with short anterior extension, posterior lateral setae situated beside lateral bead (figs. 1–7); middle femur with four setae on anterior face (fig. 74); last tarsal article with or without setae on lateroventral margins; eversion of internal sac of median lobe of male genitalia dorsoapically or ventrally on left side of median lobe.

The absence of setae on the ventral side of the last tarsal article and the left ventral eversion of the internal sac are characteristics found in the subgenus *Fortax* but not in the subgenera *Cyclotrachelus* and *Evarthrus*.

The two species groups in *Fortax* are the *morio* group and the *obsoletus* group.

The *morio* Group

Characteristics. – Pronotum with basal lateral foveae punctiform posteriorly, briefly and shallowly extended anteriorly; basal seta situated near basal angle; claw-bearing article of tarsus without setae on lateral ventral margins.

This group includes the species *hernandensis* Van Dyke, *morio* Dejean and *laevipennis* LeConte. The members of this group are found on the Gulf Coastal Plain and on the Piedmont in the southeastern United States.

Evarthrus hernandensis Van Dyke, 1943

Figures 1, 66, 74, 81, 125

Evarthrus (Ferestria) hernandensis Van Dyke, 1943:26. HOLOTYPE, male, labelled as follows: "Brooksville Fla I–20. 30/40; Van Dyke Collection; HOLOTYPE No. 5308 Evarthrus hernandensis Van Dyke". CAS. ALLOTYPE, labelled as follows: "Brooksville Fla I–20. 30/40; Van Dyke Collection; Allotype No. 5309 Evarthrus hernandensis Van Dyke." CAS. TYPE LOCALITY, near Brooksville, Hernando County, Florida. Blackwelder and Blackwelder, 1948:3 (*Ferestria*).

Recognition. – The following combination of characteristics is diagnostic for *hernandensis*: prosternal process with marginate apex; elytra with strongly convex intervals and deep striae; eversion of internal sac left and ventral around median lobe; stylus of female ovipositor elongate and narrow. The species *morio* is similar to *hernandensis* but is distinguished by the absence of a raised margin at the apex of the prosternal process and an incomplete groove along the lateral margin of the pronotum.

Description. – Body length 8.1 – 9.3 mm. Form small, short and robust.

Microsculpture of head between eyes and intervals of elytra isodiametric meshes, or highly sinuous, entwined lines. Disc of pronotum with microsculpture usually effaced, or of sinuous lines.

Head glossy; frontal grooves short, shallowly impressed, and not sharply defined, parallel or slightly oblique. Penultimate article of labial palpus with two medial setae (fig. 66).

Pronotum glossy; form circular in outline as in fig. 1; disc convex laterally but flattened in center; sides produced, constricted slightly anteriorly and strongly posteriorly, not sinuate near posterior margin; posterior angles obsolete, very broadly obtuse; anterior transverse impression incomplete, impressed laterally only; basal lateral foveae deep and punctiform posteriorly, short and shallow anteriorly. Prosternal process with marginate apex, and medially with short, distinctly impressed longitudinal groove.

Elytra glossy, slightly sinuate apically; intervals strongly convex; striae deep anteriorly, obsoletely or indistinctly punctate posteriorly; stria 7 with apical end distinctly impressed, obsolete anteriorly.

Male genitalia (fig. 81) with median lobe strongly arcuate, angle approximately right; apical blade spatulate and slightly deflected dorsally. Right paramere fairly short, slightly tapered apically, not extending to apical half of median lobe. Eversion of internal sac to left, around left and ventral sides of median lobe; apical sclerite absent, dark serrulate fields present apically on finger-like projections. The genitalia of two males were studied in detail.

Stylus of female ovipositor elongate and narrow.

Geographical distribution (fig. 125). – This species is found in western peninsular Florida. I have seen six specimens from the following localities.

United States – FLORIDA: Citrus County: (CAS). Hernando County: Brooksville (CAS). Hillsborough County: Tampa (ANSP, MCZ, USNM). Marion County: Juniper Springs (FDPI).

Evarthrus morio Dejean, 1828

Figures 2, 82, 125

Feronia (Steropus) morio Dejean 1828:302. TYPE, Labelled as follows: "morio M. in America borealis", MHNP. TYPE LOCALITY, Alma, Georgia (here selected). LeConte, 1848:355 (*Broscus*). – LeConte, 1852:231 (*Evarthrus*). – LeConte, 1863a:8. – Motschulsky, 1865:264 (*Fortax*). LeConte, 1873:319 (*Evarthrus*). – Schaupp, 1880:49. – Casey, 1918:364 (*Ferestria*). – Leng 1920:57. – Csiki, 1930:674 (*Pterostichus*).

Pterostichus (Pterostichus) (Sect. *Fortax*) *dejeanellus* Csiki, 1930:674.

Evarthrus (Ferestria) taurus Van Dyke, 1943:25. HOLOTYPE, labelled as follows: "Punta Gorda Fla. 2.5–12.40; Van Dyke Collection". CAS. ALLOTYPE, labelled the same as holotype. CAS. TYPE LOCALITY – near Punta Gorda, Fla. NEW SYNONYMY. – Blackwelder, 1948:3 (*Ferestria*).

Recognition. – the following characteristics are diagnostic for *morio*: pronotum with incomplete lateral grooves, absent between the lateral and basal setae, and complete anterior impression; prosternal process with apex unmargined; eversion of internal sac of male genitalia to the left and around left and ventral sides of median lobe. The species *laevipennis* is similar to *morio* but has crescent-shaped frontal grooves on the head, pronotum with complete lateral grooves, and the male genitalia are different (fig. 82 cf. fig. 83).

Description. – Body length 7.7 – 10.2 mm. Form robust.

Microsculpture of head between eyes, disc of pronotum and elytral intervals with sinuous lines often entwined forming amorphic or isodiametric meshes and partially effaced.

Head glossy; frontal grooves short, shallowly and broadly impressed, not sharply defined, slightly oblique. Penultimate article of labial palpus with two to four setae.

Pronotum glossy; form subcordiform in outline as in fig. 2; disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly, obsoletely sinuate in front of posterior angles; posterior angles obsolete, very broadly obtuse; anterior transverse impression complete; basal lateral foveae deep posteriorly, short and shallow anteriorly. Prosternal process with unmargined apex; longitudinal groove short and distinctly impressed. First articles of middle and hind tarsi with lateral grooves.

Elytra glossy, slightly sinuate apically; intervals completely flat or slightly raised and convex; striae 1 to 5 obsolete or distinctly impressed; striae 6 and 7 obsolete, obsoletely or indistinctly punctate.

Male genitalia (fig. 82) with median lobe strongly arcuate, angle approximately right; apical blade spatulate. Right paramere narrow apically and extending to apical half of median lobe. Eversion of internal sac to left and when everted, curled closely around left and ventral sides of median lobe; apical sclerite absent; serrulate field present apically. The genitalia of four males were studied in detail.

Stylus of female ovipositor average size for the *morio* group.

Variation. – The striae and intervals of the elytra vary. A few individuals have distinctly impressed and punctate striae and slightly raised and convex intervals. Generally, however, the striae are obsoletely impressed and the intervals are flat.

Notes on synonymy. – Van Dyke proposed the name *taurus* for the species. He wrote that the presence of the marginal groove of the pronotum was characteristic of *morio* Dejean. The groove is, in fact, absent in *morio* but it is present in the similar species *laevipennis* LeConte.

Collecting notes. – H. J. Weems, Jr. has collected this species in oak leaf litter.

Geographical distribution (fig. 125). – This species ranges from southwestern Florida to southern Georgia. I have seen 115 specimens collected in the following localities.

United States – FLORIDA: Alachua County: Archer (FDPI); Gainesville (CNC, FDPI, UMMZ); High Springs (UMMZ); Micanopy (UMMZ); Newnan's Lake (FDPI, UMMZ); University Farm (UMMZ); Warren's Cave (UMMZ). Baker County: Glen St. Mary (FDPI); Macclenny (FDPI). Charlotte County: Punta Gorda (CAS). Citrus County: (CAS). Collier County: Naples (CAS). Dixie County: Cross City (UMMZ). Duval County: Jacksonville (AMNH). Hernando County: Brooksville (CAS). Hillsborough County: Tampa (ANSP, MCZ, USNM). Jackson County: Florida Caverns State Park (FDPI). Manatee County: Bradenton (GEB); Manatee (UMMZ). Orange County: Winter Park (CU). Palm Beach County: Boynton (CAS); Lake Worth (AMNH), Putnam County: Camp Rosa, Bostwich (FDPI); Crescent City (USNM); Florahome (UMMZ); Welaka (CU). Suwanee County: Wellborn (UMMZ). Volusia County: Enterprise (ANSP, RU, USNM). County not determined: North Smyrna (CAS). GEORGIA: Bacon County: Alma (UMMZ). Bryan County: Lanier (UMMZ).

Evarthrus laevipennis LeConte, 1848

Figures 3–4, 83, 125

Broscus (Cephalotes) laevipennis LeConte, 1848:354. LECTOTYPE (here selected) a female, labelled as follows: "orange disc; Type 5627; E. laevipennis Lec." MCZ. TYPE LOCALITY, Georgia. – LeConte, 1852:231 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873: 319. – Schaupp, 1880:49. – Leng, 1915:577 (*Ferestria*). – Casey, 1920:193. – Leng, 1920:57. – Csiki, 1930:674 (*Pterostichus*). – Löding, 1945:16 (*Ferestria*).

Evarthrus acutus LeConte, 1852:231. LECTOTYPE (here selected) a female, labelled as follows: "orange disc; Type 5626; E. acutus Lec." MCZ. TYPE LOCALITY, Louisiana. NEW SYNONYMY. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:319. – Schaupp, 1880:49. – Leng, 1915:577 (*Ferestria*). – Leng, 1920:57. – Csiki, 1930:674 (*Pterostichus*).

Evarthrus ovulum; Horn, 1875:126 (not Chaudoir).

Ferestria nanula Casey, 1918:364. HOLOTYPE, female, labelled as follows: "Mobile Ala; CASEY bequest 1925; TYPE USNM 47111; nanula Csy." USNM. PARATYPE, female, labelled as follows: "Mobile Ala; CASEY bequest 1925; nanula – 2 PARATYPE USNM 47111." USNM. NEW SYNONYMY. – Casey, 1920:192 (*Ferestria*). – Leng, 1920:57. – Csiki, 1930:674 (*Pterostichus*). –Löding, 1945:16 (*Ferestria*).

Ferestria simiola Casey, 1920:192. HOLOTYPE, female, labelled as follows: "Mobile Ala; CASEY bequest 1925; TYPE USNM 47112; simiola Csy." USNM. NEW SYNONYMY. – Leng and Mutchler, 1927:10 (*Ferestria*). – Csiki, 1930:674 (*Pterostichus*).

Ferestria seminola Löding, 1945:16 (misspelling for *simiola* Casey).

Ferestria castigata Casey, 1920:192. HOLOTYPE, male, labelled as follows: "Mobile Ala; H. P. Löding; male; CASEY bequest; TYPE USNM 47110; castigata Csy." USNM. PARATYPE, female, labelled as follows: "Mobile Ala.; CASEY bequest 1925; castigata – 2 PARATYPE USNM 47110. NEW SYNONYMY. – Leng and Mutchler, 1927:10 (*Ferestria*). – Csiki, 1930:674 (*Pterostichus*). – Löding, 1945:16 (*Ferestria*).

Ferestria bullata Casey, 1920:193. HOLOTYPE, female, labelled as follows: "Mobile Ala. H. P. Löding, CASEY bequest 1925; TYPE USNM 47113; bullata Csy." USNM. NEW SYNONYMY. – Leng and Mutchler, 1927:10 (*Ferestria*). – Csiki, 1930:674 (*Pterostichus*). Löding, 1945:16 (*Ferestria*).

Evarthrus (Ferestria) morio; Van Dyke, 1943:26 (not Dejean).

Ferestria acuta; Löding, 1945:16 (not LeConte).

Recognition. – Specimens of *laevipennis* are distinguished by the following combination of characteristics: head with sharply defined, crescent-shaped frontal grooves, oblique, and widely separated. Pronotum with complete lateral grooves between the lateral and basal setae; prosternal process shallow and broadly impressed or obsolete; internal sac everts apicodorsally and to the left. Specimens of *morio* and *laevipennis* can be confused. However, they are distinguished by a number of differences in structures that are described in the recognition section of *morio*.

Description. – Body length 7.1 – 9.0 mm. Form relatively slender for the *morio* group.

Microsculpture of head between eyes, disc of pronotum, and intervals of elytra, comprised of generally effaced sinuous lines.

Head glossy; frontal grooves sharply defined, crescent-shaped with convexity directed laterally, oblique and widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum glossy; form subcordiform or cordiform in outline as in figs. 3 and 4; disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly, obsoletely sinuate in front of posterior angles when posterior angles obsolete (fig. 3),

distinctly sinuate when angles distinct (fig. 4); posterior angles obsolete and broadly rounded or produced and acute; anterior transverse impression complete or absent medially; basal lateral foveae deep and short. Prosternal process with shallow and broadly excavated or obsolete longitudinal groove. First articles of middle and hind tarsi with lateral grooves.

Elytra glossy, obsoletely sinuate apically; intervals completely flat or slightly raised and slightly convex; striae obsolete and impunctate or distinctly impressed and punctate, 6 and 7 always obsolete and impunctate.

Male genitalia (fig. 83) with median lobe strongly arcuate, angle slightly obtuse; apical blade slightly tapered and evenly rounded at apex. Right paramere narrow apically and extending to apical half of median lobe. Eversion of internal sac dorsoapically and when everted, dorsoapically and to left; apical sclerite absent; dark serrulate field apically. The genitalia of four males were studied.

Stylus of female ovipositor short, tapered apically and slightly sinuate preapically.

Geographical variation. – Individuals from southern localities are characterized by obsolete basal angles of the pronotum, distinctly impressed and complete anterior transverse impression of the pronotum (fig. 3), and elytra with completely flat intervals and obsolete striae. In central areas of the species range populations are composed of some individuals with the above characters, and some with more distinct basal angles of the pronotum, an incomplete anterior transverse impression, and more or less raised intervals and impressed punctate striae of the elytra. Specimens of northern localities have produced, sharp angles of the pronotum, an incomplete anterior transverse impression (fig. 4), and elytra with somewhat raised intervals and distinctly impressed and punctate striae. Because of the apparent clinal nature of the changes in these structures, I believe northern and southern populations, although distinct, do not merit subspecific status.

Notes on synonymy. – LeConte was not aware of the geographic variation in *laevipennis.* In 1848 he proposed the name *laevipennis* for the northern form, and in 1852, he recognized the southern form as a separate species to which he gave the name *acutus*.

Casey provided the names *nanula*, *simiola*, *castigata*, and *bullata*, the types of which are of the average form of *laevipennis* found in Mobile, Alabama.

Collecting notes. – D. Larson and I collected specimens of *laevipennis* near Grey, Georgia, in deciduous forest in leaf litter.

Geographical distribution (fig. 125). – This species inhabits the Gulf Coastal Plain and southern Piedmont. I have seen 343 specimens from the following localities.

United States – ALABAMA: Baldwin County: (UASM). Barbour County: Eufaula (USNM), Clark County: Salt Mountain, six miles south of Jackson (UMMZ). Colbert County: Tuscumbia Mountains, southwest of Tuscumbia (UMMZ). Elmore County: Wetumpka (USNM). Houston County: Chatahoochee State Park (GEB). Lee County: Auburn (CAS, KSU, VMK), Madison County: Monte Sano State Park (CAS), Mobile County: Alabama Port (GEB); Citronelle (CAS); Grand Bay (AMNH); Mobile (AMNH, CAS, CNC, CU, MCZ, UASM, USNM); Mount Vernon (CU). Randolph County: Wadley (USNM). Tallapoosa County: Alexander City (KSU). County not determined: Dog River (UK); FLORIDA: Jefferson County: Monticello (UMMZ). Liberty County: Camp Torreya (CU, UMMZ); Torreya State Park (FDPI). GEORGIA: Cobb County: Austell (CAS). Hall County: White Sulfur Springs (UMMZ). Jones County: seven miles south of Gray (RF). Rabun County: (USNM); Clayton (USNM); Pinnacle Park (USNM). MISSISSIPPI: George County: Lucedale (CU). Greene County: Leaf (CU). Jackson County: Ocean Springs (CU). Lamar County: Lumberton (CU). Perry County: New Augusta (CU); Richton (CU). Stone County: Wiggins (CU). SOUTH CAROLINA: Greenville County: Greenville (USNM); 17 miles west of Spartenburg (DL). Oconee County: CCC Camp f2 (CAS); Clemson (GEB); Clemson College (CAS, USNM). Pickens County: Nine Times (RCG).

The *obsoletus* Group

Characteristics. – Penultimate article of labial palpus with two medial setae. Pronotum cordiform in outline; basal lateral foveae completely punctiform with no anterior extensions; basal seta situated in front of the basal angle. Prosternal process with obsolete medial longitudinal groove. Claw-bearing tarsal article usually with setae on lateroventral margins. Right paramere of male genitalia elongate.

This group is generally distributed north of the *morio* group in regions of the Piedmont flanking the Appalachian Mountains (fig. 126).

Evarthrus approximatus LeConte, 1848

Figures 5, 84, 126

Broscus (Cephalotes) approximatus LeConte, 1848:354. LECTOTYPE (here selected) a female, labelled as follows: "pink disc; Type 5628; E. approximatus Lec." MCZ. TYPE LOCALITY, Pennsylvania. – LeConte, 1852:231 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Leng, 1920:57 (*Ferestria*). – Csiki, 1930: 674 (*Pterostichus*). – Brimley, 1938:120 (*Ferestria*).

Recognition. – This species is characterized by the combination of a complete anterior transverse impression of the pronotum, male genitalia, and geographical range restricted to areas east of the Appalachian Mountains. Specimens of *approximatus* are distinguished from those of *obsoletus* by the less arcuate median lobe of the male genitalia. These very similar species are allopatric in relation to one another.

The species *iuvenis* resembles *approximatus* but is distinguished by an incomplete anterior transverse impression of the pronotum.

Description. – Body length 8.4 – 10.9 mm. Form average for *obsoletus* group.

Microsculpture of head between eyes and disc of pronotum completely effaced. Microsculpture at intervals of elytra effaced or consisting of indistinct isodiametric meshes. Micropunctures present on head and pronotum.

Head glossy; frontal grooves sharply defined, crescent-shaped with convexity directed laterally, oblique and widely separated.

Pronotum glossy; cordiform in outline as in fig. 5, disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly, obsoletely sinuate in front of posterior angles; posterior angles obsolete; anterior transverse impression complete. Lateroventral margin of last article of tarsus with setae.

Elytra glossy; obsoletely sinuate apically; intervals slightly raised and slightly convex; striae clearly impressed and indistinctly punctate.

Male genitalia (fig. 84) with median lobe strongly arcuate, angle approximately right, apical half deflected to right; apical blade evenly rounded at apex and slightly deflected dorsally. Right paramere tapered apically, long, extending to apical half of median lobe. Eversion of internal sac apical and to left; apical sclerite absent, serrulate fields present apically. The genitalia of three males were studied in detail.

Stylus of female ovipositor tapered apically and sinuate preapically.

Geographical distribution (fig. 126). – This species is found in North Carolina, Virginia and Washington, D. C. According to LeConte, it also occurs in Pennsylvania, but I have not been able to verify this record. I have seen 41 specimens collected in the following localities.

United States – DISTRICT OF COLUMBIA: Washington (ANSP, CAS, MCZ, UK, USNM). NORTH CAROLINA: Guilford County: High Point (USNM). Arlington County: Rosslyn (UASM, USNM). Fairfax County: (USNM); Blackpond (USNM): Herndow (USNM). Giles County: Mountain Lake (UMMZ). Henrico County: Richmond (AMNH).

Evarthrus iuvenis new species

Figures 6, 85, 126

Recognition. – The internal sac of the median lobe of *iuvenis* everts to the left and curls ventrally on the left side of the median lobe. This feature alone sets *iuvenis* apart from the similar *obsoletus*. Also *obsoletus* inhabits areas west of the Appalachian Mountains, while *iuvenis* occurs east of that mountain range. Another diagnostic characteristic of *iuvenis* is the shape of the median lobe of the male (fig. 85).

Description. – HOLOTYPE, male, labelled as follows: "24 miles north of Roanoke, Virginia Blue Ridge Parkway 21 October 1962 leg. D. R. Whitehead; HOLOTYPE Evarthrus iuvenis R. Freitag (red label)." MCZ.

Body length 10.3 mm; width 4.1 mm. Form robust. Microsculpture effaced on head between eyes and disc of pronotum. Isodiametric meshes on intervals of elytra.

Head glossy; length 1.2 mm; width 2.5 mm; frontal grooves sharply defined, crescent-shaped with convexity directed laterally, oblique toward one another, and widely separated.

Pronotum glossy; length 2.8 mm, width 3.4 mm; form cordiform in outline as in fig. 6; disc moderately convex; sides produced, constricted slightly anteriorly, strongly posteriorly, obsoletely sinuate in front of posterior angles; posterior angles obsolete; anterior transverse impression absent medially. First articles of middle and hind tarsi with lateral grooves; lateroventral margins of claw-bearing article of tarsus with setae.

Elytra glossy; length 6.2 mm, width 4.1 mm; slightly sinuate apically; intervals slightly convex; striae clearly impressed and indistinctly punctate.

Male genitalia (fig. 85) with median lobe slightly arcuate; apical blade narrow and evenly rounded at apex, deflected dorsally and to right; right paramere with markedly tapered apical half, extending to apical half of median lobe; eversion of internal sac to left and in everted position curled ventrally around median lobe on left side; apical sclerite absent, serrulate fields present apically.

ALLOTYPE, female labelled as follows: "Raleigh, N. C., April 14'49 H. F. Howden; under board; near 1043 (yellow label) loan from CNC; ALLOTYPE Evarthrus iuvenis. R. Freitag". CNC.

Body length 11.1 mm; width 4.8 mm. Form same as in holotype.

Microsculpture of head between eyes and disc of pronotum consists of partially entwined lines. Intervals of elytra with isodiametric microsculpture.

Head slightly glossy; length 1.4 mm, width 3 mm.

Pronotum, form same as in holotype; length 3 mm; width 3.8 mm.

Elytra slightly glossy; intervals flat; striae distinctly impressed and clearly punctate; length 6.7 mm; width 4.8 mm.

Stylus of ovipositor short and tapered apically, slightly sinuate preapically.

Variation among paratypes (six males, seven females, North Carolina, Virginia). – Total length 9.8 – 12.8 mm. The basal angles of the pronotum are slightly produced and sharp in

six specimens. The last tarsal article may or may not have setae on the ventral side. The apical blade of three males is half the width of that of the holotype, while that of the other three is approximately the same width as that of the holotype. In other respects the paratypes resemble the holotype and allotype.

Derivation of specific name. – The word *iuvenis* is a Latin noun, meaning warrior. I have given the name to this species because its members seem warrior-like, robust and large in size for the subgenus *Fortax*.

Disposition of type material. – The holotype is in the MCZ. The allotype was returned to the CNC. The paratypes are deposited in the collection of CAS, DRW, RCG, RTB, UASM, UMMZ, and USNM.

Collecting notes. – This species is found in leaf litter in forested places.

Geographical distribution (fig. 126). – *Evarthrus iuvenis* is known from western Virginia and North Carolina. I have seen eight specimens from the following localities.

United States – NORTH CAROLINA: Stokes County: Hanging Rock State Park (RTB). Wake County: Raleigh (CNC). VIRGINIA: Bland County: Summit of Walker Mountain (UMMZ). Campbell County: (USNM). Floyd County: (UASM); Buffalo Mountain, five miles southeast of Willis (DRW). Rocky Knob Recreation Area, Blue Ridge National Parkway (RCG). Giles County: Cascades (TCB); Mountain Lake (RTB). Nelson County: (USNM). Roanoke County: Blue Ridge Parkway, 24 miles north of Roanoke (MCZ).

Evarthrus obsoletus Say, 1823

Figures 7, 86, 126

Feronia obsoleta Say, 1823a:57. Type lost. Type Locality – Indiana (here selected). – Say, 1834:424 (*Feronia*). – LeConte, 1848:354 (*Broscus*). – LeConte, 1852:231 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Blatchley, 1910:91 (*Pterostichus*). – Casey, 1918:364 (*Ferestria*). – Casey, 1920:193. – Leng 1920:57. – Csiki, 1930:674 (*Pterostichus*). – Löding, 1945:16 (*Ferestria*).

Recognition. – The shape of the median lobe of the male is markedly arcuate, and differs strongly from that of *approximatus* and *iuvenis* (fig. 86 cf. figs. 84 and 85). The species *obsoletus* alone in this group occurs to the west and south of the Appalachian Mountains.

Description. – Body length 7.9 – 9.9 mm. Form average for *obsoletus* group.

Microsculpture of head between eyes of obsolete sinuous impressions or completely effaced. Microsculpture of disc of pronotum and intervals of elytra completely effaced.

Head glossy; frontal grooves sharply defined, slightly curved, with convexity directed laterally, oblique toward one another and widely separated.

Pronotum glossy, cordiform in outline, as in fig. 7; disc moderately convex; sides produced, constricted slightly anteriorly and strongly posteriorly; posterior angles obsolete; anterior transverse impression incomplete, impressed laterally only. First articles of middle and hind tarsi with lateral grooves; last article of tarsus with setae on lateroventral margin.

Elytra glossy; obsoletely sinuate apically; medial intervals highly convex, lateral intervals flatter; striae deeply impressed, indistinctly punctate.

Male genitalia (fig. 86) with median lobe strongly arcuate, angle slightly obtuse; apical blade deflected to right, left edge deflected dorsally, evenly rounded at apex. Right paramere tapered apically, long, extended apically well beyond halfway point of median lobe. Eversion of internal sac apical and to left; apical sclerite absent; serrulate fields present apically. The genitalia of three males were examined.

Stylus of female ovipositor pointed at apex, tapered apically.

Notes on synonymy. – Say (1834) wrote that this species occurred in Indiana. For this reason I have selected Indiana as Type area. This species was identified by the original description.

Collecting notes. – This species is found in deciduous forests in damp leaf litter.

Geographical distribution (fig. 126). – This species ranges from southern Alabama north to Michigan west of the Appalachian Mountains. I have seen a total of 131 specimens.

United States – ALABAMA: Bibb County: The Sinks (UMMZ). Cherokee County: Leesburg (UMMZ). Colbert County: (USNM); Barton (CAS). Fayette County: Berry (GEB). Jackson County: Paint Rock (UMMZ). Madison County: Monte Sano State Park (CAS, CNHM, UASM). Mobile County: Mobile (CAS). Monroe County: Claiborne (UMMZ). Randolph County: Wadley (USNM). St. Clair County: Blount Mountains (GEB). Talladega County: Talladega (UMMZ). Tuscaloosa County: Hurricane Creek, near Peterson (GEB). Hurricane Creek, seven miles north of Tuscaloosa (RF); Lock 14 (CAS); Tuscaloosa (GEB); University (UMMZ). County not determined: National Forest (CAS, USNM); Tumblin Gap (USNM). GEORGIA: Cherokee County: Galt's Lodge (TCB). Fulton County: Silver Lake (USNM). Morgan County: four miles north of Madison (DL, RF); Madison (UMMZ). ILLINOIS: Cook County: Palos Park (UMMZ). Vermilion County: Camp Robert Drake, near Fairmount (RTB). Washington County: Dubois (UMMZ). INDIANA: Crawford County: (CNHM). Fulton County: (CAS). Monroe County: Bloomington (UMMZ). KENTUCKY: Fleming County: Blue Briar Springs (GEB). MICHIGAN: Washtenaw County: Cady's Woods, Ann Arbor (UMMZ). MISSISSIPPI: Lauderdale County: Meridian (UMMZ). Pontotoc County: Pontotoc (UMMZ). NORTH CAROLINA: Cherokee County: Murphy (CAS). OHIO: (CAS). TENNESSEE: Blount County: Chilhowee Mountains (CNC); Great Smoky Mountains National Park (CNC). Cumberland County: Grassy Cove (CAS). Hamilton County: Chattanooga (UMMZ). Lauderdale County: South Fulton (UMMZ). Morgan County: Burrville (UMMZ); Deer Lodge (USNM); Environs (CNHM). Obion County: Obion (UMMZ). Sevier County: Elkmont (USNM). County not determined: Cades Cove, Blounto (MCZ); Cedar Glade Area (USNM); Cove Mountain Trail (TCB).

The Subgenus *Cyclotrachelus* Chaudoir

Cyclotrachelus Chaudoir, 1838:27. Casey, 1918:348. – Van Dyke 1943:27. – Ball 1960: 129. TYPE SPECIES – *Molops faber* Germar, 1824 (here designated).

Evarthrus roticollis Casey (designated type species by Casey, 1918:348).

Characteristics. – The subgenus *Cyclotrachelus* is distinguished from the other subgenera of *Evarthrus* by the following combination of characteristics: pronotum with sides strongly constricted posteriorly, posterior lateral foveae monostriate, posterior lateral setae situated on bead (figs. 8–10), anterior transverse impression incomplete and impressed laterally only; middle femur with four setae on anterior face except for that of the species *unicolor* which has up to seven; eversion of internal sac of median lobe of male genitalia dorsoapical, internal sac not curled ventrally in everted position; right paramere of male genitalia without "elbow" at bend, and only slightly tapered apically. The styli of female ovipositor short and broad, in a few species sinuate preapically and tapered apically. With the exception of the right paramere all the above characteristics are present in each species of this subgenus. The species *levifaber* has an elbow in the right paramere.

The three species groups in *Cyclotrachelus* are: the *spoliatus* group, the *ovulum* group, and the *faber* group.

Notes on synonymy. – Casey's designation of *E. roticollis* Casey as type species was incorrect because this name was not included with the original description of *Cyclotrachelus*.

The *spoliatus* Group

Characteristics. – Pronotum almost circular in dorsal aspect and basal angles broadly obtuse; longitudinal groove of the prosternal process usually shallow, but if deep not sharply defined; internal sac of the median lobe of the male genitalia without apical sclerite, with serrulate fields apically.

This group includes the following species: *unicolor*, *fucatus*, *spoliatus*, and *brevoorti*. Members of these species inhabit the Coastal Plain and Piedmont regions of southeastern United States.

Evarthrus unicolor Say, 1823

Figures 8, 63, 67, 87, 127

Feronia unicolor Say, 1823a:40. Type lost. TYPE LOCALITY, Georgia (here selected). – LeConte, 1848:352 (*Feronia*). – LeConte, 1852:230 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:349 (*Cyclotrachelus*). – Leng, 1920:56. – Csiki, 1930:672 (*Pterostichus*). – Löding, 1945:15 (*Cyclotrachelus*).

Recognition. – The large body size, four to six setae on the penultimate article of the labial palpus (fig. 67), raised knobs flanking the anterior end of the gula, and dark apical serrate field in the internal sac of the median lobe of the male genitalia, combined, distinguish specimens of *unicolor* from those of the similar species *fucatus*, *spoliatus* and *brevoorti*. The species *fucatus* is further distinguished by frontal grooves of the head that are oblique to one another and a subcordiform glossy pronotum. All specimens of *brevoorti* are smaller than those of *unicolor*. The species *spoliatus* and *unicolor* are allopatric, and can also be distinguished by structural features of the male genitalia (fig. 87 cf. fig. 89).

Description. – Body length 17.7 – 22.0 mm. Form parallel and elongate.

Microsculpture of head between eyes, pronotal disc, and elytral intervals with lines distinctly impressed, highly sinuous and entwined, often forming isodiametric or amorphic meshes.

Head dull or slightly glossy; frontal grooves deeply impressed, straight, and parallel to one another. Penultimate article of labial palpus with four to six setae. Anterior end of gula flanked by raised knobs (fig. 63).

Pronotum dull or slightly glossy; form as in fig. 8; disc moderately convex; sides slightly constricted anteriorly, strongly constricted posteriorly, and moderately sinuate in front of posterior angles; posterior angles right or slightly obtuse and produced; anterior transverse impression incomplete; basal foveae of average length and moderately impressed. Longitudinal groove in prosternal process shallow or deep. Anterior face of middle femur with four to seven setae.

Elytra dull or slightly glossy, sinuate apically; intervals usually flat, occasionally slightly raised; striae shallowly impressed, small punctures confined to anterior two-thirds, impunctate posteriorly.

Male genitalia (fig. 87) with median lobe strongly arcuate, angle approximately right; apical blade produced, of average width to relatively broad, apex evenly rounded: right paramere typical *Cyclotrachelus* form, not reaching apical half of median lobe; eversion of internal sac apicodorsal and to the right; internal sac with a dark serrate field apically, apical sclerite absent. The male genitalia of three specimens were examined in detail.

Stylus of female ovipositor short, broad, and evenly rounded at tip.

Notes on synonymy. – This species was identified by the original description, and by an examination of the LeConte *unicolor* specimen in the LeConte Collection. I have selected Georgia as type locality because many *unicolor* specimens which I have seen are from Georgia.

Geographical distribution (fig. 127). – This species inhabits the Gulf Coastal Plain and southern Piedmont. I have seen 18 specimens from the following localities.

United States – ALABAMA: Cherokee County: Leesburg (UMMZ). Lee County: Auburn (AU, UMMZ). FLORIDA: Jackson County: (FDPI). GEORGIA: Dodge County: Chester (CAS, CU). Dooley County: Umadilla (UMMZ), Morgan County: Madison (UMMZ). Upson County: (MCZ, USNM).

Evarthrus fucatus new species

Figures 9, 88, 127

Recognition. – The following three characters combined are diagnostic for the species *fucatus*: subcordiform pronotum; highly glossy dorsum, and form of male genitalia. Although there are striking similarities among *fucatus*, *spoliatus*, and *brevoorti* they differ in the following respects.

The species *fucatus* and *spoliatus* are allopatric. Specimens of *fucatus* have a subcordiform pronotum, and sometimes three setae on the penultimate article of the labial palpus, while *spoliatus* specimens have a more circular pronotum and always two setae on the penultimate article of the labial palpus. In addition the frontal grooves of the head are oblique in *fucatus* and parallel in *spoliatus*.

There is some overlap in the distributions of *fucatus* and *brevoorti*. Specimens of *fucatus* normally have a more cordiform pronotum. However the most distinguishing character is the male genitalia. The apex of the median lobe of *fucatus* is evenly rounded, but is truncate in *brevoorti*.

Description. – HOLOTYPE, male, labelled as follows: "Cherokee Co., Ala. Leesburg VII – 25 – 1929 54. T. H. Hubbell; loan from UMMZ; HOLOTYPE Evarthrus fucatus R. Freitag (red label)." UMMZ.

Body length 14.1 mm; width 5.7 mm. Form typical of this group, with robust pronotum.

Microsculpture of head between eyes, disc of pronotum, and elytral intervals, with highly sinuous dense and closely entwined lines, often forming amorphic meshes.

Head glossy; length 1.7 mm, width 3.4 mm; frontal grooves straight, deep and sharply defined, oblique and widely separated; penultimate article of labial palpus with three setae, two medial and one apical.

Pronotum with disc glossy; length 3.9 mm, width 4.6 mm; subcordiform (fig. 9); disc moderately convex; sides slightly constricted anteriorly and markedly constricted posteriorly, obsoletely sinuate in front of posterior angles; posterior angles not produced and broadly obtuse; anterior transverse impression absent medially; median longitudinal impression slightly deeper at either end; basal foveae deepest at bend, of average length. Longitudinal groove of prosternal process broad, indistinct and very shallowly impressed. Anterior face of middle femur with four setae.

Elytra glossy; length 8.5 mm, width 5.7 mm; obsoletely sinuate apically; intervals moderately raised but slightly flattened; striae deep with indistinct punctures in apical half, punctures obsolete in apical third.

Male genitalia (fig. 88) with median lobe strongly arcuate, angle slightly acute; apical blade moderately produced, slightly tapered apically, and evenly rounded; right paramere typical *Cyclotrachelus* form and of average length reaching apical half of median lobe, eversion of internal sac apicodorsal and slightly to right; internal sac with apical serrulate field; apical sclerite absent.

ALLOTYPE, female, labelled as follows: "Monte Sano State Park, ALABAMA 7-VI-1960 B. Benesh; CNHM 1965 Bernard Benesh General Coleop. Coll.; ALLOTYPE Evarthrus fucatus R. Freitag". CNHM.

Body length 14.3 mm, width 8.9 mm. Form same as in holotype.

Microsculpture of head between eyes and disc of pronotum same as in holotype. Elytra with microsculpture mainly composed of amorphic or isodiametric raised meshes that appear beady.

Head glossy; length 1.7 mm, width 3.2 mm.

Pronotum, shape, same as in holotype; length 3.7 mm, width 4.7 mm.

Elytra not highly glossy; intervals slightly convex, almost flat; striae deep and obsoletely punctate anteriorly, impunctate posteriorly; length 8.9 mm, width 5.7 mm.

Stylus of ovipositor obsoletely sinuate preapically and tapered apically.

Derivation of specific name. – The name *fucatus* is a Latin adjective which means deceitful and has been given this species because of the remarkable similarity of its members to those of *spoliatus.*

Variation among paratypes (19 males, 13 females, Georgia, Alabama, Tennessee, West Virginia, Pennsylvania, Ohio, CM, CNHM, UASM, UMMZ, USNM). – Total length 12.0 – 14.6 mm. The penultimate article of the labial palpus bears two or three setae. A minimal amount of variation is evident in coloration and structural features among the paratypes which resemble closely the holotype and allotype. The male genitalia of five specimens were examined in detail.

Disposition of type material. – The holotype and allotype are in the collections of the UMMZ and CNHM, respectively. The paratypes are in the collections of the following institutions: CM, CNHM, UASM, UMMZ, and USNM.

Collecting notes. – Specimens of *fucatus* have been collected in deciduous forest in leaf litter.

Geographical distribution (fig. 127). – This species inhabits the Piedmont on the western and southern sides of the Appalachian Mountains. I have seen 41 specimens collected in the following localities.

United States – ALABAMA: Cherokee County: Leesburg (UMMZ). Madison County: Huntsville (UMMZ); Monte Sano State Park (CNHM, UASM). GEORGIA: Floyd County: Armuchee (UMMZ). KENTUCKY: Edmonson County: near Hist. Ent. (TCB); Mammoth Cave (TCB). OHIO: Hamilton County: Cincinnati (UMMZ). PENNSYLVANIA: Allegheny County: Pittsburg (CM). Westmoreland County: Jeanette (CM). TENNESSEE: Cumberland County: Grassy Cove (UMMZ). Hamilton County: Signal Mountain (UMMZ). Montgomery County: Clarksville (USNM). Morgan County: Burrville (CNHM). WEST VIRGINIA: Marion County: Fairmount (CM).

Evarthrus spoliatus Newman, 1838

Figures 10, 89, 127

Feronia spoliata Newman, 1838:386. TYPE, male, labelled as follows: "Type H. T.; Ent. Club. 44–12; J. Ingall, Canada." BM. TYPE LOCALITY, Southern Pines, N. C. (here selected).

Evarthrus rotundatus LeConte, 1852:230. LECTOTYPE (here selected) a female, labelled as follows: "Va; rotundatus 2". MCZ. NEW SYNONYMY. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:349 (*Cyclotrachelus*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*). – Brimley, 1938:119 (*Cyclotrachelus*). – Löding, 1945:14.

Evarthrinus (Evarthrops) pinorum Casey, 1920:198. HOLOTYPE, male, labelled as follows: "Southern Pines, A. H. Manee. NC.; CASEY bequest 1925; TYPE USNM 47135; pinorum Csy". USNM. TYPE LOCALITY, Southern Pines, N. Carolina. NEW SYNONYMY. – Leng and Mutchler, 1927:10 (*Evarthrinus*). – Csiki, 1930:673 (*Pterostichus*). – Brimley, 1938:119 (*Evarthrinus*).

Recognition. – The combination of geographical distribution, generally parallel frontal grooves on the head, and form of the median lobe of the male genitalia is characteristic of *spoliatus*. The differences among *spoliatus*, *fucatus* and *unicolor* have been discussed in connection with the recognition of the last two species. The remaining species in this group, *brevoorti*, can also be mistaken for *spoliatus*. The frontal grooves of the head are parallel in *spoliatus* and oblique in *brevoorti*, and the apex of the median lobe is rounded in *spoliatus*, truncate in *brevoorti*.

Description. – Body length 12.8 – 15.8 mm. Form elongate.

Head between eyes, disc of pronotum, and elytral intervals, with lines of microsculpture dense, highly sinuous, entwined, forming amorphic raised meshes.

Head moderately or slightly glossy. Frontal grooves broadly but deeply impressed, normally with a slight bend the convexity of which is directed medially. Penultimate article of labial palpus with two setae.

Pronotum with slightly glossy disc; form as in fig. 10; disc moderately convex; sides moderately constricted anteriorly, more strongly so posteriorly, and distinctly sinuate in front of posterior angles; posterior angles slightly to broadly obtuse, and slightly produced; basal foveae moderately impressed. Longitudinal groove in prosternal process shallow. Middle femora each with four setae on anterior face; occasionally four setae on one middle femur and five or six on opposite one.

Elytra dull or slightly glossy; slightly sinuate apically; intervals slightly raised and flat; striae shallow or moderately impressed with small punctures anteriorly, impunctate posteriorly.

Male genitalia (fig. 89) with arcuate median lobe, apical half deflected to right; apical blade slightly tapered apically and apex evenly rounded; right paramere short and rather stout; internal sac with serrulate field apically, apical sclerite absent. Elongate, left lateral sclerotized flap of median lobe near opening of invaginated internal sac extending onto basal half of sac when everted; eversion of internal sac apicodorsal and to right. The genitalia of four males were studied in detail.

Stylus of female ovipositor tapered apically and slightly sinuate behind apex.

Notes on synonymy. – I have selected Southern Pines as the type locality because *spoliatus* specimens have been collected there. Also, it is centrally located in the species range. The name Canada on the label of the type specimen indicates the country of the collector, J. Ingall. The type specimens of *rotundatus* LeConte and *pinorum* Casey are average specimens of *spoliatus*.

Collecting notes. – V. M. Kirk collected specimens of *spoliatus* in litter on the ground in deciduous forest.

Geographical distribution (fig. 127). – This species is found on the Piedmont and Coastal Plain west of the Appalachian Mountains from District of Columbia south to South Carolina. I have seen 61 specimens from the following localities.

United States – DISTRICT OF COLUMBIA: Rock Creek (USNM, CNHM). NORTH CAROLINA: Duplin County: Faison (CNC). Durham County: Durham (USNM). Franklin County: Louisburg (CNC) Moore County: Pinehurst (MCZ): Southern Pines (USNM). New Hanover County: Wilmington (USNM). Orange County: Chapel Hill (CAS, CU). Union County: (GEB). Wake County: Raleigh (CNC). SOUTH CAROLINA: Bamberg County: Bamberg (VMK). Darlington County: Darlington (UMMZ). Florence County: Florence (GEB, VMK); Scranton (UMMZ); Three miles east of Florence (GEB). Sumter County: Sumter (GEB). VIRGINIA: County not determined: Virginia (CAS).

Evarthrus brevoorti LeConte, 1848

Figures 11–13, 90–91, 127

Feronia (Pterostichus) brevoorti LeConte, 1848:352. LECTOTYPE (here selected) a male, labelled as follows: "orange disc: Type 5625; E. spoliatus (Newm). Brevoorti Lec." MCZ. TYPE LOCALITY, Alabama. – LeConte, 1852:230 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Leng, 1920:57. – Csiki, 1930:671 (*Pterostichus*).

Evarthrus spoliatus; LeConte, 1873:319 (not Newman). – Schaupp, 1880:49. – Csiki, 1930:671.

Recognition. – The most distinctive feature of this species is the truncate apex of the median lobe of the male. Additional characteristics of this species have been mentioned above in connection with recognition of *unicolor*, *spoliatus*, and *fucatus*.

Description. – Body length 10.4 – 16.3 mm. Form typical of the *spoliatus* group.

Head between eyes, disc of pronotum, and elytral intervals, with lines of microsculpture highly sinuous, entwined and usually forming amorphic meshes.

Head slightly or markedly glossy. Frontal grooves sharply defined, straight, slightly oblique. Penultimate article of labial palpus with two to four setae.

Pronotum with disc slightly or markedly glossy; form as in figs. 11–13; disc moderately convex; sides produced medially, constricted posteriorly slightly or moderately sinuate in front of posterior angles; posterior angles slightly produced, broadly obtuse; basal foveae moderately impressed. Longitudinal groove in prosternal process shallow and poorly defined or obsolete. Front face of middle femur with four setae.

Elytra slightly glossy and usually iridescent; slightly sinuate apically; intervals raised and weakly convex; striae deep, distinctly punctate anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (figs. 90–91) with median lobe arcuate, angle slightly obtuse, and apical half slightly deflected to right, apex truncate and often with a short, right, lateral spine; right paramere broad and reaching apical half of median lobe; internal sac with dark serrulate fields basally and very light, highly folded, serrulate fields apically; apical sclerite absent. Eversion of internal sac apicodorsal. The genitalia of nine males were studied in detail.

Stylus of female ovipositor sinuate preapically and tapered apically.

Geographical variation. – Individuals from coastal populations are generally somewhat larger in body size and slightly duller than those of inland areas. In some males the median lobe has a short spine jutting out of the right side of the apical blade (fig. 91). The pronotum varies slightly in form, but there is no geographical pattern to the variation.

Collecting notes. – Specimens of *brevoorti* are found in forested areas. H. V. Weems, Jr. collected a specimen in leaf mold on a bank of a stream in Florida. They are also found in rotting logs.

Geographical distribution (fig. 127). – This species is found on the Gulf Coastal Plain and southern Piedmont. I have seen 92 specimens from the following localities.

United States – ALABAMA: Clarke County: Salt Mountain, six miles south Jackson (UMMZ). DeKalb County: Mentone (GEB). Lee County: Auburn (AU). Mobile County: Alabama Port (GEB); Calvert (CAS, NCSU); Mobile (CAS, CU, MCZ, UMMZ, USNM). Perry County: Felix (UMMZ). FLORIDA: Liberty County: Camp Torreya (UMMZ); Torreya State Park (FDPI). GEORGIA: Cobb County: Austell (CAS). Floyd County: 2 mi. s. Armuchee (UMMZ). Fulton County: Atlanta (CAS). MISSISSIPPI: Choctaw County: Little Mountain Camp Ground (RCG). George County: Lucedale (CU). Jackson County: Ocean Springs (CU); Pascagoula (CU). Oktibbeha County: State College (CAS). Wayne County: Waynesboro (UMMZ). County not determined: Oneca Springs (CU). SOUTH CAROLINA: Oconee County: Clemson (CAS, GEB); Clemson College (AMNH, USNM). Pickens County: Kedwee River (RCG). Saluda County: Saluda (UMMZ).

The *ovulum* Group

Characteristics. – Small to medium size beetles; pronotum cordate with basal angles produced, relatively sharp and slightly obtuse; apical sclerite present in internal sac of median lobe.

This group includes the following species: *macrovulum, texensis, ovulum, alabamensis* and *vinctus*.

The group occurs on the Coastal Plain, except for the species *vinctus*, which lives in the higher altitudes of northern Georgia and western North Carolina, and in the Great Smoky Mountains.

Evarthrus vinctus LeConte, 1852

Figures 14, 92, 128

Evarthrus vinctus LeConte, 1852:232. LECTOTYPE (here selected) a female, labelled as follows: "orange disc; Type 5623; E. vinctus Lec." MCZ. TYPE LOCALITY, Nakutshi Valley, Habersham Co., Georgia. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:350 (*Cyclotrachelus*). – Leng, 1920:57. – Csiki, 1930:672 (*Pterostichus*).

Recognition. – The following characters of this species combined are diagnostic: sharply defined and oblique frontal grooves of the head; elongate and deeply impressed basal foveae

of the pronotum; very shallow longitudinal groove in the prosternal process; very convex and iridescent intervals of the elytra in the males; obsoletely punctate or impunctate elytral striae; and male genitalia (fig. 92).

Specimens of *vinctus* and those of its congeners in the *ovulum* group are similar in appearance. The impunctate or obsoletely punctate elytral striae are characteristics of *vinctus* and distinguish specimens of this species from those of *alabamensis, macrovulum, texensis* and *ovulum.*

Description. – Body length 8.5 – 11.1 mm. Form typical of this group.

Microsculpture on head between eyes with slightly sinuous, entwined lines, and raised amorphic meshes. Disc of pronotum with microsculpture same as that on head but occasionally partially effaced. Microsculpture of elytral intervals same as that on head only more stretched transversely and slightly effaced.

Head slightly or markedly glossy. Frontal grooves deep, sharply defined and oblique. Penultimate article of labial palpus with two or three medial setae.

Pronotum slightly or markedly glossy; form cordiform as in fig. 14; disc slightly convex; sides slightly constricted anteriorly and strongly constricted posteriorly, very broadly sinuate in front of posterior angles; posterior angles prominent, slightly obtuse; anterior transverse impression incomplete, very rarely complete, impressed laterally only; basal foveae elongate, sharply impressed throughout, deep posteriorly, crescent-shaped with convexity directed medially. Prosternal groove distinct or obsolete, but always very shallow. Four setae on front face of middle femur.

Elytra highly glossy and slightly iridescent in males, slightly glossy and slightly iridescent in a few females; intervals moderately to strongly convex in males, slightly convex in females; striae deeply impressed and obsoletely punctate or impunctate.

Male genitalia (fig. 92); angle of median lobe slightly obtuse, apical half deflected to right, apical blade moderately tapered apically and evenly rounded; right paramere of average length extending to apical half of median lobe, shape typical of *Cyclotrachelus*, eversion of internal sac to right and slightly dorsal of median lobe, and a basal bulbous serrulate field directed to left; internal sac with serrulate field basally and apically, preapical sclerite lightly sclerotized, large and hemispherical. The genitalia of two males were studied in detail.

Stylus of female ovipositor short with preapical, lateral sinuation, and tapered apically.

Collecting notes. – Members of this species inhabit leaf litter of forests (information obtained from locality label).

Geographical distribution (fig. 128). – This species is found in the high Piedmont of northern Georgia, western South Carolina and eastern Tennessee. I have seen 29 specimens from the following localities.

United States – GEORGIA: Rabun County: Black Rock Mountain (CU); Clayton (AMNH, CAS, CU, MCZ, UMMZ, USNM). Rabun – Towns Co. line, Appalachian Trail, 1-2 mi. s. Dicks Ck. Gap, 3000-4000' (TCB). Towns – White Co. line, Rt. 75-17, Appalachian Trail, Unicoi Gap, 2950' (TCB). NORTH CAROLINA: eight miles northeast of Highlands (RTB). SOUTH CAROLINA: Oconee County: Walhalla (CAS). County not determined: Walnut Creek Gap, Cowee Mountains (RTB). TENNESSEE: Clingman's Dome, Great Smoky Mountains National Park (DRW).

Evarthrus alabamensis Casey, 1920

Figures 15, 70, 93, 128

Evarthrus constrictus Bates, 1882:80 (not Say, 1823b). TYPE, female, labelled as follows: "Type H. T.; Mexico Sallé Coll.; B. C. A. Col. I. 1. Evarthrus constrictus Bates; Evarthrus constrictus Bates." BM. NEW SYNONYMY. – Horn, 1886:9. – Blackwelder and Blackwelder, 1948:2.

Evarthrinus (Evarthrops) alabamensis Casey, 1920:198. HOLOTYPE, male, labelled as follows: "Allen Ala los; CASEY bequest 1925; TYPE USNM 47136; alabamensis Csy." USNM. TYPE LOCALITY, Allen, Alabama. – Leng and Mutchler 1927:10 (*Evarthrinus*). – Csiki, 1930:673 (*Pterostichus*). Löding, 1945:16 (*Evarthrinus*).

Evarthrinus (Evarthrops) lilliputicus Casey, 1920:199. HOLOTYPE, male, labelled as follows: "Mobile Ala. VII–17 H. P. Löding; CASEY bequest 1925; TYPE USNM 47137; lilliputicus Csy." USNM. PARATYPE, female, labelled as follows: "Mobile, Ala. II–5–15. H. P. Löding; CASEY bequest 1925; lilliputicus – 2 PARATYPE USNM 47137." USNM. NEW SYNONYMY. – Leng and Mutchler 1927:10 (*Evarthrinus*). – Csiki, 1930: 673 (*Pterostichus*). – Löding, 1945:16 (*Evarthrinus*).

Pterostichus batesellus Csiki, 1930:671. – Blackwelder and Blackwelder, 1948:1 (*Evarthrus*). New name for *constrictus* Bates, not Say, 1823b.

Recognition. – Specimens of this species are most easily recognized by their glossy pronota and dull elytra. Other diagnostic characters are: distinctly impressed straight frontal grooves (fig. 70); shape of the pronotum (fig. 15); and form of male genitalia (fig. 93).

This species, *macrovulum, texensis* and *ovulum* are separable by a number of characters that are given in the recognition sections of the last three species. However individuals of the species *parafaber* may also be mistaken for those of *alabamensis*. These can be distinguished by several characters. Specimens of *alabamensis* have: a cordiform pronotum with produced basal angles and glossy disc with partially effaced microsculpture; and moderately impressed elytral striae with distinct punctures. In contrast specimens of *parafaber* have: an oval pronotum with more parallel sides, recessed basal angles, and a semi-glossy disc with dense, closed, slightly transversely stretched meshes comprising the microsculpture; and deeply impressed elytral striae with coarse and broad indistinct punctures. In addition the male genitalia are diagnostic (fig. 96).

Description. – Body length 8.8 – 12.6 mm. Form of body typical of *ovulum* group.

Head between eyes and disc of pronotum with lines of microsculpture sinuous, entwined and forming open meshes. Microsculpture of elytral intervals with isodiametric, raised and beady meshes in females, flatter in males.

Head glossy; frontal grooves (fig. 70) straight, sharply defined, slightly oblique and moderately separated. Penultimate article of labial palpus with two medial setae.

Pronotum (fig. 15) with disc glossy; sides strongly constricted posteriorly and very broadly sinuate in front of hind angles; posterior angles small, prominent and slightly obtuse; anterior transverse impression only impressed laterally, absent medially; basal foveae moderately impressed. Prosternal process with deep and sharply defined longitudinal groove. Anterior face of middle femur with four setae.

Elytra dull in females, slightly glossy in males; intervals moderately convex in males, distinctly flatter in females; striae moderately impressed in males shallow in females; punctures of striae coarse in males, small and distinct in females, obsolete posteriorly in both sexes. First articles of middle and hind tarsi with lateral grooves.

Median lobe (fig. 93) of male genitalia strongly arcuate, angle almost right; apical blade short, broad, almost truncate; right paramere of average length, just short of reaching apical half of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac with two horns – one fairly tapered and one other broad and blunt and more like a serrulate field than a sclerite. The genitalia of three males were studied in detail.

Notes on synonymy. – The type specimen of *lilliputicus* Casey is an average male of *alabamensis*. The name *constrictus* cannot be used because it is a junior homonym of *constrictus* Say.

Geographical distribution (fig. 128). – This species is known only from Mobile County, Alabama. I have seen 87 specimens from the following localities.

United States – ALABAMA: Mobile County: Citronelle (CAS); Grand Bay (USNM); Mobile (CAS, CNC, CU, MCZ, NCSU, USNM); Spring Hill (CAS, USNM).

Evarthrus ovulum Chaudoir, 1868

Figures 16, 71, 94, 128

Feronia (Evarthrus) ovulum Chaudoir, 1868:52. TYPE, female, labelled as follows: "Steropus picipes, Sturm, Georgetown". MNHP. – LeConte, 1873:319 (*Evarthrus*). – Schaupp, 1880:49. – Leng, 1920:57 (*Ferestria*). – Csiki, 1930:674 (*Pterostichus*).

Recognition. – The diagnostic characters are a combination of crescent-shaped frontal grooves; sharp basal angles of the pronotum; deep short groove of the prosternal process; form of the median lobe and sclerite of the internal sac of the male genitalia; and small body size. Specimens of *ovulum* can be confused with specimens of three other small species of *Cyclotrachelus*. This species is most similar to *macrovulum* and *texensis*, but in specimens of the last two species the prosternal process is shallowly grooved. The three are also distinguished by differences in the shape of the median lobe and apical sclerite of the internal sac (fig. 94 cf. fig. 95a–d and 95e–h). In addition these species are allopatric.

The smaller body size, glossy elytra, crescent-shaped frontal grooves and male genitalia distinguish *ovulum* from *alabamensis*. Further, the two species are allopatric.

Description. – Body length 8.5 – 11.0 mm. Form narrow but rather typical of the *ovulum* group.

Head between eyes with microsculpture composed of highly sinuous, entwined or sparse lines. Microsculpture of disc of pronotum same as on head but generally effaced. Elytral intervals with isodiametric meshes, partially effaced in males.

Head between eyes, glossy; frontal grooves (fig. 71) sharply defined, oblique, crescent-shaped with bend produced laterally, widely separated. Penultimate article of labial palpus with two to four setae.

Pronotum (fig. 16) glossy; sides strongly constricted posteriorly and moderately sinuate in front of hind angles; posterior angles small, prominent and slightly obtuse; anterior transverse impression incomplete, impressed laterally only; basal foveae moderately impressed.

Prosternal process with deep and sharply defined longitudinal groove deepest near apex. Anterior face of middle femur with four setae.

Elytra glossy in males and slightly duller in females; intervals not markedly convex; striae of average depth, coarsely punctate anteriorly and impunctate posteriorly; umbilicate series markedly impressed.

Male genitalia (fig. 94) with median lobe strongly arcuate, angle slightly obtuse; apical blade short and broadly rounded at apex; right paramere of average length reaching halfway point of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac U-shaped with horn-like projections narrow, sturdy, and slightly curved. The genitalia of three males were studied in detail.

Stylus of female ovipositor evenly rounded apically without preapical sinuations.

Notes on synonymy. – Chaudoir thought the type locality of *ovulum* was Georgetown, South Carolina. Georgetown, Georgia is closer to the range of this species and it is more likely the correct type locality.

Collecting notes. – This species has been collected in pine forests of Florida and Georgia. Specimens have also been found under bark and caught in malt bait traps

Geographical distribution (fig. 128). – *Evarthrus ovulum* inhabits Florida and southern Georgia. I have seen 29 specimens collected in the following localities.

United States – FLORIDA: Alachua County: Gainesville (FDPI). Baker County: Glen St. Mary (FDPI); Macclenny (FDPI). Gadsden County: Quincy (FDPI). Leon County: Tallahassee (CNHM, CNC, USNM). GEORGIA: Thomas County: Thomasville (ANSP). Toombs County: Lyons (UMMZ).

Evarthrus macrovulum new species

Figures 17, 95a–d, 128

Recognition. – The following combination of characters is diagnostic for specimens of *macrovulum*: crescent-shaped frontal grooves on the head; sharp basal angles of the pronotum; very shallow longitudinal groove in prosternal process; glossy pronotum and elytra, and very short right paramere of the male genitalia (fig. 95). This species, *texensis, alabamensis*, and *ovulum* are remarkably similar.

The differences between *macrovulum* and *ovulum* are given in the diagnosis of the latter species.

The frontal grooves of the head of *macrovulum* are distinctly crescent-shaped and oblique but they are straight and more parallel in *alabamensis*. A glossy pronotum and equally glossy elytra is characteristic of *macrovulum* and contrasts with the combined glossy pronotum and dull elytra of *alabamensis*. In addition *macrovulum* has a shallow groove in the prosternal process while it is deep in *alabamensis*. Males of the species can be separated by characteristics of the genitalia (fig. 93 cf. fig. 95a–d).

The species *texensis* is the only representative of *Cyclotrachelus* occurring to the west of the Mississippi River. Structurally, specimens of *texensis* closely resemble specimens of *macrovulum*, but they differ in details of the male genitalia (figs. 95a–c; cf. figs. 95e–g).

Description. – HOLOTYPE, male, labelled as follows: "Mobile, Ala XI–11–39; Van Dyke Collection; HOLOTYPE Evarthrus macrovulum R. Freitag (red label)." CAS.

Body length 10.8 mm, width 4.1 mm. Form average for group.

Head between eyes and disc of pronotum with microsculpture composed of isolated sinuous lines or effaced. Microsculpture of elytral intervals sinuous, closely entwined lines often forming amorphic meshes, and partially effaced.

Head glossy; length 1.8 mm, width 2.3 mm; frontal grooves sharply defined, oblique, crescent-shaped with lateral bend, and widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum glossy on disc; length 2.8 mm, width 3.4 mm; form as in fig. 17; greatest width slightly anterior to transverse mid-line; disc moderately convex; sides strongly constricted posteriorly, and moderately sinuate in front of posterior angles; posterior angles small, prominent and slightly obtuse; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression shallow throughout; basal foveae deepest posteriorly. Prosternal process with shallow longitudinal groove. Middle femur with four setae on anterior face.

Elytra glossy; length 6.2 mm, width 4.1 mm; intervals rather flat; striae shallow, distinctly but not coarsely punctate anteriorly, and impunctate posteriorly; umbilicate series deeply impressed. First articles of middle and hind tarsi with lateral grooves.

Male genitalia as in fig. 95a–d with median lobe strongly arcuate, apical blade short and evenly rounded at apex; right paramere short, not reaching apical half of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac with two horns, one blunt and one sharp and twisted.

ALLOTYPE, female, labelled as follows: "Mobile Ala XII-1-39; Van Dyke Collection; ALLOTYPE Evarthrus macrovulum R. Freitag (green label)." CAS.

Body length 11.4 mm, width 4.4 mm. Form as in holotype.

Microsculpture of head between eyes and pronotal disc same as in holotype. Elytral intervals with microsculpture less effaced than that of holotype, formed by close and distinct closed amorphic meshes.

Head length 1.8 mm, width 2.5 mm.

Pronotum shape as in holotype; length 2.9 mm, width 3.6 mm.

Elytra slightly duller than holotype; length 6.8 mm, width 4.4 mm; sides more parallel posteriorly than those of holotype. Stylus of ovipositor tapered slightly toward apex.

Derivation of specific name. – This species name suggests that specimens of *macrovulum* are large and like *ovulum* in appearance. Specimens of *macrovulum* are not necessarily longer but appear more robust than those of *ovulum*.

Variation among paratypes (91 males, 89 females, Mobile, Alabama. CAS). – Slight and inconsequential. Total length, 8.5 – 11.8 mm. The genitalia of three males were examined in detail.

Disposition of type material. – The holotype and allotype are in the collection of the CAS. One paratype is in the UASM collection, and the others are in the collection of CAS, and RCG.

Geographical distribution (fig. 128). – This species is known from southern Alabama and southern Louisiana. I have seen 182 specimens from the following localities.

United States – ALABAMA: Baldwin County: Fairhope (CAS). Mobile County: Mobile (CAS). LOUISIANA: Saint Tammany County: Slidell (RCG). County not determined: Hart (CAS).

Evarthrus texensis new species

Figures 17a, 95e–h, 128

The following combination of characters is diagnostic for specimens of *texensis*: crescent-shaped frontal grooves on the head; very shallow longitudinal groove in prosternal process; broadly rounded apex of the median lobe of the male, length of right paramere, and shape of the apical sclerite of the internal sac.

Recognition. – The differences between the very similar species *macrovulum* and *texensis* are described in the recognition section of the former species.

Description. – HOLOTYPE, male, labelled as follows: "U. S. A., TEXAS, Tyler Co. 12 mi. W. Kirbyville, Rte. 1013 XII–6–68 G. E. Ball; HOLOTYPE Evarthrus texensis R. Freitag (red label)." MCZ.

Body length 7.5 mm, width 3.3 mm. Form average for group.

Microsculpture of head between eyes and disc of pronotum almost effaced; microsculpture of elytra composed of isodiametric meshes.

Head glossy; length 1.0 mm, width 1.6 mm; frontal grooves sharply defined, oblique, crescent-shaped, and widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum glossy on disc; length 1.8 mm, width 2.6 mm; form as in fig. 17a; greatest width anterior to transverse mid-line; disc moderately convex, sides strongly constricted posteriorly, and moderately sinuate in front of posterior angles; posterior angles small, prominent and slightly obtuse; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression moderately impressed; basal foveae deepest posteriorly; prosternal process with shallow longitudinal groove. Middle femur with four setae on anterior face. First article of middle and hind tarsi with faint lateral grooves.

Elytra slightly duller than head and prothorax; length 4.7 mm, width 3.3 mm; intervals slightly convex; striae moderately impressed, distinctly punctate anteriorly, impunctate posteriorly; umbilicate series deeply impressed.

Male genitalia as in fig. 95e–g with median lobe strongly arcuate, apical blade short and broadly rounded at apex; right paramere almost reaching apical half of median lobe; eversion of internal sac dorsoapical and to right; apical sclerite of internal sac with two horns, one very broad and blunt and one sharp and twisted (fig. 95h).

ALLOTYPE, female, labelled as follows: "USA., TEXAS, Tyler Co. 12 mi. W. Kirbyville Rte. 1013 XII–6–1968 G. E. Ball; ALLOTYPE Evarthrus texensis R. Freitag (green label)." MCZ.

Body length 8.4 mm, width 3.6 mm. Form as in holotype.

Microsculpture of head between eyes, pronotal disc, and intervals of elytra same as in holotype.

Head length 1.0 mm, width 1.8 mm.

Pronotum shape as in holotype; length 2.4 mm, width 2.9 mm.

Elytra length 5.0 mm, width 3.6 mm. Stylus of ovipositor tapered slightly toward apex.

Derivation of specific name. – This species has been named *texensis* since it is known only from Texas.

Variation among paratypes (four males, one female, Orange Co., Jasper Co., Tyler Co., Texas). – Total length, 7.0 – 9.2 mm. The genitalia of four males were examined.

Disposition of type material. – The holotype and allotype are in the MCZ collection and the paratypes are in the collections of CAS, UASM, and USNM.

Geographical distribution (fig. 128). – This species is known from eastern Texas. I have seen seven specimens from the following localities.

United States – TEXAS: Orange County nr. Lakeview. Jasper County: Rte. 63, 11 mi. N. Jasper. Tyler County: Rte. 1013, 12 mi. W. Kirbyville.

The *faber* Group

Characteristics. – Small to medium size beetles; pronotum circular to subcordate, with basal angles recessed and broadly obtuse; longitudinal groove of prosternal process long, deep and sharply defined; dark apical sclerite present in internal sac of median lobe of male genitalia.

The species included in this group are *faber*, *levifaber* and *parafaber*. All of these are found only on the Coastal Plain of southeastern United States.

Evarthrus parafaber new species

Figures 18, 96, 129

Recognition. – This species is distinguished from its relatives by the following combination of characters: frontal grooves of head fairly straight, slightly oblique in relation to one another; pronotum with sides not produced, basal angles almost obsolete; long deep, and sharply defined longitudinal, medial groove in prosternal process; and form of male genitalia. This species can be confused with most members of the *ovulum* group but is distinguished by the obsolete posterior angles of the pronotum. There is no overlap in the geographical ranges of the closely related species *parafaber*, *faber* and *levifaber*. Specimens of *faber* are distinguished from those of *parafaber* by their larger size, four setae on the penultimate article of the labial palpus, shape of the pronotum, and details of the male genitalia. The smaller species *levifaber* also resembles *parafaber* in habitus, but it has a pronotum with markedly produced sides that contrast with the more parallel sides of that of *parafaber*. Furthermore there are striking differences in the structures of the male genitalia of these two species (fig. 96 cf. fig. 97).

Description. – HOLOTYPE, male, labelled as follows: "Mobile, Ala XI–4–39; Van Dyke Collection; HOLOTYPE Evarthrus parafaber R. Freitag (red label)." CAS.

Body length 9.2 mm, width 3.8 mm. Form average for *faber* group.

Microsculpture of head between eyes with lines dense, highly sinuous or closed and forming bead-like meshes. Disc of pronotum with impressions of microsculpture highly sinuous or closed meshes slightly stretched transversely. Microsculpture of elytral intervals composed of isodiametric meshes.

Head semi-glossy; length 1.1 mm, width 2.1 mm; frontal grooves sharply defined, slightly curved but not crescent-shaped, widely separated. Penultimate article of labial palpus with two medial setae.

Pronotum with disc semi-glossy; length 2.7 mm, width 3.1 mm; form as in fig. 18; greatest width slightly anterior to transverse midline; disc moderately convex; sides slightly prominent laterally, moderately constricted anteriorly and strongly constricted posteriorly,

slightly sinuate in front of posterior angles; posterior angles almost obsolete, widely obtuse and recessed; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression distinctly deeper at both ends; basal foveae deep posteriorly, shallow and elongate anteriorly. Prosternal process with long, deep, sharply defined medial, longitudinal groove. Middle femur with four setae on anterior face.

Elytra semi-glossy; length 5.4 mm, width 3.8 mm; markedly sinuate apically; intervals slightly convex; striae moderately impressed and coarsely punctate in anterior half, obsoletely punctate apically.

Male genitalia as in fig. 96 with angle of median lobe almost right, apical blade short and slightly produced medially and deflected ventrally; right paramere not reaching apical half of median lobe; eversion of internal sac dorsoapical and slightly to right; apical sclerite of internal sac with two horns, one blunt, one sharp and twisted.

ALLOTYPE, female, labelled as follows: "Mobile Ala XI–4–39; Van Dyke Collection; ALLOTYPE Evarthrus parafaber R. Freitag (green label)." CAS.

Body length 9.5 mm, width 4.1 mm. Form as in holotype.

Microsculpture of head between eyes with distinct closed meshes. Microsculpture of disc of pronotum and intervals of elytra same as in holotype.

Head, length 1 mm, width 2.1 mm.

Pronotum shape as in holotype; length 2.7 mm, width 3.7 mm.

Elytra shape, intervals and striae same as in holotype; length 5.7 mm, width 4.1 mm.

Stylus of ovipositor short and broad, not sinuate apically.

Derivation of specific name. – This species is closely related to *faber*, which is what the name *parafaber* suggests.

Variation among paratypes (29 males, 26 females, Mobile, Ala. CAS). – Total length, 9.8 – 12.8 mm. Variation in color is moderate in the elytra ranging from light rufopiceous to deep piceous. Other parts of the body vary slightly from those of the type specimens. The genitalia of two males were carefully examined.

Disposition of type material. – The holotype, allotype, and 53 paratypes are in the collection of the CAS. Two paratypes are in the UASM collection.

Geographical distribution (fig. 129). – This species is known only from the type locality. I have seen 57 specimens.

United States – ALABAMA: Mobile County: Mobile (CAS, UASM).

Evarthrus levifaber new species

Figures 19, 97, 129

Recognition. – Specimens of *levifaber* are characterized by a combination of the following features: penultimate article of labial palpus bisetose; straight frontal grooves; slightly cordiform pronotum with produced sides; right paramere of male genitalia with distinct elbow; and apical sclerite of internal sac crescent-shaped. Characters that distinguish *levifaber* and *parafaber* are presented in the recognition section of the latter species. The species *levifaber* and *faber* are allopatric. The four setae on the penultimate article of the labial palpus, inwardly curved frontal grooves of the head, and male genitalia of *faber* distinguish it from *levifaber*. Furthermore the pronotum of *faber* is circular but in *levifaber* this sclerite is more cordiform.

Description. – HOLOTYPE, female, labelled as follows: "Camden S. C.; Roland Hayward Coll.; HOLOTYPE Evarthrus levifaber R. Freitag (red label)." MCZ.

Body length 10.1 mm, width 4.2 mm. Form robust. Head with microsculpture composed of highly sinuous entwined lines occasionally forming amorphic meshes. Disc of pronotum and elytral intervals with microsculpture same as head except amorphic meshes raised.

Head glossy; length 1.2 mm, width 2.5 mm; frontal grooves sharply defined and straight, slightly oblique toward one another. Penultimate article of labial palpus with two medial setae.

Pronotum with semi glossy disc; length 2.7 mm, width 3.5 mm; form as in fig. 19; disc moderately convex; sides broadly rounded and prominent, slightly constricted anteriorly and strongly constricted posteriorly, obsoletely sinuate in front of posterior angles; posterior angles not prominent and broadly rounded; anterior transverse impression incomplete, impressed laterally only; median longitudinal impression slightly deeper at posterior end; basal fovea deep posteriorly, moderately deep and short anteriorly. Prosternal process with long, deep, sharply defined longitudinal groove. Middle femur with four setae on anterior face.

Elytra semi-glossy; length 6.2 mm, width 4.2 mm; margin at shoulder broad; apex distinctly sinuate; intervals slightly convex; striae moderately impressed and distinctly punctate anteriorly, impunctate posteriorly.

Stylus of ovipositor short and broad, not sinuate apically.

ALLOTYPE, male, labelled as follows: "Ga.; Horn Coll H536; ALLOTYPE Evarthrus levifaber R. Freitag (green label)". ANSP.

Body length 9.1 mm, width 3.7 mm. Form same as in holotype.

Microsculpture of head between eyes and disc of pronotum same as in holotype. Microsculpture of elytra with sinuous lines that often form longitudinally stretched meshes.

Body mainly rufopiceous, antennae, palpi, legs and epipleura light rufopiceous.

Head glossy; length 1.1 mm, width 2.2 mm.

Pronotum shape same as in holotype; length 2.5 mm, width 3.0 mm.

Elytra glossy, appearance velvet; intervals more convex and striae more impressed than in holotype; length 5.5 mm, width 3.7 mm.

Genitalia (fig. 97) with strongly arcuate median lobe, particularly apical half, apical blade elongate, narrow, and evenly rounded at apex; right paramere with produced elbow, tapered apically and extended to apical half of median lobe; eversion of internal sac apicodorsal and to right; apical sclerite of internal sac dark and C-shaped.

Derivation of specific name. – Specimens of this species appear to be lighter in weight than those of the closely related species *faber*, which is implied in the name *levifaber*.

Variation among paratypes (three males, one female, Georgia, South Carolina, North Carolina, ANSP, MCZ and UASM). – Total length, 11.1 – 13 mm. Except for one teneral male the coloration of the paratypes is approximately the same as that of the holotype and allotype, and similar in all other respects. The genitalia of one male was examined in detail.

Disposition of type material. – The holotype and allotype are in the collection of the MCZ and ANSP respectively. The paratypes are in the collection of MCZ, ANSP, and UASM.

Geographical Distribution (fig. 129). – I have seen six specimens from the following localities.

United States – GEORGIA: (ANSP, UASM). NORTH CAROLINA: (MCZ). SOUTH CAROLINA: Kershaw County: Camden (MCZ).

Evarthrus faber Germar, 1824

Figures 20, 68, 98, 129

Molops faber Germar, 1824:23. Type not seen. TYPE LOCALITY, "*America septentrionali* (Kentucky)," [this locality is probably incorrect]. – LeConte, 1848:353 (*Steropus*). – LeConte, 1852:230 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:349 (*Cyclotrachelus*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*).

Feronia tenebricosa Dejean, 1828:301. Type seen by C. H. Lindroth (1955). TYPE LOCALITY, "l'Amerique septentrionale." MHNP. – Chaudoir, 1838:30 (*Cephalotes*). – LeConte, 1848:353 (*Steropus*). – LeConte, 1868a:8 (*Evarthrus*). – LeConte, 1873:319. – Casey, 1918:349 (*Cyclotrachelus*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*).

Feronia spoliatus; LeConte, 1848:353 (not Newman). – LeConte, 1852:230. – LeConte, 1863a:8.

Cyclotrachelus roticollis Casey, 1918:349. HOLOTYPE, male, labelled as follows: "Fla; CASEY bequest 1925; TYPE USNM 47108; Cyclotrachelus roticollis Csy." USNM. TYPE LOCALITY, Dunedin, Florida. PARATYPES, two males, labelled as follows: "Dunedin; Fla. W. S. B. coll. 3–23 1913 and 17–7 2–15; roticollis – 2 and – 3 PARATYPE USNM 47108." NEW SYNONYMY. – Casey, 1924:78 (*Cyclotrachelus*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*).

Cyclotrachelus fallaciosus Casey, 1924:77. HOLOTYPE, male, labelled as follows: "Dunedin, Fla. W. S. B. coll. 4–5–1915; TYPE USNM 47109; fallaciosus Csy." USNM. NEW SYNONYMY. – Leng and Mutchler, 1927:10 (*Cyclotrachelus*). – Csiki, 1930:671 (*Pterostichus*).

Recognition. – The following combination of characters is diagnostic of the species *faber:* penultimate article of labial palpus with four setae, frontal grooves on head crescent-shaped with the convexity directed medially; sides of pronotum strongly arcuate; long, deep, sharply defined longitudinal groove in prosternal process; cup-like scales on the ventral side of the front tarsi of the males; and details of the male genitalia.

The differences among the closely related species *faber*, *levifaber*, and *parafaber* are described in the recognition sections of the last two species.

Description. – Body length 8.5 – 11.1 mm. Form robust and typical of the *faber* group.

Head between eyes, disc of pronotum, and intervals of elytra with lines of microsculpture distinctly impressed, very dense, and sinuous, forming raised amorphic meshes.

Head glossy, dull or slightly glossy; frontal grooves moderately impressed, crescent-shaped with convexity directed medially, and moderately separated. Penultimate article of labial palpus with two medial and two apical setae (fig. 68).

Pronotum dull or slightly glossy; form of sides circular in outline, as in fig. 20; disc markedly convex; sides moderately constricted anteriorly and strongly constricted posteriorly, slightly sinuate in front of posterior angles; posterior angles broadly obtuse; anterior transverse impression incomplete, impressed laterally only; basal foveae deep posteriorly, and often anterior end very shallowly extended onto anterior half of disc. Prosternal process with long, deep, sharply defined longitudinal groove. Middle femur with four or five setae on anterior face. Males with even rows of cup-like scales on ventral side of front tarsi.

Elytra dull or slightly glossy; margin near shoulder slightly narrow; sinuate apically; intervals slightly convex; striae deeply impressed and distinctly punctate anteriorly and on disc, impunctate posteriorly.

Male genitalia (fig. 98) with moderately arcuate median lobe, apical portion more acute, apical blade resembling a two-edged sword with produced medial apex; right paramere short, not extended to apical half of median lobe, shape typical of *Cyclotrachelus* with recessed elbow and not strongly tapered apically; eversion of the internal sac apicodorsal and to right; internal sac with light basal serrulate field and darker apical serrulate field, apical sclerite dark and C-shaped. The male genitalia of three specimens were examined in detail.

Stylus of female ovipositor short, broadly rounded apically.

Variation. – The number of setae on the front face of the middle femur varies from four to five, but there is no geographical pattern to the variation.

Notes on synonymy. – In the MNHP collection there are six specimens of the species determined as *faber* Germar, the first of which bears the label *tenebricosa m.* which was written by Dejean. The specimen was probably given to him by Joseph E. LeConte with whom Dejean traded specimens.

The type specimens of *roticollis* Casey and *fallaciosus* Casey are average specimens of *faber*.

Collecting notes. – Specimens of this species have been found in leaf litter (label data). The gut of one specimen contained a mixture of sand and fungus zygotes, which were identified by Dr. L. L. Kennedy.

Geographical distribution (fig. 129). – This species inhabits Florida and southern Georgia. The New York and Ohio records are certainly incorrect. I have seen 132 specimens collected in the following localities.

United States – FLORIDA: Alachua County: Archer (FDPI); Gainesville (UMMZ): High Springs (UMMZ): R.–24–E T–10–S (UMMZ). Baker County: Glen St. Mary (FDPI). Brevard County: Melbourne (USNM). Calhoun County: near Clarksville (CNC). Charlotte County: Punta Gorda (CAS, CNHM). DeSoto County: Arcadia (GEB, UMMZ); Fort Ogden (CNC). Dixie County: Cross City (UMMZ); Shamrock (CAS). Duval County: Jacksonville (USNM). Gadsden County: Quincy (FDPI). Hendry County: LaBelle (CU). Hernando County: Brooksville (CAS, UMMZ). Lee County: Fort Myers (CNC). Leon County: (CU); Tallahassee (CNC, UMMZ). Liberty County: Camp Torreya (UMMZ). Manatee County: Bradenton (CAS). Marion County: (ANSP); Ocala (CNC); Ocala National Forest (UMMZ). Monroe County: Big Pine Key (UMMZ). Okaloosa County: Delaco (UMMZ). Orange County: Winter Park (MCZ). Osceola County: Deer Park (MCZ); Kissimmee (AMNH). Pasco County: Elfers (CNC). Pinellas County: Dunedin (AMNH, CAS): St. Petersburg (AMNH). Polk County: Lakeland (USNM). Sarasota County: Sarasota (USNM). Seminole County: Sanford (MCZ). Walton County: DeFuniak Springs (UMMZ). County not determined: Fringers (USNM); Iuka Island (USNM); North Smyrna (CAS); 15 miles south of Wadky (CNC). GEORGIA: Camden County: Kingsland (UMMZ); St. Mary's (MCZ). Decatur County: Faceville (UMMZ). NEW YORK: Westchester County: Peekskill (CU). OHIO: (CMNH).

The Subgenus *Evarthrus* LeConte

Evarthrus LeConte, 1852:225, TYPE SPECIES – *Evarthrus sigillatus* Say, 1823a (designated by Casey, 1918:322).

Anaferonia Casey, 1918:341. TYPE SPECIES – *Evarthrus constrictus* Say, 1823b (designated by Casey, 1918:321).

Megasteropus Casey, 1918:350. TYPE SPECIES – *Megasteropus gigas* Casey, 1918 (designated by Casey, 1918:322).

Eumolops Casey, 1918:351. TYPE SPECIES – *Eumolops sexualis* Casey, 1918 (designated by Casey, 1918:322).

Evarthrinus Casey, 1918:357. TYPE SPECIES – *Evarthrus deceptus* Casey, 1918 (here designated).

Evarthrops Casey, 1920:194. TYPE SPECIES – *Evarthrus furtivus* LeConte, 1852 (here designated).

Characteristics. – Penultimate article of labial palpus with three (rarely) or five to seven setae; pronotum with sides parallel or constricted posteriorly, posterior lateral foveae bistriate, posterior lateral setae usually beside bead (figs. 21–61), but in *gravesi* on bead; middle femur with 4–11 setae on anterior face; last tarsal article with setae on ventral side; eversion of internal sac of median lobe of male genitalia right.

Notes on synonymy. – Casey established the above genera and subgenus *Evarthrops* on characters which are common throughout the subgenus *Evarthrus*. The description of *Anaferonia* provided by Casey can be applied to most species groups in the subgenus *Evarthrus*. He established *Megasteropus* on features such as size of head and impunctate striae of elytra. I do not accept these as generic or subgeneric characters. He separated *Eumolops* from *Evarthrus* mainly because of differences in the form of the last article of the maxillary palpus, a characteristic which varies intraspecifically throughout *Evarthrus*. Casey believed that species with three punctures on the third interval of the elytron constituted a separate genus which he named *Evarthrinus*. This characteristic is present in a number of unrelated species in the subgenus *Evarthrus*.

The following species groups compose the subgenus *Evarthrus*: the *incisus* group, the *blatchleyi* group, the *sigillatus* group, the *seximpressus* group, the *hypheripiformis* group, the *sodalis* group, the *substriatus* group, the *torvus* group, and the *gigas* group.

The *incisus* Group

Characteristics. – Penultimate article of labial palpus with five setae. Pronotum cordiform in outline; anterior transverse impression usually absent medially, complete in a few specimens. Prosternal process with longitudinal groove shallow. Middle femur with four setae on anterior face. Median lobe of male genitalia with hump medially on ventral surface; pigmented apical sclerite in internal sac; right paramere very short.

The species *incisus* and *whitcombi* are included in this group, which is represented on the Great Plains from Arkansas and Oklahoma north to South Dakota.

Evarthrus incisus LeConte, 1848

Figures 21, 99, 130

Feronia (Molops) incisa LeConte, 1848:345. LECTOTYPE (here selected) a male, labelled as follows: "green disc; Type 5620; E. incisus Lec." MCZ. TYPE LOCALITY, Missouri Territory. – LeConte, 1852:232 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873: 319. – Schaupp, 1880:49. – Casey, 1918:348 (*Anaferonia*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*).

Feronia (Molops) lixa LeConte, 1848:346. LECTOTYPE (here selected) a female, labelled as follows: "green disc; Type 5622; E. lixa LeC; abdominalis 3". MCZ. TYPE LOCALITY, near Long's Peak. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:319. – Schaupp, 1880:49.

Feronia (Molops) abdominalis LeConte, 1848:347. LECTOTYPE (here selected) a male, labelled as follows: "green disc; Type 5621; E. abdominalis Lec." MCZ. TYPE LOCALITY, near Long's Peak. – LeConte, 1852:232 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:347 (*Anaferonia*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*).

Anaferonia distincta Casey, 1918:342. HOLOTYPE, male, labelled as follows: "Ia; CASEY bequest 1925; TYPE USNM 47103; distincta Csy." USNM. TYPE LOCALITY, Iowa. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia iowana Casey, 1918:347. HOLOTYPE, male, labelled as follows: "Ia; CASEY bequest; TYPE USNM 47107; iowana Csy." USNM. TYPE LOCALITY, Iowa. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia fausta Casey, 1918:348. HOLOTYPE, male, labelled as follows: "Penn; CASEY bequest 1925; TYPE USNM 47104; fausta Csy." USNM; PARATYPE, male, labelled as follows: "Penn; CASEY bequest 1925; fausta –2; PARATYPE USNM 47104. USNM. TYPE LOCALITY, Pennsylvania. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Recognition. – Specimens of this species are easily confused with specimens of *whitcombi*, but they are distinguished by their smaller size and by differences in male genitalia (fig. 99 cf. fig. 100). In Arkansas the micropunctures in the elytral intervals are distinct in specimens of *incisus* but indistinct in specimens of *whitcombi*.

Description. – Body length 9.0 – 12.3 mm. Form robust anteriorly, average for *incisus* group.

Microsculpture of head between eyes and disc of pronotum effaced. Intervals of elytra with isodiametric meshes forming microsculpture, occasionally almost effaced; integument of dorsum glossy.

Head with frontal grooves distinctly but not deeply impressed, straight or slightly curved, usually oblique but occasionally parallel toward one another, not widely separated.

Pronotum form as in fig. 21; disc moderately convex; sides slightly constricted anteriorly, strongly constricted posteriorly, short and slightly sinuate in front of posterior angles; posterior angles small, produced, slightly obtuse; anterior transverse impression usually incomplete, in a few specimens complete with medial portion obsolete or interrupted; basal lateral foveae with sides usually continuous near base, separated in a few specimens.

Elytra obsoletely sinuate apically; intervals of average convexity or flattened, striae moderately impressed, indistinctly or obsoletely punctate in anterior half, obsoletely punctate apically.

Male genitalia (fig. 99) with median lobe slightly arcuate, angle broadly obtuse, low median ventral hump present; apical blade elongate with apical lateral edges strongly deflected dorsally, apex evenly rounded; right paramere short, broadly rounded at apex, not extended to apical half of median lobe; internal sac with serrulate field apically, apical sclerite dark elongate and slightly curved basally. The genitalia of five males were studied in detail.

Stylus of female ovipositor narrow, gradually tapered apically.

Geographical variation. – Individuals of *incisus* have red or black legs. Red legs are common in Nebraska and appear occasionally throughout the rest of the species range.

Notes on synonymy. – The lectotypes of *abdominalis* and *lixa* LeConte are average specimens of *incisus*. The type specimen of *distincta* Casey has a basal fovea of the pronotum with the sides continuous posteriorly, and is average for this species in most other structures. The type specimens of *fausta* and *iowana* Casey are normal *incisus* specimens.

Collecting notes. – D. L. Larson and I collected specimens of *incisus* in leaf litter of deciduous forest near Morrilton, Arkansas. Some of the specimens were taken at the soil surface beneath moist leaf litter and some were in the litter itself.

Geographical distribution (fig. 130). – This species inhabits the central states from Kansas and Arkansas north to Illinois and South Dakota. The Pennsylvania record is probably incorrect. I have seen 222 specimens collected in the following localities.

United States – ARKANSAS: Carroll County: Eureka Springs (INHS). Conway County: six miles south of Morrilton (DL, RF). Johnson County: ten miles east of Ozark (DL, RF). Madison County: 45 miles east of Fayetteville (RF). Marion County: (USNM); Buffalo River State Park (CU). Pope County: (UA). Washington County: Cove Creek (CU, DL, RF); Devil's Den State Park (RTB); Fayetteville (UA). ILLINOIS: Knox County: Galesburg (INHS). Piatt County: Robert Allerton Park, Monticello (RTB). IOWA: Johnson County: Iowa City (MCZ, UASM, USNM). KANSAS: Dickinson County: (CNHM). Wabaunsee County: McFarland (USNM). MISSOURI: Carter County: Van Buren (UMMZ). Crawford County: Onandaga Cave (UMMZ). NEBRASKA: Douglas County: Omaha (CAS). Fillmore County: (USNM). Red Willow County: McCook (USNM). OKLAHOMA: Comanche County: Wichita National Forest (CAS, UMMZ). Oklahoma County: (CAS). PENNSYLVANIA: Allegheny County: (CAS, CNC, USNM). SOUTH DAKOTA: Hutchinson County: Menno (VMK). Yankton County: Yankton (VMK).

Evarthrus whitcombi new species

Figures 22, 100, 130

Recognition. – Several characteristics, previously described in connection with the recognition of *incisus*, distinguish specimens of *whitcombi* from those of *incisus*. Both *incisus* and *whitcombi* can be mistaken for specimens of the somewhat similar species *substriatus* or *iowensis*. Individuals of *substriatus* are distinguished by a large elytral plica and distinct dorsolateral knob on the last abdominal segement that fits onto the plica (fig. 77). Specimens of *iowensis* are characterized by having five or six setae on the anterior face of the middle femur, which contrasts with the four setae on the same structure of *incisus* and *whitcombi*.

Description. – HOLOTYPE, male, labelled as follows: "Hot Springs, Ark. X–1–39; Van Dyke Collection; HOLOTYPE Evarthrus whitcombi R. Freitag (red label)." CAS.

Body length 13.4 mm, width 5.7 mm. Larger and more robust than specimens of *incisus* LeC.

Head between eyes and disc of pronotum with microsculpture composed of highly sinuous lines, entwined, but rarely forming meshes. Microsculpture of elytral intervals with isodiametric meshes. Integument of dorsum slightly glossy.

Head length 1.5 mm, width 3.3 mm; frontal grooves distinctly but broadly impressed, straight, parallel to one another.

Pronotum length 3.8 mm, width 4.6 mm; shape cordiform in outline as in fig. 22; disc moderately convex, somewhat flattened medially; sides constricted slightly anteriorly, strongly posteriorly, briefly sinuate in front of posterior angle; posterior angles small,

produced, slightly obtuse; anterior transverse impression absent medially; basal lateral foveae with sides not continuous near base. First articles of middle and hind tarsi with lateral grooves.

Elytra 8.1 mm in length, width 5.7 mm; sides parallel, slightly sinuate apically; intervals of low convexity almost flat; striae moderately impressed anteriorly, punctate anteriorly, indistinctly or obsoletely impressed posteriorly.

Male genitalia (fig. 100) with median lobe moderately arcuate, and with marked median ventral hump; apical blade short and deflected to right, edges of apex not deflected dorsally; right paramere short, apical half evenly tapered to apex; internal sac serrulate apically, apical sclerite very dark with broad tooth apically and hook basally.

ALLOTYPE, female, labelled as follows: "Hot Springs Ark. X–1–39; Van Dyke Collection; ALLOTYPE Evarthrus whitcombi R. Freitag (green label)." CAS.

Body length 14.0 mm, width 5.7 mm. Form same as in holotype.

Head between eyes and disc of pronotum with highly sinuous dense, entwined lines comprising microsculpture. Intervals of elytra with isodiametric meshes forming microsculpture.

Head dull; length 1.7 mm, width 3.5 mm.

Pronotum dull, form same as in holotype; length 3.7 mm, width 4.8 mm.

Elytra dull; intervals somewhat flattened; striae moderately impressed, distinctly punctate anteriorly, indistinctly or obsoletely punctate posteriorly; length 8.7 mm, width 5.7 mm.

Stylus of ovipositor narrow, gradually tapered apically.

Derivation of specific name. – This species is named in honour of Dr. W. H. Whitcomb, formerly Professor of Entomology, University of Arkansas, who has made important contributions in the field of terrestrial arthropod biology.

Variation among paratypes (five males, eight females, Ark., Okla.). – Body length 11.4 – 15.4 mm. The genitalia of two males were examined.

Disposition of type material. – The holotype and allotype are in the collection of the CAS. The paratypes are in the collection of AMNH, CAS, CNHM, INHS.

Geographical distribution (fig. 130). – This species inhabits eastern Oklahoma and southern Arkansas. I have seen 15 specimens from the following localities.

United States – ARKANSAS: Garland County: Hot Springs (CAS, INHS, UASM). Logan County: Mount Magazine (CNHM). County not determined: Southwest (AMNH). OKLAHOMA: LeFlore County: Page (UMMZ). McCurtain County: Beavers Bend State Park (UMMZ).

The *blatchleyi* Group

Characteristics. – Penultimate article of labial palpus with five setae (fig. 69), pronotum quadrate with obtuse basal angles; prosternal process with deep, medial, longitudinal groove; middle femur with four setae on anterior face; male genitalia with median lobe slightly arcuate; right paramere short and broad; internal sac very lightly sclerotized or with serrulate field apically.

The group is composed of the species *blatchleyi* and *floridensis* whose collective range includes Florida, and southern and eastern Georgia.

Evarthrus blatchleyi Casey, 1918

Figures 23, 69, 101, 131

Evarthrus blatchleyi Casey, 1918:360. HOLOTYPE, male, labelled as follows: "Dunedin Fla. W. S. B. coll. 3-22-18; CASEY bequest 1925; TYPE USNM 47122; blatchleyi Csy." USNM, PARATYPES, two females, labelled as follows: "Dunedin Fla. W. S. B. coll. 3–18–16 and 3–14–16; CASEY BEQUEST 1925; blatchleyi –2 and –3 PARATYPE USNM 47122." USNM. – Leng, 1920:57 (*Evarthrus*). – Csiki, 1930:673 (*Pterostichus*).

Evarthrus americanus; LeConte, 1852:228 (not Dejean). – LeConte, 1863a:8. – LeConte, 1873:318. – Leng, 1915:577. – Leng, 1920:57.

Recognition. – The following combination of characteristics is diagnostic of this species: clearly impressed basal foveae of the pronotum, width of lateral bead of pronotum even throughout length, elongate apical blade of median lobe of male genitalia, and relatively large body size.

Specimens of *blatchleyi* are normally larger than specimens of the similar species *floridensis*. They are further distinguished by differences in the male genitalia (fig. 101 cf. fig. 102).

Description. – Body length 14.8 – 17.6 mm. Form broad with parallel sides.

Head between eyes and disc of pronotum with microsculpture composed of extremely tiny, densely distributed, amorphic meshes. Microsculpture of elytral intervals forming raised, bead-like isodiametric meshes. Micropunctures present on head between eyes. Integument of dorsum slightly glossy.

Head with frontal grooves deep, sharply defined, straight or slightly curved with convexity directed medially, parallel to one another.

Pronotum somewhat quadrate in outline as in fig. 23; disc slightly convex anteriorly, flatter posteriorly, sides constricted moderately anteriorly and slightly posteriorly, sinuation in front of basal angles obsolete or absent; posterior angles not produced but not broadly rounded, slightly obtuse; anterior transverse impression complete and distinctly impressed; basal lateral foveae with sides not continuous near base, inner side with extension from base toward middle longitudinal line; width of lateral bead even throughout.

Elytra slightly sinuate apically; intervals flat or slightly raised, striae moderately or shallowly impressed, punctate anteriorly, impunctate posteriorly.

Male genitalia (fig. 101) with median lobe slightly arcuate, angle broadly obtuse; apical blade elongate and narrow, deflected dorsally and to left, apex evenly rounded; right paramere short and broad, not extended to apical half of median lobe; internal sac serrulate apically, apical sclerite light amorphic. The genitalia of six males were examined.

Stylus of female ovipositor slightly tapered apically, broadly rounded at apex.

Collecting notes. – This species is found in open disturbed places. G. E. Ball collected specimens with a pitfall trap in an orange grove near Oneco, Florida.

Geographical distribution (fig. 131). – This species ranges from southwestern Florida to southeastern Georgia. I have seen 88 specimens from the following localities.

United States – FLORIDA: Alachua County: Gainesville (FDPI), (UMMZ); Newnan's Lake (UMMZ); Route 18 east (FDPI). DeSoto County: Arcadia (UMMZ). Duval County: Jacksonville (AMNH, CAS, CNHM, MCZ). Highlands County: Hammock State Park (GEB). Hillsborough County: Tampa (ANSP). Lee County: Fort Myers (UP). Manatee County: Oneco (GEB). Marion County: Ocala National Forest (UMMZ). Orange County: Orlando (GEB). Osceola County: Kissimmee (AMNH). Pasco County: Elfers (CNC). Pinellas County: Dunedin (UP). Putnam County: Welaka (UMMZ). Suwannee County: Wellborn (UMMZ). GEORGIA: Bryan County: Lanier (UMMZ). Camden County: Kingsland (UMMZ). Charlton County: Billy's Island, Okefenokee Swamp (CU). Ware County: Waycross (UMMZ).

Evarthrus floridensis new species

Figures 24, 102, 131

Recognition. – The combination of the flattened area between the basal fovea and margin of the pronotum, and unique shape of the apical blade of the median lobe of the male (fig. 102) sets this species apart from the closely similar species *blatchleyi*. Specimens of another species, *sinus*, also resemble specimens of *floridensis* but these two groups are allopatric and possess different male genitalia (fig. 102 cf. fig. 104) among other distinguishing features.

Description. – HOLOTYPE, male, labelled as follows: "Winter Park. 2–15–28 Fla.; John George Gehring Collection; HOLOTYPE Evarthrus floridensis R. Freitag (red label); loan from MCZ." MCZ.

Body length 13.1 mm, width 5.3 mm, sides parallel, not robust.

Head between eyes and disc of pronotum with microsculpture formed of highly sinuous, densely distributed lines, occasionally forming amorphic meshes. Elytral intervals with amorphic or isodiametric meshes composing microsculpture. Integument of dorsum slightly glossy.

Head length 1.7 mm, width 3.6 mm; frontal grooves deep and sharply defined, slightly curved with convexity directed medially.

Pronotum length 3.7 mm, width 4.6 mm; form quadrate in outline as in fig. 24; disc quite convex; sides not prominent, slightly constricted anteriorly and posteriorly, not sinuate in front of posterior angles; posterior angles not prominent, slightly obtuse and broadly rounded; anterior transverse impression complete and clearly impressed; basal lateral foveae not continuous posteriorly, inner groove with extension from base toward median longitudinal impression; lateral bead wider near basal foveae, and area between bead and foveae flat.

Elytra length 7.7 mm, width 5.3 mm, sides parallel, slightly sinuate apically; intervals almost flat; striae distinctly but not deeply impressed, indistinctly punctate anteriorly, impunctate posteriorly.

Male genitalia (fig. 102) with median lobe slightly arcuate, angle broadly obtuse; apical blade with ridge on ventral side, apex deflected dorsally; right paramere short and broad, not extended to apical half of median lobe; internal sac serrulate near apex, apical sclerite not present.

ALLOTYPE, female, labelled as follows: "Winter Park 2.15.28 Fla,; John George Gehring Collection; ALLOTYPE Evarthrus floridensis R. Freitag (green label); loan from MCZ." MCZ.

Body length 14.7 mm, width 6.1 mm. Form same as in holotype.

Microsculpture of head between eyes, disc of pronotum and intervals of elytra same as in holotype; integument of dorsum slightly glossy.

Head length 1.9 mm, width 3.6 mm. Pronotum form same as in holotype; length 4.1 mm, width 5.1 mm. Elytra length 8.7 mm, width 6.1 mm. Stylus of ovipositor gradually tapered apically.

Derivation of species name. – The name *floridensis* was given to this species because its members are known from Florida only.

Variation among paratypes (18 males, 13 females, Fla.). – Total length 13.0 – 15.0 mm. The genitalia of five males were examined and no variation was observed.

Disposition of type material. – The holotype and allotype are in the collections of the MCZ. Two paratypes are in the UASM collection and the others are in the collections of the CU and MCZ.

Geographical distribution (fig. 131). – This species is endemic to Florida. I have seen 46 specimens from the following localities.

United States – FLORIDA: Orange County: Winter Park (CU, MCZ, UASM). Osceola County: Deer Park (MCZ); Kissimmee (AMNH). Seminole County: Sanford (MCZ). Volusia County: Enterprise (CAS). Counties not determined: Haw Creek (USNM); North Smyrna (CAS).

The *sigillatus* Group

Characteristics. – Pronotum quadrate with obtuse and broadly rounded basal angles; male genitalia with median lobe moderately or strongly arcuate, right paramere tapered apically and slightly to markedly elongate.

The *sigillatus* group is composed of the species *sigillatus*, *sinus* and *convivus*. This group occupies the eastern side of the Mississippi River Valley, Piedmont and Coastal Plain areas.

Evarthrus sigillatus Say, 1823

Figures 25–28, 72–73, 103, 131

Feronia sigillata Say, 1823a:42. Type lost. TYPE LOCALITY, Mr. R. Haines farm, Germantown (Pa.). – LeConte, 1848:350 (*Feronia*). – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:318. – Schaupp, 1880:49. – Leng, 1920:57. – Leonard, 1926:222. – Brimley, 1938:119.

Feronia (Omaseus) vidua Dejean, 1828:278. Type seen by C. H. Lindroth (1955). MNHP. TYPE LOCALITY, l'Amerique Septentrionale. – LeConte, 1848:350 (*Feronia*). – LeConte, 1852:228 (*Evarthrus*). – LeConte, 1863a:49. – Leng, 1920:57. – Csiki, 1930: 675 (*Pterostichus*).

Feronia (Abax) americana Dejean, 1828:392. TYPE, male, labelled as follows: "americanus m." MHNP. TYPE LOCALITY, "l'Amerique Septentrionale." NEW SYNONYMY. – Schaupp, 1880:49 (*Evarthrus*). – Casey, 1918:361. – Csiki, 1930:673 (*Pterostichus*).

Feronia orbata Newman, 1835:386. TYPE, female, labelled as follows: "Type H. T.; Ent. Club. 44-12; J. Ingall Canada; Feronia Latreille orbata Newman Ent. Mag. V.386." BM. NEW SYNONYMY. – Motschulsky, 1865:261 (*Evarthrus*). – Leng, 1920:57. – Csiki, 1930:673 (*Pterostichus*).

Evarthrus breviformis Casey, 1918:360. HOLOTYPE, female, labelled as follows: "Southern Pines; A. H. Manee. NC; CASEY bequest 1925; TYPE USNM 47120; breviformis Csy." USNM. TYPE LOCALITY, Southern Pines, N. Carolina. NEW SYNONYMY. – Leng, 1920:57 (*Evarthrus*). – Csiki, 1930:673 (*Pterostichus*). – Brimley, 1938:119 (*Evarthrus*).

Evarthrus montanus Van Dyke, 1926:116. HOLOTYPE, male, labelled as follows: "Black Mts. NC VII. 1902; collector E. C. Van Dyke; Van Dyke Collection." ALLOTYPE, labelled the same except for "Black Mts. NC VI.1902." CAS. TYPE LOCALITY, in the valley at the base of the Black Mountains, North Carolina. NEW SYNONYMY. – Csiki, 1930:673 (*Pterostichus*). – Leng and Mutchler, 1933:13 (*Evarthrus*).

Pterostichus (Pterostichus) (Sect. *Evarthrus*) *carolinensis* Csiki, 1930:673. NEW SYNONYMY. – Leng and Mutchler, 1933:13 (*Evarthrus*). – Brimley, 1938:119.

Recognition. – The following combination of characters separates specimens of *sigillatus* from specimens of all similar species of *Evarthrus*: pronotum quadrate, sides not strongly constricted posteriorly; basal angles slightly or broadly obtuse, not prominent, evenly rounded; male genitalia, with left side of apex of median lobe sharply deflected dorsally, internal sac with characteristic apical sclerite; range mainly east of the Appalachian Mountains.

Specimens of *sigillatus* in western areas of the range can be confused with *convivus* individuals. It is usually necessary to compare the male genitalia for a certain identification. The right paramere is long and tapered in *convivus* but short and broader in *sigillatus* (fig. 103 cf. fig. 105).

Specimens of *blatchleyi* resemble those of *sigillatus* in North and South Carolina. These can be distinguished as follows: basal fovea of the pronotum of *blatchleyi* simply and clearly impressed, but it is more complex in *sigillatus* (fig. 23 cf. figs. 25-28); apical blade of median lobe of male in *blatchleyi* is elongate, narrow, and evenly deflected dorsally and to the left, but it is short, broader, and left side of apex sharply deflected dorsally in *sigillatus* (fig. 101 cf. fig. 103).

Description. – Body length 13.4 – 18.3 mm. Form narrow with sides of elytra somewhat convex or broad with parallel sides of elytra.

Microsculpture of head between eyes and disc of pronotum with highly sinuous, entwined lines, often forming amorphic meshes, usually partially effaced. Intervals of elytra with microsculpture formed by amorphic or isodiametric meshes. Integument of dorsum markedly glossy, elytra dull in some specimens.

Head with frontal grooves fairly deep and sharply defined, usually short with middle bend, convexity directed medially, or straight and slightly oblique to one another. Penultimate article of labial palpus with four or five setae.

Pronotum shape somewhat variable but essentially quadrate as in figs. 25-28; disc of average convexity; sides not strongly produced, usually fairly parallel, slightly constricted anteriorly and posteriorly, sinuation in front of basal angle slight or absent; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and distinctly impressed, basal lateral foveae with sides continuous or not posteriorly, inner side with interrupted extension from base toward middle longitudinal line; lateral bead slightly broader posteriorly. Prosternal process with deep, sharply defined longitudinal groove. Middle femur with four to six setae on anterior face.

Elytra slightly sinuate apically; intervals slightly raised or flat; striae distinctly and moderately impressed, punctate anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (fig. 103) with median lobe moderately arcuate, angle distinctly obtuse; apical blade elongate, left corner of apex deflected dorsally; right paramere short not extending to apical half of median lobe, fairly broad, with slight tapering apically; internal sac with serrulate field apically, apical sclerite light, amorphic plate with darker basal tooth. The genitalia of 22 males were examined in detail.

Stylus of female ovipositor with relatively parallel sides and broadly rounded apex.

Geographical variation. – This is one of the most variable species of *Evarthrus*. The variable features which I have noted are: the shape of the pronotum, shape of the elytra, glossiness of the elytra and form of the male genitalia. In northern areas of the species range,

in Pennsylvania for example, the pronotum is fairly rectangular in outline (fig. 25), elytra are produced laterally and slightly glossy. At higher altitudes in western North Carolina the pronotum is more elongate and the sides are more sinuate in front of the posterior angles (fig. 26). The shape and glossiness of the elytra are the same as those of specimens in Pennsylvania. On the Piedmont and Coastal Plain regions of North and South Carolina, Georgia, Florida panhandle and eastern Alabama, the pronotum is relatively broader, without sinuate sides in front of the posterior angles (figs. 27–28), and the sides of the elytra are more parallel and surface of the elytra are duller than those of specimens further north in Pennsylvania or at higher elevations. These three morphologically distinct populations are linked by populations with intermediate structures that intergrade clinally.

Notes on synonymy. – The species *sigillatus* was identified by the original description. The type specimen of *vidua* Dejean resembles *sigillatus* specimens from northern limits of this species range. The type specimen of *americana* Dejean is a *sigillatus* specimen of the form that occurs in central and eastern North and South Carolina. The type specimen of *orbata* Newman is a *sigillatus* specimen of the kind that composes populations in Pennsylvania and Virginia. The type of *breviformis* Casey is a *sigillatus* specimen of the sort found in eastern and southern North Carolina. The type specimen of *montanus* is a *sigillatus* specimen of the average form which inhabits western North Carolina. Csiki lumped *Evarthrus* and *Pterostichus* which brought into one genus the names *montanus* Motschulsky and *montanus* Van Dyke. The new name *carolinensis* Csiki was created to replace *montanus* Van Dyke.

Collecting notes. – This species is found in leaf litter of deciduous forests as well as under cover in open places such as pastures.

Geographical distribution (fig. 131). – *Evarthrus sigillatus* ranges from the Florida panhandle to southern New York primarily east of the Appalachian Mountains. I have seen 432 specimens collected in the following localities.

United States – ALABAMA: Lee County: Auburn (AU, CAS, MCZ). Randolph County: Wadley (USNM). Tallapoosa County: Alexander City (AU). DISTRICT OF COLUMBIA: Piney Bridge (CNHM); Washington (USNM). FLORIDA: Jackson County: Grand Ridge (FDPI). Leon County: Tallahassee (FDPI, UMMZ). Liberty County: Camp Torreya (UMMZ); Rock Bluff (UMMZ). GEORGIA: Camden County: Kingsland (UMMZ). Liberty County: Riceboro (UMMZ). Morgan County: four miles north of Madison (DL); Madison (UMMZ). Rabun County: Clayton (AMNH, UMMZ, USNM). County not determined: Wilson Gap (CU). MARYLAND: Ann Arundel County: Odenton (CU); Baltimore (CAS). Harford County: Edgewood (CU). Montgomery County: (USNM). County not determined: Yellow Springs (RTB). MASSACHUSETTS: Middlesex County: Woburn (USNM). NEW JERSEY: Bergen County: Hillsdale (MCZ, USNM); Palisades (USNM); Ramsey (AMNH). Essex County: Newark (AMNH); South Orange (USNM). Hudson County: Arlington (USNM). Morris County: Boonton (USNM); Chester (AMNH); Lake Hopatcong (MCZ). Passaic County: Oak Ridge (USNM). Somerset County: Bound Brook (USNM). Sussex County: Hopatcong (AMNH); Sparta (DRW). Counties not determined: Dundsel (MCZ); Durh. P. (USNM); Fulerton (CU); Lahaway (USNM); Springdale Park (USNM). NEW YORK: Nassau County: Sea Cliff (MCZ). Rockland County: Bear Mountain (CAS, UASM). NORTH CAROLINA: Buncombe County: (GEB); Asheville (MCZ); Black Mountains (AMNH, CAS, CNHM, MCZ, USNM). Burke County: Linn Falls (USNM). Catawba County: Hickory (CNC). Haywood County: Crestmont (UMMZ); Lake Junaluska (FDPI); Mount Sterling (UMMZ). Henderson County: 5 mi. north of Bat Cave (AMNH); Hendersonville (USNM); Mills River (CNC). Jackson County: Dillsboro (AMNH). Madison County: Hot Springs (USNM). McDowell County: Marion (MCZ). Mecklenburg County: Charlotte (MCZ). Moore County: Southern Pines (CAS, KSU, MCZ, RTB, UW). Orange County: Chapel Hill (CU). Polk County: Tryon (MCZ). Randolph County: Julian (MCZ). Robeson County: Lumberton (UMMZ). Wake County: Raleigh (CNC, NCSU, USNM). Wilkes County: Wilkesboro (CU, USNM). Counties not determined: Beaver Creek (NCSU); Black Camp Gap (TCB); Graybeard Mountain (AMNH); Morrison Mountain (USNM); Mount Pisgah (USNM); Peano Rendezvous (GEB)

Round Knob (USNM); Stony Creek (RTB). PENNSYLVANIA: Bucks County: (RU) Cumberland County: Enola (MCZ). Fayette County: Uniontown (CAS). Montgomery County: Whitemarsh (USNM). Northampton County: Easton (CAS, CNHM, TE, UASM); Wind Gap (CNHM). Philadelphia County: Frankford (USNM); Germantown (ANSP); Mount Airy (CAS, RU); Philadelphia (MCZ). Counties not determined: Abbotsford (MCZ); Angord (CAS); Fernwald (CNHM; Inglenook (CAS); Lehigh Gap (USNM); Rockville (MCZ); Water Gap (AMNH); Wissahickon Creek (RU). SOUTH CAROLINA: Beaufort County: Hardeeville (UMMZ). Berkeley County: Goose Creek (UMMZ). Colleton County: Round O (UMMZ). Darlington County: Hartsville (UMMZ). Florence County: Florence (GEB); Scranton (UMMZ). Greenville County: Greenville (UMMZ). Greenwood County: Greenwood (UMMZ). Kershaw County: Camden (MCZ, UMMZ). Oconee County: CCC Camp F-2 (CAS); Clemson College (USNM). Richland County: Columbia (UMMZ). Saluda County: Saluda (UMMZ). County not determined: Meredith (CAS). TENNESSEE: Blount County: Chilhowee Mountain (CNC). Carter County: Roan Mountain (UMMZ). Cocke County: French Broad River (MCZ). Knox County: Knoxville (CNC). McMinn County: 1.5 mi. north of Athens (UMMZ). Morgan County: (CNHM); Deer Lodge, Environs (CNHM). Sevier County: Gatlinburg (UMMZ, USNM). Counties not determined: Crabtree (CU); Great Smoky Mountains National Park (CNC); Unaka Mountains (ANSP); Unaka Springs (RTB). VIRGINIA: Arlington County: Rosslyn (MCZ). Bedford County: Blue Ridge National Parkway (RCG). Fairfax County: (ANSP, USNM); Dead Run (USNM). Nansemond County: Cypress Chapel (UMMZ). Counties not determined: Black Pond (USNM); Diamond Springs (USNM); Great Falls (USNM); Stony Man Mountain (MCZ).

Evarthrus sinus new species

Figures 29, 104, 131

Recognition. – The following combination of characteristics is diagnostic for this species: pronotum with sides more constricted anteriorly than posteriorly, not sinuate in front of posterior angles; lateral bead rather broad posteriorly; male genitalia with strongly arcuate median lobe and narrow parameres; coastal or near coastal distribution. The species which are most similar in external structural characteristics to *sinus* are *blatchleyi* and *floridensis*. The geographical ranges of *sinus* and the last two species are different. However specimens of these species can also be easily separated by differences in their male genitalia (figs. 101, 102, 104).

Description. – HOLOTYPE, male, labelled as follows: "Alabama Port, Mobile Co. Ala. June 6, 1950 Ball-Wilson; HOLOTYPE Evarthrus sinus R. Freitag (red label)." MCZ.

Body length 13.7 mm, width 5.7 mm. Form approximately parallel at sides.

Head between eyes, disc of pronotum, and intervals of elytra with microsculpture consisting of sinuous, entwined, dense lines often forming amorphic meshes.

Head glossy; length 1.7 mm, width 3.3 mm; frontal grooves distinctly and sharply impressed; slightly curved away from one another posteriorly. Penultimate article of labial palpus with five setae, three medial and two apical.

Pronotum moderately glossy; length 3.9 mm, width 4.8 mm; shape somewhat cordiform in outline as in fig. 29; disc of average convexity, sides more constricted anteriorly than posteriorly, not sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and deeply impressed; basal lateral foveae with sides not continuous posteriorly, inner side with extension from base toward middle longitudinal line; lateral bead distinctly broader posteriorly. Prosternal process with deep, sharply defined longitudinal groove. Middle femur with four setae on anterior face.

Elytra slightly glossy, somewhat velvety in appearance; length 8.1 mm, width 5.7 mm; slightly sinuate apically; intervals almost flat; striae moderately impressed, distinctly punctate anteriorly, obsoletely punctate posteriorly.

Male genitalia (fig. 104) with median lobe strongly arcuate, angle approximately right; apical blade fairly short, round at apex, and deflected to right; right paramere of average length just extended to apical half of median lobe, distinctly tapered apically, apex narrow; internal sac with serrulate field apically, apical sclerite light amorphic plate with serrulate basal portion.

ALLOTYPE, female, labelled as follows: "Alabama Port, Mobile Co. Ala. June, 6, 1950 Ball-Wilson; ALLOTYPE Evarthrus sinus R. Freitag (green label)." MCZ.

Body length 13.9 mm, width 5.8 mm. Form same as in holotype.

Microsculpture on head, pronotum and elytra same as in holotype. Head glossy; length 1.7 mm, width 3.3 mm. Pronotum glossy; form same as in holotype; length 3.7 mm, width 4.7 mm. Elytra slightly glossy; length 8.4 mm, width 5.8 mm. Stylus of ovipositor with somewhat parallel sides, apex evenly rounded.

Derivation of specific name. – This species is given the name *sinus*, a latin noun meaning gulf, because its members live in the vicinity of the Gulf Coast.

Variation among paratypes (five males, nine females, Mississippi, Alabama). – Total length 13.1 – 15.9 mm. The variation in the features which I examined is no greater than that between the holotype and allotype. The genitalia of five males were examined.

Disposition of type material. – The holotype and allotype are in the collections of the MCZ. The paratypes are in the following collections: CAS, CU, GEB, MCZ, UASM, UMMZ, USNM.

Collecting notes. – This species has been collected in pine-oak coastal forest by G. E. Ball.

Geographical distribution (fig. 131). – This species is represented on the Coastal Plain of Alabama and Mississippi. I have seen 19 specimens from the following localities.

United States – **ALABAMA**: Mobile County: Alabama Port (GEB); Mobile (CAS, MCZ, UASM, USNM). MISSISSIPPI: George County: Lucedale (CU). Harrison County: Gulfport (UMMZ). Perry County: Richton (CU).

Evarthrus convivus LeConte, 1852

Figures 30–32, 105, 131

Evarthrus convivus LeConte, 1852:229. LECTOTYPE (here selected) a male, labelled as follows: "orange disc; Type 5654, E. orbatus (Newm) conviva LeC." MCZ. TYPE LOCALITY, Alabama. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:318. – Schaupp, 1880: 49. – Leng, 1920:57. – Csiki, 1930:673 (*Pterostichus*). – Löding, 1945:16 (*Evarthrus*).

Feronia (Pterostichus) orbata; LeConte, 1848:348 (not Newman).

Evarthrus orbatus; LeConte, 1852:229 (not Newman). – LeConte, 1863a:8. – LeConte, 1873:318. – Schaupp, 1880:49. – Blatchley, 1910:101. – Löding, 1945:16.

Evarthrus sigillatus; LeConte, 1852:228 (not Say). – Blatchley, 1910:101. – Casey, 1918: 359. – Löding, 1945:16.

Evarthrus sigillatus parallelus Casey, 1918:359. HOLOTYPE, male, labelled as follows: "Ind; CASEY bequest 1925; TYPE USNM 47119, parallelus Csy." USNM. TYPE LOCALITY, Indiana. NEW SYNONYMY. – Leng, 1920:57 (*Evarthrus*). – Csiki, 1930:674 (*Pterostichus*). – Löding, 1945:16 (*Evarthrus*).

Pterostichus (Pterostichus) (Sect. *Evarthrus*) *sigillatus*; Csiki, 1930:674 (not Say).

Recognition. – A combination of flat and dull elytral intervals, male genitalia with an elongate and narrow right paramere and C-shaped sclerite of the internal sac, and geographic distribution west and southwest of the Appalachian Mountains, is characteristic of *convivus*.

The species *sigillatus* and *convivus* are for the most part allopatric but their ranges overlap in western Pennsylvania and eastern Tennessee. In Pennsylvania *convivus* specimens have decidedly more parallel sides and are duller than those of *sigillatus*. The distinction between these two species is more obscure in eastern Tennessee and indeed it is usually necessary to examine the male genitalia for a certain identification.

The closely related species *sinus* and *convivus* are distinguished by the basal lateral foveae of the pronotum (fig. 29 cf. figs. 30–32) male genitalia (fig. 105), and geographical range.

Description. – Body length 11.6 – 19.2 mm. Form typical of *sigillatus* group.

Head between eyes with highly sinuous lines and amorphic meshes or meshes alone composing microsculpture. Disc of elytra with highly sinuous lines, usually very densely distributed, forming microsculpture. Microsculpture of intervals of elytra with highly sinuous lines and raised bead-like meshes.

Head moderately glossy; frontal grooves fairly deep and sharply defined, with middle bend, convexity directed medially. Penultimate article of labial palpus with five setae.

Pronotum moderately glossy; shape quadrate as in figs. 30 – 32; disc of average convexity or slightly flatter; sides not strongly produced, slightly constricted anteriorly and posteriorly, obsoletely sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and distinctly impressed; basal lateral fovea with sides continuous or not posteriorly, inner side with interrupted extension from base toward median longitudinal impression; lateral bead slightly broader posteriorly. Prosternal process with deeply or shallowly impressed longitudinal groove. Middle femur with four to five setae on anterior face.

Elytra dull, matte, slightly sinuate apically; intervals flat or almost flat; striae not deeply impressed, distinctly punctate anteriorly, indistinctly or obsoletely punctate posteriorly.

Male genitalia (fig. 105) with median lobe strongly arcuate, angle slightly obtuse; apical blade short, evenly rounded at apex, curved to right; right paramere elongate, apical half narrow, extended to apical half of median lobe; internal sac with serrulate field apically, apical sclerite distinctly C-shaped. The genitalia of 26 males were examined.

Stylus of female ovipositor slightly tapered apically.

Geographical variation. – Body size is notably variable. Tiny specimens are uncommon and appear sporadically throughout the range. In contrast giant forms are rather common in northeastern Alabama and in all directions from that region the body size decreases clinally. In other characteristics variation is minimal and specimens in Mississippi are grossly similar to those at the other end of the range in Pennsylvania or Illinois.

Notes on synonymy. – The type specimen of *parallelus* Casey is a slightly smaller than average *convivus* specimen.

Collecting notes. – D. J. Larson and I have taken some specimens in leaf litter in mixed pine and deciduous forests in Mississippi.

Geographical distribution (fig. 131). – This species ranges from the Mississippi River east to the Appalachian Mountains and from southern Alabama north to Illinois and western Pennsylvania. Some populations occur beside the Mississippi River in Louisiana. I have seen 491 specimens from the following localities.

United States – ALABAMA: Bibb County: The Sinks (UMMZ). Blount County: Blount Springs (CM). Cherokee County: Leesburg (UMMZ). Clarke County: six miles south of Jackson (UMMZ). Conecuh County: Brooklyn (TCB). DeKalb County: Desoto State Park (CAS). Franklin County: Russellville (GEB). Jackson County: Point Rock (UMMZ); Sand Mountain, Bryant (UMMZ). Madison County: Huntsville (UMMZ); Monte Sano (CNC, UMMZ). Marengo County: south of Demopolis (UMMZ). Mobile County: (CAS); Chickasaw (CU); Mobile (ANSP, CAS, MCZ); Mount Vernon (CU); Spring Hill (CAS). St. Clair County: Blount Mountains (GEB). Talladega County: Talladega (UMMZ). Tuscaloosa County: Lock 14 (CAS); Peterson (GEB); Talladega State Forest (GEB); Tuscaloosa (GEB, UMMZ); Windham Springs (GEB). ILLINOIS: Alexander County: Cache River (RTB); Olive Branch (CAS, CNHM). Cass County: Virginia (CU). Champaign County: Urbana (CNHM, MCZ, RTB). Clark County: Martinsville (UMMZ). Coles County: Fox Ridge State Park (RTB). Vermilion County: Kickapoo State Park (RTB). Washington County: Dubois (INHS). County not determined: Bottoms (INHS). INDIANA: Crawford County: (UP). Clark County: (CAS, UP). Elkhart County: Goshen (UMMZ). Floyd County: (UP, MCZ). Gibson County: Oakland City (UMMZ). Greene County: (UP). Hendricks County: Stilesville (CAS). Jefferson County: Clifty Falls State Park (GEB). Knox County: (CAS). LaGrange County: Lagrange (UMMZ). Marion County (UASM). Monroe County: Bloomington (UMMZ). Montgomery County: (UP). Putnam County: (UP). St. Joseph County: Mishawaka (UMMZ). Starke County: Bass Lake (CNHM). Tippecanoe County: LaFayette (UMMZ). County not determined: Turkey Run (INHS). KENTUCKY: Barren County: Cave City (USNM). Edmonson County: Mammoth Cave National Park (TCB). Hardin County: Fort Knox (GEB). Jefferson County: Anchorage (UL); Prospect (UL). Jessamine County: (GEB). Wayne County: Wolf Creek Lake (UL). County not determined: Sleepy Hollow (UL). LOUISIANA: East Baton Rouge County: Baton Rouge (UMMZ). St. Tammany County: Covington (USNM). MISSISSIPPI: Adams County: Natchez (CAS, USNM). Calhoun County: Vardaman (UMMZ). Clairborne County: Edwardsville (RCG). Forrest County: Hattiesburg (AMNH). George County: Lucedale (CU). Granada County: Dubard Station (UMMZ). Greene County: Leakesville (CU). Lauderdale County: five miles south of Toomsuba (DL, RF); Meridian (UMMZ). Perry County: Richton (CU). Simpson County: (UMMZ). Tishomingo County: Iuka (UMMZ). Counties not determined: North Augusta (CU); six miles east of Iuka (FDPI). OHIO: Adams County: (UMMZ). Allen County: Lima (UMMZ). Brown County: Russelsville (CU). Cuyahoga County: Cleveland (MCZ, UMMZ). Darke County: Beamville (RU, UMMZ). Hamilton County: Cincinnati (UMMZ). Licking County: West Alexandria (RTB). Preble County: Eaton (UMMZ). PENNSYLVANIA: Allegheny County: (CM, CU); Fair Oaks (CM); Millvale (CM); Pittsburgh (CAS, CM); Wall (CM, UK). Fayette County: Dunbar (CM); Union Town (CAS, MCZ, UMMZ, USNM). Westmoreland County: Jeanette (CM). County not determined: Allegheny (ANSP, MCZ, UK, USNM). TENNESSEE: Knox County: 25 miles south of Knoxville (AMNH). Lake County: Gray's Landing (RTB). Lauderdale County: South Fulton (UMMZ). Morgan County: Burrville (CNHM, CU). Obion County: Obion (UMMZ). WEST VIRGINIA: Monongalia County: Greer (GEB). Taylor County: Grafton (USNM). Webster Springs (MCZ).

The *seximpressus* Group

Characteristics. – Penultimate article of labial palpus with five setae, two medial and three apical. Pronotum more or less quadrate in outline; anterior transverse impression complete and distinct throughout. Prosternal process with setae on apex. Middle femur with five to seven setae on anterior face (fig. 75). Prosternal process with longitudinal groove shallow, but sharply defined. Male genitalia with median lobe moderately arcuate; internal sac with apical sclerite light with darker oval basal portion; right paramere markedly tapered apically.

This group includes the species *seximpressus*, *alabamae*, *engelmanni*, and *nonnitens*. They occur on the Gulf Coast in Texas, Louisiana, Mississippi, Alabama, the Ozark Plateau, and Mississippi Valley north to Wisconsin.

Evarthrus seximpressus LeConte, 1848

Figures 33, 75, 106, 132

Feronia (Pterostichus) seximpressa LeConte, 1848:350. LECTOTYPE (here selected) a male, labelled as follows: "dark green disc; Type 5653; E. seximpressus LeConte." MCZ.

TYPE LOCALITY, Rocky Mountains near Long's Peak. – LeConte, 1852:228 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:318. – Schaupp, 1880:49. – Blatchley, 1910:100. – Casey, 1918:361. – Leng, 1920:57. – Csiki, 1930:673 (*Pterostichus*). – Löding, 1945:16 (*Evarthrus*).

Evarthrus rubripes Casey, 1918:359. HOLOTYPE, male, labelled as follows: "Mo.; CASEY bequest 1925; TYPE USNM 47121; rubripes Csy." USNM. TYPE LOCALITY, Saint Louis, Missouri. PARATYPE, female, labelled as follows: "Ia; CASEY bequest 1925; rubripes – 2; PARATYPE USNM 47121." USNM. TYPE LOCALITY, Keokuk, Iowa. NEW SYNONYMY. – Leng, 1920:57 (*Evarthrus*). – Csiki, 1930:673 (*Pterostichus*).

Recognition. – The species *seximpressus* is distinguished from other species of the *seximpressus* group by the following combination of characteristics: body size relatively small; pronotum (fig. 33) more quadrate than circular in outline, posterior angles obsolete, lateral bead broad near base; male genitalia with apical blade of median lobe relatively narrow and evenly rounded at apex (fig. 106).

Description. – Body length 10.3 – 15.9 mm. Form relatively less robust than other species of the *seximpressus* group.

Microsculpture on head between eyes with markedly sinuous lines and amorphic meshes. Disc of pronotum with microsculpture formed of highly sinuous lines. Microsculpture of elytral intervals with amorphic or isodiametric meshes.

Head slightly or moderately glossy; frontal grooves fairly deep and distinct, with slight middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum moderately or slightly glossy; shape quadrate, as in fig. 33; disc of average convexity; sides produced, slightly constricted anteriorly and posteriorly, not sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and distinctly impressed; basal fovea with sides continuous or not posteriorly; lateral bead much broader posteriorly. Prosternal process with longitudinal groove distinctly but not deeply impressed. Legs red or black; middle femur with five or six setae on anterior face (fig. 75).

Elytra usually dull, slightly glossy in a few specimens; slightly sinuate apically; intervals flat or almost flat; striae not deeply impressed, distinctly punctate anteriorly, impunctate or obsoletely punctate posteriorly.

Male genitalia (fig. 106) with median lobe moderately arcuate, angle clearly obtuse; apical blade evenly rounded at apex, very slightly deflected to right; right paramere distinctly tapered apically, not extended to apical half of median lobe; internal sac with serrulate field apically, apical sclerite light amorphic plate. The genitalia of four specimens were examined in detail.

Stylus of female ovipositor slightly tapered apically.

Geographical variation. – Leg color varies from red to black. Specimens with red legs are most abundant in Wisconsin and northern Arkansas but they are uncommon throughout the rest of the range of this species.

Notes on synonymy. – The type specimen of *rubripes* Casey is an average, red-legged *seximpressus* specimen.

Collecting notes. – Specimens of *E. seximpressus* have been collected under cover in pastures.

Geographical distribution (fig. 132). – This species inhabits eastern areas of the Great Plains, and the Mississippi Valley, from Oklahoma or possibly Texas in the south, north to Michigan, Indiana and possibly western Pennsylvania. I have seen 451 specimens from the following localities.

United States – ARKANSAS: Benton County: Rogers (KSU). Bradley County: (UA); Pine Oak Woods (UA). Conway County: (UA). Garland County: Hot Springs (CAS). Hempstead County: Hope (CAS, MCZ, UMMZ). Lawrence County: (CAS). Searcy County: Leslie (CAS). Sebastian County: Greenwood (INHS). Washington County: (INHS, UA); Cove Creek, 27 miles from Fayetteville (DL); Cove Creek Valley (UA); Devil's Den State Park (RTB). Yell County: (UA). ILLINOIS: Adams County: Camp Point (INHS). Champaign County: (INHS); Urbana (INHS). DeKalb County: Hinckley (UP). Hardin County: Shane Landing (RTB). McHenry County: Harvard (RCG). Macoupin County: Chesterfield (RTB). Peoria County: Hanna City (INHS). Richland County: Wabash Valley (CM, MCZ). Rock Island County: Rock Island (UMMZ). County not determined: Grand Detour (CNHM). INDIANA: Greene County: (UP). Knox County: (UP). Marion County: (UP). Putnam County: (UP). IOWA: Davis County: (UMMZ). Henry County: Mount Pleasant (MCZ, MSU). Johnson County: Iowa City (CNC, MCZ, USNM); Solon (USNM). Polk County: Des Moines (ISU). Pottawattomie County: Council Bluffs (CAS, USNM). Story County: Ames (ISU). KANSAS: Clay County: (ANSP, CAS, UMMZ, USNM). Doniphan County: Wathena (USNM). Douglas County: (MCZ, UK, USNM); Lawrence (ANSP, CAS, CNC, UMMZ, UW). Pottawatomie County: Onaga (KSU). Riley County: Manhatten (KSU); Popenoe (KSU, USNM). Shawnee County: Topeka (KSU, USNM). Woodson County: two miles east of Yates Centre (DL). Wyandotte County: Argentine (AMNH, RU). MICHIGAN: Lenawee County: Adrian (MCZ). MINNESOTA: Houston County: Caledonia (KSU). MISSOURI: Buchanan County: St. Joseph (MCZ, USNM). Camden County: Camdenton (UMMZ). Carter County: Van Buren (UMMZ). Greene County: Willard (ANSP, MCZ, UASM). Jackson County: Kansas City (UK). Jefferson County: Kimmswick (UMMZ). Miller County: Ozark Lake (CAS). Polk County: Aldrich (CU). St. Louis County: St. Louis (CAS, CM, USNM). Taney County: Branson (CAS). County not determined: Bolival (CAS). NEBRASKA: Douglas County: Omaha, Child's Point (CAS). Lancaster County: Lincoln (CAS). OKLAHOMA: Cleveland County: (CAS); Norman (CAS). Latimer County: (CAS). LeFlore County: Page (UMMZ). Lincoln County: east of Stroud (TCB). Marshall County: Lake Texoma State Park (TE). Rogers County: Catdosa (CNHM). Tulsa County: Tulsa (CAS). Wagoner County: Cornell (UMMZ). PENNSYLVANIA: Westmoreland County: Jeanette (CM). TEXAS: Brazos County: College Station (INHS). WISCONSIN: Dane County: (UW); Madison (CU, UW). Dodge County: Beaver Dam (CAS, KSU, MCZ, UMMZ). Milwaukee County: Milwaukee (UW). Vernon County: Westby (USNM). County not determined: Wingra Lake (UW).

Evarthrus alabamae Van Dyke, 1926

Figures 34, 107, 132

Evarthrus vagans alabamae Van Dyke, 1926:118. HOLOTYPE, male labelled as follows: "Mobile, Ala. III.08; Van Dyke Collection." CAS. ALLOTYPE, labelled as follows: "Mobile, Ala. II.26.1901. H. P. Löding; Van Dyke Collection." CAS. NEW STATUS. – Csiki, 1930:673 (*Pterostichus*). – Leng and Mutchler, 1933:13 (*Evarthrus*). – Löding, 1945:16.

Evarthrus lodingi; Löding, 1945:16 (not Van Dyke).

Recognition. – The circular pronotum is diagnostic of *alabamae* and distinguishes it from the closely related species *seximpressus* which has a more rectangular pronotum. Characteristics of the male genitalia of *alabamae* and *seximpressus* also distinguish these species from one another (fig. 106 cf. fig. 107).

Description. – Body length 14.6 – 18.7 mm. Form robust, particularly the pronotum.

Head between eyes and disc of pronotum with highly sinuous lines and amorphic meshes composing microsculpture. Intervals of elytra with microsculpture formed by a combination of raised amorphic and isodiametric meshes.

Head slightly or moderately glossy; frontal grooves of average depth, distinct, with slight middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum slightly or moderately glossy; shape somewhat circular in outline as in fig. 34. Disc of average convexity; sides strongly produced, moderately constricted anteriorly and posteriorly, not sinuate in front of posterior angles; posterior angles not produced, obtuse and broadly rounded; anterior transverse impression complete and deeply impressed; basal foveae with sides continuous or not posteriorly; lateral bead much broader posteriorly. Prosternal process with longitudinal groove distinct but not deep. Middle femur with five or six setae on anterior face.

Elytra dull or slightly glossy; slightly sinuate apically; intervals almost flat or strongly convex; striae of average depth, distinctly punctate anteriorly indistinctly punctate posteriorly.

Male genitalia (fig. 107) with median lobe moderately arcuate, angle clearly obtuse; apical blade rather broad, apex broadly rounded; apex with lateral edges deflected dorsally; right paramere distinctly tapered apically, extended to approximately halfway point of median lobe; internal sac with serrulate field apically; apical sclerite light amorphic plate, with darker elliptically-shaped basal portion. The genitalia of six males were examined in detail.

Stylus of female ovipositor slightly tapered apically.

Variation. – Body size and convexity of elytral intervals are somewhat variable, but there is no apparent geographical clinal pattern in the variation.

Two specimens from Oakhurst, Texas and two from Livingston, Texas are smaller than the average *alabamae* specimen (e.g. from Mobile, Alabama). They vaguely resemble *engelmanni*. However the *alabamae* characters are evident, e.g. very round basal angles of the elytra and broader apical blade of the male phallus. These appear to be variants of *alabamae* and that is how I regard them.

Collecting notes. – Specimens of *alabamae* are found in pine-oak woods, in leaf litter. G. E. Ball collected specimens of this species along with specimens of *E. sinus* in pine-oak coastal forest.

Geographical distribution (fig. 132). – This species inhabits the Gulf Coastal Plain from Alabama west to Texas. The Kansas and northern Arkansas records are probably wrong. I have seen 163 specimens from the following localities.

United States – ALABAMA: Mobile County: Alabama Port (GEB); Grand Bay (ANSP); Mobile (AMNH, ANSP, AU, CAS, CU, KSU, MCZ, UMMZ, USNM, UW). ARKANSAS: Bradley County: Pine Oak Woods (UA). Lawrence County: Imboden (CNHM, MCZ, USNM). KANSAS: Clay County: (CNHM). LOUISIANA: Caddo County: Shreveport (CAS). Jefferson Davis County: Lake Arthur (CAS). Natchitoches County: Natchitoches (UMMZ); Vowell's Mill (USNM). County not determined: Hart (CAS). MISSISSIPPI: Harrison County: Gulfport (CU); Handsboro (FDPI, UMMZ). Jackson County: Pascagoula (USNM). TEXAS: Harrison County: Marshall (UMMZ). Polk County: five miles east of Livingston (AMNH); Livingston (AMNH). San Jacinto County: two miles east of Oakhurst (AMNH). Travis County: Austin (MCZ).

Evarthrus engelmanni LeConte, 1852

Figures 35, 108, 132

Evarthrus engelmani LeConte, 1852:228. LECTOTYPE (here selected) a male, labelled as follows: "Tex; engelmani 2." MCZ. TYPE LOCALITY, Texas. – LeConte, 1858:28 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:318. – Schaupp, 1880:49. – Leng, 1920:57. – Csiki, 1930:673 (*Pterostichus*).

Evarthrus vagans; Schaupp, 1880:49 (not LeConte). – Csiki, 1930:673 (*Pterostichus*). – Löding, 1945:16 (*Evarthrus*).

Recognition. – The combination of the produced sides, produced posterior angles, and posterior widening of the lateral bead of the pronotum is diagnostic of specimens of *engelmanni*. These features distinguish *engelmanni* from *nonnitens*.

Description. – Body length 12.6 – 19.1 mm. Form average for the *seximpressus* group.

Head between eyes and disc of pronotum with highly sinuous lines and amorphic meshes composing microsculpture. Microsculpture of intervals of elytra formed by bead-like isodiametric meshes.

Head slightly or moderately glossy; frontal grooves moderately deep, distinct, straight or with slight middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum slightly glossy; shape somewhat quadrate in outline as in fig. 35 with disc of average convexity; sides strongly produced, moderately constricted anteriorly and posteriorly, distinctly sinuate in front of posterior angles; posterior angles small, more or less produced, slightly or broadly obtuse; anterior transverse impression complete and deeply impressed; basal lateral fovea with sides usually continuous posteriorly; lateral bead much broader posteriorly than anteriorly. Prosternal process with longitudinal groove moderately or deeply impressed. Middle femur with five or six setae on anterior face.

Elytra dull, slightly sinuate apically; intervals flat or slightly convex; striae not deep, indistinctly punctate anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (fig. 108) with median lobe moderately arcuate, angle clearly obtuse; apical blade broad with broadly rounded almost truncate apex; lateral edges of apex not strongly deflected dorsally; right paramere very narrow apically, not extended to halfway point of median lobe; internal sac with serrulate field apically, apical sclerite light amorphic plate with dark elliptical basal portion. The genitalia of eleven males were examined.

Stylus of female ovipositor moderately tapered apically.

Geographical variation. – The pronotum is variable, which sometimes makes it difficult to separate *engelmanni* from the three other species in the *seximpressus* group. For example several specimens from College Station, Texas are very much like *seximpressus* but they all have a sinuation in front of the posterior angles of the pronotum which is characteristic of *engelmanni*. Other specimens of *engelmanni* resemble individuals of *nonnitens* in pronotal features but are distinguishable by their male genitalia.

Notes on synonymy. – I believe LeConte named this species after George Engelmann, 1809 – 1844, a physician in St. Louis and eminent botanist. This is probably why LeConte changed the name *engelmani* (1852) to *engelmanni* in subsequent publications.

Collecting notes. – Specimens of *engelmanni* have been collected in forests (label data).

Geographical distribution (fig. 132). – This species inhabits eastern Texas. The El Paso record is surely not correct. I have seen 69 specimens from the following localities.

United States – TEXAS: Bastrop County: Bastrop State Park (CNC). Brazos County: (MCZ); College Station (MCZ, TAM). DeWitt County: Cuero (AMNH). El Paso County: El Paso (CM). Goliad County: (USNM). Grimes County: (TAM). Harris County: Houston (CM). Madison County: (TAM). Tarrant County: east of Fort Worth (KSU). Travis County: Austin (MCZ). Victoria County: Victoria (USNM). County not determined: Fedor (CAS, CM).

Evarthrus nonnitens LeConte, 1873

Figures 36, 109, 132

Evarthrus nonnitens LeConte, 1873:320. LECTOTYPE (here selected) a female, labelled as follows: "red disc; Red River; Type 5656; E. nonnitens LeC." MCZ. TYPE LOCALITY, Red River, Louisiana. – Schaupp, 1880:49 (*Evarthrus*). – Casey, 1918:362. – Leng, 1920:57. – Csiki, 1930:673 (*Pterostichus*).

Evarthrus enormis Casey, 1918:361. HOLOTYPE, female, labelled as follows: "Tex; CASEY BEQUEST 1925; TYPE USNM 47125; enormis Csy." USNM. TYPE LOCALITY, Houston, Texas. NEW SYNONYMY. – Leng, 1920:57 (*Evarthrus*). – Csiki, 1930:673 (*Pterostichus*).

Recognition. – Specimens of *nonnitens* are characterized by the combination of the extremely matte surface of the elytra, somewhat flattened disc of the pronotum, and relatively narrow posterior portion of the lateral bead of the pronotum.

Individuals of *nonnitens* can be confused with specimens of *seximpressus* and *engelmanni*. The duller elytra of *nonnitens* usually distinguishes it from both *engelmanni* and *seximpressus*. In addition specimens of *nonnitens* and *engelmanni* can be distinguished from one another by the difference in widths of the basal part of the lateral bead of the pronotum (fig. 35 cf. fig. 36). Also *seximpressus* does not have a produced basal angle of the pronotum while *nonnitens* has. The relative width of the apex of the median lobe of the genitalia is also a reliable feature for separating these species (fig. 109 cf. figs. 106 and 108).

Description. – Body length 13.7 – 16.9 mm. Form average for the *seximpressus* group.

Head between eyes, disc of pronotum, and intervals of elytra with microsculpture composed of highly sinuous entwined lines.

Head slightly glossy; frontal grooves deep, distinct, with middle bend, posterior halves directed laterally. Penultimate article of labial palpus with five setae.

Pronotum dull, shape quadrate in outline as in fig. 36, disc somewhat flattened in middle; sides slightly produced, slightly constricted anteriorly and posteriorly, sinuate in front of posterior angles; posterior angles small and slightly produced, clearly obtuse; anterior transverse impression complete and deeply impressed; basal lateral fovea with sides continuous or not posteriorly; lateral bead slightly broadened posteriorly. Prosternal process with longitudinal groove moderately or deeply impressed. Middle femur with five to seven setae on anterior face.

Elytra very dull, matte; obsoletely sinuate apically; intervals flat or slightly convex; striae not deep, distinctly punctate anteriorly, indistinctly punctate or impunctate posteriorly.

Male genitalia (fig. 109) with median lobe moderately arcuate, angle clearly obtuse, evenly rounded; apical blade broad, apex broadly rounded almost truncate, lateral edges deflected dorsally; right paramere very narrow apically extended to approximately halfway point of median lobe; internal sac with serrulate field apically; apical sclerite light amorphic plate with dark oval basal portion. The genitalia of five males were examined.

Stylus of female ovipositor slightly tapered apically.

Notes on synonymy. – The type specimen of *enormis* Casey is an average specimen of *nonnitens* in all respects.

Geographical distribution (fig. 132). – This species is known from southern Arkansas and the Gulf Coastal Plain in Mississippi, Louisiana and eastern Texas. I have seen 33 specimens collected in the following localities.

United States – ARKANSAS: Bradley County: (UA); Crimson Clover (UA); Pine Oak Woods (UA). Clarke County: (UA). Hempstead County: Hope (MCZ, UASM, UMMZ). LOUISIANA: Grant County: Grant Point, Dryprong (CNHM). Lincoln County: five miles east of Ruston (AMNH); Ruston (MCZ). County not determined: Red River (MCZ). MISSISSIPPI: Adams County: Natchez (CAS). TEXAS: Harris County: Houston (USNM). San Jacinto County: two miles east of Oakhurst (AMNH).

The *hypherpiformis* Group

Characteristics. – Penultimate article of labial palpus with five setae. Pronotum quadrate in outline; anterior transverse impression complete, shallow medially. Prosternal process without setae on apex. Three to five setae on third interval of elytron. Median lobe of male genitalia with medial ventral bump; apex of apical blade flat and sharp, deflected ventrally. Right paramere short and markedly tapered apically. This group is represented by one species, *hypherpiformis*. It occurs in the northern Coastal Plain area of Alabama and Mississippi.

Evarthrus hypherpiformis new species

Figures 37, 110, 132

Recognition. – The combination of body size, three to five setae on the third interval of the elytron, flattened pronotum, and form of the male genitalia is diagnostic for this species. Specimens of *hypherpiformis* resemble those of *nonnitens* but without setae on the apex of the prosternal process.

Description. – HOLOTYPE, male, labelled as follows: "Marengo Co., ALABAMA Prairies s. Demopolis June, 1935 A. F. Archer; loan from UMMZ; HOLOTYPE Evarthrus hypherpiformis R. Freitag (red label)." UMMZ.

Body length 18.0 mm, width 7.4 mm. Form somewhat flat, with parallel sides.

Microsculpture of head between eyes composed of isodiametric and amorphic meshes; disc of pronotum with amorphic meshes; intervals of elytra with isodiametric bead-like meshes. Integument of dorsum slightly glossy.

Head length 2.0 mm, width 4.1 mm; frontal groove deep and broadly impressed, posterior halves slightly directed laterally. Penultimate article of labial palpus with five setae.

Pronotum length 5.3 mm, width 5.6 mm; form quadrate in outline as in fig. 37; disc distinctly flattened in centre; sides not prominent, constricted moderately anteriorly slightly posteriorly, slightly sinuate in front of posterior angles; posterior angles not prominent, slightly obtuse, somewhat sharp; anterior transverse impression complete; basal lateral fovea with sides not continuous posterio-medially, central depressed portion flattened and somewhat rugose, extension from inner side to middle longitudinal line represented by a small roughly sculptured area; lateral bead same width throughout length. Apex of prosternal process extended far beyond middle coxae, longitudinal groove obsolete. Anterior faces of middle femora with five setae on one, six setae on the other.

Elytra length 10.7 mm, width 7.4 mm; sides parallel, obsoletely sinuate apically; intervals distinctly convex; striae with small but distinct punctures anteriorly, obsoletely punctate posteriorly. Third interval of each elytron with three setae.

Male genitalia (fig. 110): median lobe moderately arcuate, with ventral medial bump; apical blade with apex deflected dorsally at a sharp right angle; right paramere very short, markedly tapered apically; internal sac serrulate apically, apical sclerite elongate, pale colored plate.

Derivation of specific name. – The habitus of specimens of *hypherpiformis* is vaguely like that of individuals of some species of the subgenus *Hypherpes* of the genus *Pterostichus.*

Variation among paratypes (four males, Alabama, Mississippi). – Body length 17.7 – 18.5 mm. The number of setae in the third interval of the elytron ranges from three to five. The genitalia of one male was examined. It resembled that of the holotype in all respects.

Disposition of type material. – The holotype and one paratype are in the collections of the UMMZ, and the three other paratypes are in the collections of AMNH, CU, and UASM.

Geographical distribution (fig. 132). – This species is found in Alabama and Mississippi only. I have seen five specimens from the following localities.

United States – ALABAMA: Dallas County: Hazen (AMNH). Marengo County: south of Demopolis (UASM, UMMZ). MISSISSIPPI: Oktibbeha County: Agriculture College (CU).

The *sodalis* Group

Characteristics. – Penultimate article of labial palpus with five to seven setae. Pronotum subcordiform, sides moderately or strongly constricted posteriorly; anterior transverse impression complete or incomplete. Prosternal process with shallow or obsolete longitudinal groove, without setae at apex. Middle femur with 5 – 11 setae on anterior face. Male genitalia with median lobe slightly or moderately arcuate; internal sac with apical sclerite light amorphic plate usually with darker basal tooth, tooth sometimes unsclerotized. The species *sodalis, parasodalis, furtivus, alternans* and *iowensis* are included in this group. They occur across northeastern United States from New Jersey west to South Dakota, Nebraska, and Kansas, and south to northern Alabama and Arkansas.

Evarthrus sodalis LeConte, 1848

Frontispiece and Figures 38–48, 64, 111, 133

Feronia (Molops) sodalis LeConte, 1848:349. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; Type 5659; E. sodalis Lec. orbatus Lec." MCZ. TYPE LOCALITY, Illinois. – LeConte, 1852:229 (*Evarthrus*). – LeConte, 1870:5. – LeConte, 1873: 318. – Schaupp, 1880:49. – Blatchley, 1910:101. – Casey, 1918:356 (*Eumolops*). – Casey, 1920:197 (*Evarthrinus*). – Leng, 1920:57 (*Eumolops*). – Leonard, 1926:222. – Csiki, 1930:672 (*Pterostichus*).

Feronia (Molops) colossus LeConte, 1848:343. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; colossus 4." MCZ. TYPE LOCALITY, Missouri. NEW COMBINATION. – LeConte, 1852:233 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873: 318. – Schaupp, 1880:49. – Casey, 1918:356 (*Eumolops*). – Leng, 1920:57. – Csiki, 1930:672 (*Pterostichus*).

Feronia (Molops) corax LeConte, 1848:347. LECTOTYPE (here selected) a male, labelled as follows: "green disc; Type 5661; E. corax Lec." MCZ. TYPE LOCALITY, near Long's Peak. – LeConte, 1852:229 (*Evarthrus*). – Motschulsky, 1865:261. – LeConte, 1873: 318. – Schaupp, 1880:49. – Casey, 1918:357. – Leng, 1920:57. – Csiki, 1930:672 (*Eumolops*).

Feronia (Pterostichus) vagans LeConte, 1848:349. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; Type 5664; E. vagans Lec." MCZ. TYPE LOCALITY, Ohio. NEW SYNONYMY. – LeConte, 1852:229 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:320. – Leng, 1920:57.

Evarthrus fatuus LeConte, 1852:233. LECTOTYPE (here selected) a male, labelled as follows: "yellow disc; Type 5060; E. fatuus LeC." MCZ. TYPE LOCALITY, Iowa. – LeConte, 1873:318 (*Evarthrus*). – Schaupp, 1880:49. – Casey, 1918:356 (*Eumolops*). – Casey, 1920:197 (*Evarthrinus*). – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*). – Lindroth, 1966:474.

Evarthrus furtivus; Blatchley, 1910:101 (not LeConte).

Evarthrinus (Evarthrops) retractus Casey, 1920:197. HOLOTYPE, female, labelled as follows: "L. CASEY bequest 1925; TYPE USNM 47132; retractus Csy." USNM. TYPE LOCALITY, "probably Indiana." NEW SYNONYMY. – Leng and Mutchler 1927:10 (*Evarthrinus*). – Csiki, 1930:673 (*Pterostichus*).

Evarthrinus inflatipennis Casey, 1924:78. HOLOTYPE, female, labelled as follows: "Ill.; CASEY bequest 1925; TYPE USNM 47133; inflatipennis Csy." USNM. TYPE LOCALITY, near Chicago, Illinois. NEW SYNONYMY. – Leng and Mutchler 1927:10 (*Evarthrinus*). – Csiki, 1930:673 (*Pterostichus*).

Eumolops sulcata Casey, 1918:355. HOLOTYPE, male, labelled as follows: "Fla; CASEY bequest 1925; TYPE USNM 47134; sulcata Casy." USNM. TYPE LOCALITY. FLORIDA (this locality is probably incorrect). NEW SYNONYMY. – Casey, 1920:196 (*Evarthrinus*). – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Evarthrus lodingi Van Dyke, 1926:118. HOLOTYPE, male, labelled as follows: "Monte Sano, Ala. Madison Co. 6.9.11." H. P. Löding; Van Dyke Collection. CAS. TYPE LOCALITY, Monte Sano, Alabama. NEW COMBINATION. – Csiki, 1930:673 (*Pterostichus*). – Leng and Mutchler, 1933:13 (*Evarthrus*).

Recognition. – The species *alternans, furtivus, iowensis* and *parasodalis* are remarkably similar to *sodalis* in their external non-genitalic structures. Although some specimens of *sodalis* can be distinguished from individuals of the first four species by external features, the male genitalia are the only reliable diagnostic character of *sodalis*. The apical blade of the median lobe is elongate and narrow in *sodalis* while it is shorter and broader in the other species (fig. 111 cf. figs. 112, 113, 114, 115).

Description. – Body length 12.4 – 20 mm. Form robust.

Microsculpture: head between eyes with flattened amorphic meshes, disc of pronotum with highly sinuous entwined lines, or transversely directed lines, or meshes transversely stretched; intervals of elytra with isodiametric bead-like or flattened meshes, or highly sinuous lines.

Head moderately glossy; frontal grooves of average depth, not sharply defined, straight or with slight bend in middle, convexity directed medially. Penultimate article of labial palpus with five to seven setae.

Pronotum moderately glossy; shape subcordiform in outline as in figs. 38 – 48; disc of average convexity; sides moderately or strongly produced, constricted moderately anteriorly strongly posteriorly, sinuation in front of posterior angles well marked, moderate, slight, or

absent; posterior angles produced or not, broadly obtuse or slightly acute; anterior transverse impression complete or incomplete; basal lateral fovea with sides usually but not always, continuous posteriorly; lateral bead same width throughout. Prosternal process with shallow, broadly excavated or obsolete longitudinal groove. Middle femur with five to eight setae on anterior face.

Elytra of males moderately glossy or iridescent, females dull; apical sinuation slight, obsolete, or absent; intervals flat, moderately convex, or highly convex; striae of average depth, punctate anteriorly, impunctate or obsoletely punctate posteriorly.

Male genitalia (fig. 111) with median lobe slightly arcuate, angle broadly obtuse; apical blade elongate, right side and apex deflected dorsally; right paramere of average length extending to halfway point of median lobe, rather broad, slightly tapered apically, apex broadly rounded; internal sac with serrulate apical field, apical sclerite light apically with darker basal tooth, or tooth not sclerotized. The genitalia of 21 males were examined in detail.

Stylus of female ovipositor elongate, slightly tapered apically.

Geographical variation and subspecies. – There are three populations which are more or less distinct in several structural features.

In Kansas and proximal areas specimens referred to the nominal species *colossus* are distinguished from typical *sodalis* by larger body size, more prominent posterior angles of the pronotum, and the absence of an apical sclerite of the internal sac of the median lobe of the male. Between these populations there are populations which have intermediate characteristics and therefore all of these groups appear to be the same species. Because of the differences I recognize a subspecies *s. colossus* west of the Mississippi River, and mainly south of the Missouri River, and an eastern subspecies mainly east of the Mississippi River and north of Alabama and Tennessee.

The third distinct form, formerly the species *lodingi*, occurs in Tennessee, and northern Alabama. It is distinguished from *s. sodalis* and *s. colossus* by highly convex and iridescent elytral intervals of the males. This iridescence is because of the microsculpture which is composed of numerous highly sinuous lines, placed very close to one another. Both *s. sodalis* and *s. colossus* have isodiametric meshes forming the microsculpture on the elytral intervals of the male. Furthermore, specimens from Alabama and Tennessee are generally larger than *s. sodalis* specimens. They also differ from *s. colossus* individuals by having an apical sclerite in the internal sac of the median lobe of the male. The few *sodalis* specimens which I have seen from Kentucky appear intermediate in structural features between those of Tennessee and Alabama, and Indiana, Illinois and Ohio. I believe the Alabama and Tennessee specimens form a third subspecies, *s. lodingi*.

Notes on synonymy. – The lectotype of *colossus* LeConte is a *sodalis* specimen larger than the average size and of the form which inhabits Kansas and Missouri.

The lectotype of *corax* LeConte, is an average *sodalis* specimen that inhabits western areas of this species range; and it is characterized by the small prominent basal angles of the pronotum.

The lectotype of *vagans* LeConte, is a *sodalis* specimen with very broadly rounded basal angles of the pronotum, which is the common condition of specimens in northern Ohio.

The lectotype of *fatuus* LeConte is a *sodalis* specimen with rectangular hind angles of the pronotum as in fig. 43. This form is common in eastern Iowa.

The type specimen of *inflatipennis* Casey is a *sodalis* specimen that is average for the form found in Illinois but slightly smaller in body size.

The type specimen of *sulcata* Casey is a *sodalis* specimen that is of the common form and size found in Illinois.

The type specimen of *lodingi* Van Dyke is a *sodalis* specimen of the common form inhabiting northern Alabama.

Collecting notes. – Specimens of *s. sodalis* and *s. colossus* are found in open grassy places under cover. G. E. Ball collected specimens of *s. sodalis* beside railroad tracks under ties near Ithaca, New York. I have taken *s. colossus* from under boards in pasture and abandoned farmyards in Kansas. The subspecies *s. lodingi* is forest adapted and occurs in leaf litter.

The gut of a female *s. colossus* specimen, which I examined, was full of the remains of ants.

Geographical distribution (fig. 133). – This species is widespread in northeastern United States ranging from Pennsylvania west to Kansas and Nebraska, south to northern Mississippi and Alabama, and north to Duluth, Minnesota.

E. s. sodalis LeConte

I have seen 664 specimens from the following localities.

Canada – ONTARIO: Point Pelee (Lindroth 1966).

United States – ILLINOIS: Adams County: five miles east of LaPrairie (CNHM). Bureau County: Princeton (UMMZ). Champaign County: Champaign (CNC, INHS, RTB, UASM); Seymour (MCZ); Urbana (CNHM, INHS, RTB, RU, UMMZ, UW). Cook County: Carle Woods (CNHM); Chicago (CAS, CNHM, CU, UASM, UMMZ, USNM, UW); Evanston (ASNP, CAS, UMMZ); Glencoe (CNHM, UMMZ); Palos Park (CAS, CNHM, UMMZ); River Forest (CNHM); River Grove (USNM); Summit (CNHM, INHS); West Northfield (MCZ); Willow Springs (CAS, CNHM, CNC, UMMZ). DuPage County: Glen Ellyn (CNHM). Lake County: Fort Sheridan (UMMZ); Lake Zurich (RTB); Ravinia (UMMZ). LaSalle County: Ottawa (RTB). McHenry County: Algonquin (INHS). McLean County: Bloomington (CNHM, CU, USNM); Normal (INHS). Mason County: Havanna (INHS). Ogle County: Oregon (UMMZ). Peoria County: Peoria (INHS). Putnam County: (INHS). Richland and Lawrence County: Wabash Valley (CM, MCZ, USNM). Rock Island County: Rock Island (UMMZ). Sangamon County: Springfield (CNHM). Vermilion County: Danville (INHS); Kickapoo State Park (RTB); Oakwood (INHS). Washington County: Dubois (INHS). Will County: Joliet (CNHM), Winnebago County: Rockford (CAS). Counties not determined: Edgebrook (UMMZ); Somerset (INHS). INDIANA: Cass County: (MCZ). Gibson County: (UMMZ); Princeton (USNM). Jefferson County: Clifty Falls State Park (GEB); Hanover (UMMZ). Knox County: Vincennes (USNM); Wheatland (UMMZ). Kosciusko County: Winona Lake (UMMZ). Lagrange County: Lagrange (UMMZ). Marion County: (MCZ, UP). Monroe County: Bloomington (UMMZ). Posey County: (CNHM); Mount Vernon (CNHM). Wells County: LaFayette (UMMZ). Warren County: Pine (CNHM). Wells County: Bluffton (UMMZ). County not determined: Indiana Dunes State Park: (RTB). IOWA: Benton County: (UMMZ). Clayton County: McGregor (UMMZ). Des Moines County: Burlington (MCZ). Hamilton County: Randall (CNC). Johnson County: Iowa City (CAS, MCZ, UMMZ, USNM); Solon (USNM). Linn County: Cedar Rapids (UMMZ). Tama County: Traer (ISU). KENTUCKY: Edmonson County: Bee Spring (MCZ); Mammoth Cave National Park (TCB). Fayette County: Lexington (TCB). Franklin County: Stony Creek, north of Frankfort (UMMZ). Hardin County: Summit (CNHM). Harlan County: Cumberland Gap (MCZ). Henderson County (CNC). MICHIGAN: Jackson County: Jackson (TH). Kalamazoo County: Climax (UMMZ); Gull Lake Biology Station (TH). Lenawee County: Adrian (TH). Munroe County: (UMMZ). Oakland County: (UMMZ). Wayne County: Detroit (USNM). MINNESOTA: Houston County: Caledonia (UMMZ). St. Louis County: Duluth (MCZ). MISSISSIPPI: Tishomingo County: Cook's lodge near Iuka (UMMZ); six miles east of Iuka (FDPI). MISSOURI: Buchanan County: St. Joseph (USNM). NEW JERSEY: Morris County: Lincoln Park (CNHM). NEW YORK: Chautauqua County: Findley Lake (GEB); Mayville (GEB); Pendergast Creek, near Lake Chautauqua (GEB). Erie County: Buffalo (GEB); Hamburg (CAS). Tompkins County: Ithaca (GEB, FDPI, UA); Turner Hill

(GEB). Yates County: Dresden (UMMZ). Counties not determined: Van Cort'dt Park (CU); Windom (CU). OHIO: Allen County: Lima (UMMZ, USNM). Columbiana County: Salineville (CAS, CU). Cuyahoga County: Cleveland (MCZ). Darke County: (CAS); Beamville (UMMZ). Fairfield County: Millersport (CM). Franklin County: Columbus (CAS, MCZ, RU). Hamilton County: (CNHM); Cincinnati (ANSP, CAS, UMMZ). Licking County: Alexandria (RTB). Mercer County: Mendon (UMMZ). Ottawa County: Lakeside (UMMZ); Put-in-Bay, South Bass Island (UMMZ). Preble County: Eaton (UMMZ). PENNSYLVANIA: Allegheny County: (CM, CU); Pittsburgh (CM, RU). Erie County: (CM). Forest County: Cook's Forest (CM). Warren County: (UMMZ). Westmoreland County: Jeanette (CM). TENNESSEE: Knox County: Knoxville (CNC); 30 miles west of Knoxville (AMNH). WISCONSIN: Bayfield County: (MCZ). Dane County: (UW); Madison (UASM, UW). Dodge County: Beaver Dam (CAS, MCZ, TE, USNM). Green County: Albany (CAS, CNHM); Brodhead (UMMZ). Jefferson County: Fort Atkinson (GEB). Milwaukee County: (UW); Milwaukee (CAS). Racine County: Burlington (CNHM). Walworth County: Walworth (CNHM). County not determined: Rautubug (MCZ).

E. s. colossus LeConte

I have seen 151 specimens from the following localities.

United States – ARKANSAS: (UASM). IOWA: O'Brien County: four miles east of Sanborn (ISU). Woodbury County: Sioux City (UMMZ). KANSAS: Chase County: (UK). Doniphan County: Wathena (UASM, USNM). Douglas County: (UK); five miles north of Baldwin City (DL, RF); Lawrence (CAS, MCZ, UK, UMMZ). Franklin County: (UMMZ). Johnson County: Mission (UK). Lawrence County: (UMMZ). Leavenworth County: Leavenworth (CAS, CNHM); Tonganoxie (MCZ). Linn County: (UK). Pottawatomie County: Onaga (UK). Reno County: (ANSP). Riley County: (USNM); Manhattan (KSU, USNM). Shawnee County: Topeka (USNM). Wilson County: Benedict (CAS). Woodson County: two miles east of Yates Centre (DL, RF). MISSOURI: Boone County: Columbia (CNHM). Buchanan County: St. Joseph (USNM). Clinton County: Cameron (CAS); Lathrop (CNC). Jackson County: Kansas City (UK). Pettis County: Sedalia (CNHM). St. Louis (CAS, CNHM, USNM). County not determined: Pickle Springs (UMMZ). NEBRASKA: Cedar County: Randolph (MCZ). Knox County: Creighton (CAS).

E. s. lodingi Van Dyke

I have seen 53 specimens collected in the following localities.

United States – ALABAMA: Jackson County: Point Rock (UMMZ). Madison County: Monte Sano (CAS, MCZ, UASM, UK, UMMZ, USNM); Monte Sano State Park (CNHM). TENNESSEE: Cumberland County: Grassy Cove (CAS, UMMZ). Davidson County: Madison (CU); Nashville (AMNH, USNM). Maury County: Columbia (ANSP). County not determined: Cedar Glade (USNM).

Evarthrus parasodalis new species

Figures 49, 112, 133

Recognition. – The following combination of structures characterizes this species: pronotum with sides not sinuate or obsoletely sinuate in front of posterior angles, posterior angles not prominent and broadly obtuse; apex of median lobe of male genitalia short and broad, right paramere rather narrow apically; range, Arkansas. These features distinguish *parasodalis* from the similar *sodalis lodingi* which has the following corresponding features: pronotum with more produced sides, distinctly sinuate in front of posterior angles; apex of median lobe elongate and narrow, right paramere broader apically; known from northern Alabama and Tennessee.

Description. – HOLOTYPE, male, labelled as follows: "Washington Co., Ark. 1962 Trap A 29–VI; HOLOTYPE Evarthrus parasodalis R. Freitag (red label)." MCZ.

Body length 16.9 mm, width 7.1 mm. Form typical of *sodalis* group.

Microsculpture: head between eyes and disc of pronotum with isodiametric and amorphic meshes; intervals of elytra with transversely stretched meshes. Integument of dorsum moderately glossy.

Head length 1.9 mm, width 3.7 mm; frontal groove deep, broadly impressed, middle bend with convexity directed medially. Penultimate article of labial palpus with three medial and three apical setae.

Pronotum length 4.8 mm, width 5.9 mm; form subcordate in outline as in fig. 49; disc of average convexity; sides not prominent, constricted slightly anteriorly, moderately posteriorly, not sinuate in front of posterior angles; posterior angles not prominent, broadly obtuse; anterior transverse impression complete, obsoletely impressed medially; basal lateral foveae with sides not continuous posterio-medially, amorphic depression medially beside inner side; lateral bead gradually broadened posteriorly. Prosternal process with obsolete longitudinal groove. Anterior faces of middle femora with eight setae on one and 11 setae on the other.

Elytra length 10.2 mm, width 7.1 mm; sides slightly produced, obsoletely sinuate apically; intervals raised with flattened centres; striae deep with rather small indistinct punctures throughout.

Male genitalia (fig. 112): median lobe moderately arcuate; apical blade short, broad, apex evenly rounded; right paramere elongate, extended to apical half of median lobe, strongly tapered apically; internal sac with serrulate field apically, apical sclerite light amorphic plate with dark basal tooth.

ALLOTYPE, female, labelled as follows: "Washington Co. Ark. VII–16–1960; Forest leaf litter; Otis and Maxine Hite; ALLOTYPE Evarthrus parasodalis R. Freitag (green label)." MCZ.

Body length 16.8 mm, width 7.1 mm. Form same as in holotype except pronotum with sides more strongly constricted posteriorly.

Microsculpture on head between eyes and disc of pronotum same as in holotype; intervals of elytra with raised bead-like isodiametric meshes.

Pronotum moderately glossy; length 4.5 mm, width 5.6 mm.

Elytra dull; length 10.5 mm, width 7.1 mm.

Stylus of ovipositor elongate and quite tapered apically.

Derivation of specific name. – This species is closely related to *sodalis* which is what the name *parasodalis* connotes.

Variation among paratypes (41 males, 40 females, Arkansas). – Total length 15.6 – 19.3 mm. The genitalia of three males were examined in detail and in all respects resemble those of the holotype. One female specimen collected at Hot Springs has produced and rather sharp posterior angles of the pronotum.

Disposition of type material. – The holotype and allotype are in the collections of the MCZ. The paratypes are in the collections of the following: CU, INHS, RF, RTB, UASM and UA.

Collecting notes. – I collected a specimen of *parasodalis* in deciduous forest leaf litter on a hillside near Fayetteville, Arkansas.

Geographical distribution (fig. 133). – This species is known from Arkansas, only. I have seen 83 specimens from the following localities.

United States – ARKANSAS: Conway County: (UA). Franklin County: (UA). Garland County: Hot Springs (UMMZ). Montgomery County: north of Mount Ida (RTB). Washington County: (UA, UASM, CU); Cove Creek, 27 miles northwest of Fayetteville (RF); Cove Creek Valley (CU).

Evarthrus furtivus LeConte, 1852

Figures 50–51, 113, 133

Evarthrus furtivus LeConte, 1852:234. LECTOTYPE (here selected) a male, labelled as follows: "white disc; Type 5662; E. furtivus Lec." MCZ. TYPE LOCALITY, here restricted to Virginia. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:355 (*Eumolops*). – Casey, 1920:195 (*Evarthrinus*). – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Recognition. – Specimens of *furtivus* are extremely difficult to distinguish from individuals of *s. sodalis* by their external nongenitalic structures. The posterior angles of the pronotum of *furtivus* are less broadly rounded than those of *s. sodalis* in southwestern Pennsylvania where their geographical ranges overlap. For a certain identification however, it is necessary to examine the male genitalia.

Description. – Body length 13.0 – 17.0 mm. Form typical of the *sodalis* group with sides of pronotum and elytra somewhat convex.

Microsculpture: head between eyes and disc of pronotum with highly sinuous entwined lines, often almost effaced; intervals of elytra with bead-like or more flattened isodiametric meshes. Integument of dorsum moderately glossy; elytra slightly glossy in some specimens.

Head: frontal grooves not deep, not sharply defined, fairly straight, slightly oblique toward one another. Penultimate article of labial palpus with five setae.

Pronotum subcordiform in outline as in figs. 50 – 51; disc of average convexity; sides slightly or strongly produced, constricted moderately anteriorly, moderately or strongly posteriorly, obsoletely or distinctly sinuate in front of posterior angles; posterior angles produced or not produced, broadly obtuse; anterior transverse impression incomplete; basal lateral fovea with sides usually continuous posteriorly; lateral bead not broadened posteriorly. Prosternal process with shallow or obsolete longitudinal groove. Middle femur with five or six setae on anterior face.

Elytra with apical sinuation obsolete; intervals slightly convex or flat; striae distinct, not deep, indistinctly punctate anteriorly, obsoletely or impunctate posteriorly.

Male genitalia (fig. 113): median lobe slightly arcuate, angle broadly obtuse, apical blade short, broad with apex evenly rounded; right paramere extended to halfway point of median lobe, markedly tapered apically; internal sac with apical serrulate field, apical sclerite light, broad, somewhat triangular with apical end graded into serrulate field around genital opening. The genitalia of 11 males were examined.

Stylus of female ovipositor elongate, moderately tapered apically.

Geographical variation. – Specimens possessing pronota with somewhat sharp posterior angles are common in southwestern Pennsylvania, but decrease in number southward where specimens with more broadly rounded posterior angles are more numerous.

Geographical distribution (fig. 133). – This species ranges from southern Pennsylvania south to Virginia. I have seen 113 specimens collected in the following localities.

United States – DISTRICT OF COLUMBIA: Washington (USNM). MARYLAND: Montgomery County: (USNM). NEW JERSEY: Gloucester County: Malaga (USNM). PENNSYLVANIA: Allegheny County: (CM); Pittsburg (CM). Cumberland County: New Cumberland (CAS, CU, MCZ); Shippensburg (UMMZ). Dauphin County: Harrisburg (CU, MCZ). Fayette County: Ohiopyle (CM). Philadelphia County: Germantown (ANSP); Philadelphia (CAS, MCZ). Westmoreland County: Jeanette (CM). Counties not determined: Inglenook (CAS); Rockville (ANSP, CAS, MCZ). VIRGINIA: Arlington County: Rosslyn (MCZ). Fairfax County: Mount Vernon (USNM). Henrico County: Richmond (AMNH). Nelson County: (USNM). Spotsylvania County: Fredricksburg (MCZ). Counties not determined: Blackpond (MCZ, USNM); Edsall (USNM); Glencarlyn (USNM); Merdon (USNM). WEST VIRGINIA: Pocahontas County: Swamp Creek (TCB).

Evarthrus alternans Casey, 1920

Figures 52, 114, 134

Evarthrinus (Evarthrops) alternans Casey, 1920:196. HOLOTYPE, male, labelled as follows: "Ia; CASEY bequest 1925; TYPE USNM 47131; alternans Csy." USNM. TYPE LOCALITY, Keokuk, Iowa. PARATYPE, female, labelled as follows: "Iowa, CASEY bequest 1925; alternans –2 PARATYPE 47131." USNM. – Leng and Mutchler 1927:10 (*Evarthrinus*). – Csiki, 1930:673 (*Pterostichus*).

Recognition. – The similar *sodalis colossus* is distinguished from *alternans* by structural details of the male genitalia and by the more laterally produced posterior angles of the pronotum (figs. 45–47 cf. fig. 52). These species are largely allopatric.

Description. – Body length 13.4 – 18.4 mm. Form robust notably constricted at base of pronotum.

Microsculpture: head between eyes with highly sinuous entwined lines, occasionally amorphic meshes formed; disc of pronotum with highly sinuous lines or transversely stretched meshes, often partially effaced; intervals of elytra with isodiametric meshes, bead-like in females, flatter in males.

Head moderately glossy; frontal grooves of average depth, somewhat broad, generally straight, slightly oblique toward one another. Penultimate article of labial palpus with six setae.

Pronotum moderately glossy; shape somewhat cordiform in outline as in fig. 52; disc of average convexity; sides markedly produced, moderately constricted anteriorly, strongly and sharply constricted posteriorly, markedly sinuate in front of posterior angles; posterior angles produced, almost right or slightly obtuse; anterior transverse impression incomplete; basal lateral fovea with sides usually continuous posteriorly, medial side with anterior end directed laterally; lateral bead not broad posteriorly. Prosternal process with shallow or obsolete longitudinal groove. Middle femur with six to nine setae on anterior face.

Elytra of males slightly glossy, females dull; apical sinuation obsolete or absent; intervals slightly convex, almost flat; striae of average depth, with small distinct punctures anteriorly, obsoletely punctate or impunctate posteriorly.

Male genitalia (fig. 114): median lobe moderately arcuate, broadly obtuse; apical blade short, broad, with apex very broadly rounded, almost truncate slightly deflected dorsally; right paramere extended to apical half of median lobe, slightly tapered apically; internal sac with serrulate field apically, preapical sclerite light near genital opening with darker basal tooth. The genitalia of 20 males were examined.

Stylus of female ovipositor elongate, slightly tapered apically.

Collecting notes. – Members of this species are found under cover in open grassy places.

Geographical distribution (fig. 134). – Members of this species are common in a relatively restricted range in Iowa and margins of peripheral states. I have seen 830 specimens from the following localities.

United States – ILLINOIS: Adams County: five miles northeast of La Prairie (CNHM). Hancock County: Pilot Knob State Park (ISU). Macoupin County: Chesterfield (RTB). Pike County: Rockport (CAS). IOWA: Appanoose County: Moulton (UMMZ). Boone County: Boone (ISU); Ledges State Park (ISU). Crawford County: (MCZ); Denison (AMNH). Dallas County: Perry (ISU). Davis County: (CAS). De Moines County: Burlington (MCZ). Dickenson County: Cayler Prairie (ISU); Lakeside Laboratory (ISU). Hamilton County: Blairsburg (ISU); five miles south of Stanhope (ISU); Randall

(ISU). Hardin County: Iowa Falls (CNHM). Henry County: Mount Pleasant (CAS, UASM, UMMZ). Johnson County: Iowa City (ANSP, MCZ, UASM, USNM). Lee County: Fort Madison (MCZ). Linn County: Cedar Rapids (UMMZ); Palisades (USNM). Lucas County: Chariton (USNM). Marshall County: State Centre (CU); ten miles west of Marshall Town (ANSP). Montgomery County: Red Oak (ISU). O'Brien County: four miles east of Sanborn (ISU). Page County: Shenandoah (ISU). Palo Alto County: Ruthuen (UMMZ). Plymouth County: Le Mars (ISU). Pochahontas County: Kaslow (ISU). Polk County: Des Moines (ISU). Pottawattamie County: Council Bluffs (ISU). Sioux County: Hawarden (VMK). Story County: Ames (AU, CAS, CU, ISU, MCZ, MSU, UMMZ, USNM, UW); four miles east of Gilbert (ISU); Maxwell (ISU); Nevada (UASM); Soper's Mill Dam near Gilbert (ISU). Tama County: Traer (ISU, USNM). Van Buren County: (ISU). Wayne County: Lineville (ISU). Webster County: three miles west of Dayton (ISU). Winnebago County: Forest City (UMMZ). Thompson (ISU). Counties not determined: Boonsboro (MCZ); Harold (CU); Lake Okoboji (USNM). MINNESOTA: Lincoln County: Lake Benton (VMK). MISSOURI: Livingston County: six miles north of Chillocothe (ISU). St. Louis County: (CU); Overland (CAS); St. Louis (USNM). County not determined: Onandaga Cave (UMMZ). SOUTH DAKOTA: Brookings County: Brookings (VMK); White (VMK). Deuel County: Gary (VMK). WISCONSIN: Bayfield County: (MCZ).

Evarthrus iowensis new species

Figures 53, 115, 134

Recognition. – The following combination of characteristics is diagnostic for the species *iowensis*: small size; pronotum usually with complete anterior transverse impression; elytra with first two umbilicate punctures of umbilicate series with normally raised areas around them, and third puncture as large as either first or third; and form of male genitalia. Specimens of *alternans* generally resemble individuals of *iowensis* but are distinguished by the larger body size, sides of pronotum more strongly constricted posteriorly, incomplete anterior transverse impression of pronotum, and relatively longer right paramere of male genitalia.

The species *substriatus* and *constrictus* also strikingly resemble *iowensis*. In *substriatus* and *constrictus* however the first and second anterior umbilicate punctures have areas between them which are flatter than the normal condition, and the third puncture is distinctly larger than the first two. In addition the male genitalia are different (fig. 115 cf. figs. 116, 117 and 118).

Description. – HOLOTYPE, male, labelled as follows: "Iowa City, Iowa 5–15 Buchanan; Loan from USNM: HOLOTYPE Evarthrus iowensis R. Freitag (red label)." USNM.

Body length 11.7 mm, width 5.0 mm. Form less robust than other species of *sodalis* group.

Microsculpture of head between eyes, disc of pronotum, and intervals of elytra with highly sinuous somewhat sparsely distributed lines, partially effaced. Integument of dorsum glossy.

Head length 1.4 mm, width 2.8 mm; frontal grooves shallow and broad, slightly curved with middle bend directed medially. Penultimate article of labial palpus with two medial and three apical setae.

Pronotum length 3.2 mm, width 4.1 mm; form subcordate in outline as in fig. 53; disc of average convexity; sides prominent, constricted moderately anteriorly and strongly posteriorly, distinctly sinuate in front of posterior angles; posterior angles prominent, sharp, slightly obtuse; anterior transverse impression complete, distinctly impressed throughout; basal lateral fovea with sides continuous posteriorly; lateral bead not broad posteriorly. Prosternal process with longitudinal groove obsolete. Middle femur with five setae on anterior face.

Elytra length 7.1 mm, width 5.0 mm; sides slightly produced, not sinuate apically; intervals almost flat; striae of average depth, indistinctly punctate throughout. Third interval of each elytron with two setae.

Male genitalia (fig. 115): median lobe moderately arcuate; apical blade short, broad, apex evenly rounded, almost truncate; right paramere not extended to apical half of median lobe, strongly tapered apically; internal sac with apical serrulate field, apical sclerite light with darker basal tooth.

ALLOTYPE, female, labelled as follows: "Iowa City, Iowa IV.14 Wickham; Wickham Collection 1933; loan from USNM; ALLOTYPE Evarthrus iowensis R. Freitag (green label)." USNM

Body length 11.5 mm, width 4.9 mm. Form same as in holotype.

Microsculpture on head between eyes and disc of pronotum same as in holotype; intervals of elytra with raised, bead-like isodiametric meshes.

Pronotum glossy; length 3.0 mm, width 3.1 mm.

Elytra slightly glossy; length 7.1 mm, width 4.9 mm.

Stylus of ovipositor slightly tapered apically, apex broadly rounded.

Derivation of specific name. – This species is named *iowensis* because much of its range is in Iowa.

Variation among paratypes (16 males, 15 females, Iowa, Minnesota, South Dakota). – Total length 11.2 – 13.9 mm. The genitalia of five males were examined and varied little or not at all from that of the holotype. The elytra of females are duller than those of the males. The number of setae in the third interval of an elytron varies from one to three.

Disposition of type material. – The holotype and allotype are in the collections of the USNM. The paratypes are in the following collections: CAS, CU, ISU, KLE, MCZ, UASM, UMMZ, USNM, and VMK.

Collecting notes. – V. M. Kirk has collected specimens of *iowensis* in corn fields in southeastern South Dakota.

Geographical distribution (fig. 134). – This species is confined to Iowa, Minnesota and South Dakota. I have seen 33 specimens from the following localities.

United States – IOWA: Dickinson County: Cayler Prairie (ISU, UASM). Howard County: Elma (USNM). Johnson County: Iowa City (USNM). Story County: Ames (ISU). Woodbury County: Sioux City (UMMZ). MINNESOTA: Olmsted County: Rochester (CU). SOUTH DAKOTA: Brookings County: Brookings (VMK). Hutchinson County: Menno (VMK). Yankton County: Yankton (VMK)

The *substriatus* Group

Characteristics. – Penultimate article of labial palpus with four or five setae. Pronotum with sides strongly constricted posteriorly; anterior transverse impression complete or not complete. Prosternal process with shallow or obsolete longitudinal groove without setae apically. Middle femur with four to seven setae on anterior face. First two anterior punctures of umbilicate series of elytra without normally raised ridges around them, third umbilicate puncture distinctly larger than first two. Median lobe of male genitalia strongly arcuate; internal sac with elongate narrow amorphic plate.

This group includes *substriatus* and *constrictus* whose aggregate geographical range includes the grasslands of central United States and northwestern Mexico.

Evarthrus substriatus LeConte, 1848

Figures 54, 77–78, 116–117, 134

Feronia (Molops) substriata LeConte, 1848:344. LECTOTYPE (here selected) a female, labelled as follows: "green disc; Type 5616; E. substriatus Lec." MCZ. TYPE LOCALITY, near the Rocky Mountains. – LeConte, 1852:233 (*Evarthrus*). – LeConte, 1858:28. – LeConte, 1863a:8. – LeConte, 1873:319. – LeConte, 1876:519. – Schaupp, 1880:49. – Casey 1918:343 (*Anaferonia*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*).

Evarthrus latebrosus LeConte, 1852:233. LECTOTYPE (here selected) a male, labelled as follows: "green disc; Type 5617; E. latebrosus Lec." MCZ. TYPE LOCALITY, Missouri Territory. – LeConte, 1863a:8 (*Evarthrus*). – LeConte, 1873:319. – Schaupp, 1880:49. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia evanescens Casey, 1918:343. HOLOTYPE, female, labelled as follows: "Mex; CASEY bequest 1925; TYPE USNM 47100; evanescens Csy." USNM. TYPE LOCALITY, Colonia Garcia, Sierra Madre Mts., Chihuahua, Mexico. NEW SYNONYMY. – Csiki, 1930:671 (*Pterostichus*). – Leng and Mutchler, 1933:12.

Anaferonia pantex Casey, 1918:344. HOLOTYPE, female, labelled as follows: "Tex; CASEY bequest 1925; TYPE USNM 47099; Anaferonia pantex Csy." PARATYPES, two males and three females, labelled as follows: "Tex; CASEY bequest 1925; pantex –2 to pantex –6; PARATYPE USNM 47099." USNM. NEW SYNONYMY. – Csiki, 1930:671 (*Pterostichus*). – Leng, 1920:56 (*Anaferonia*).

Recognition. – The species *substriatus* can be separated from the structurally similar *constrictus* by the following characters: elytra with marked apical sinuation, plica large; last external abdominal sternum with prominent dorsal lateral knob that articulates with plica (more distinct in females); elytral striae almost effaced in some specimens; apex of apical blade of median lobe of male evenly rounded. In contrast with these the structures of *constrictus* are as follows: elytra with slight apical sinuation; plica average for subgenus; last external abdominal sternum with slightly raised mound that fits onto plica; elytral striae always distinctly impressed; apex of apical blade of median lobe more truncate.

Specimens of *iowensis* also can be mistaken for those of *substriatus*. The structures that distinguish them are recorded in the recognition section of *iowensis*.

Description. – Body length 9.5 – 14.5 mm. Form short with broad pronotum.

Microsculpture: head between eyes and disc of pronotum with sparsely distributed sinuous lines and/or amorphic meshes, largely effaced; intervals of elytra with isodiametric meshes.

Head slightly or moderately glossy; frontal grooves of average depth, bent medially with convexity directed medially. Penultimate article of labial palpus with four or five setae.

Pronotum moderately or slightly glossy; shape in outline as in figs. 54–55; disc of average convexity; sides markedly produced, moderately constricted anteriorly, strongly constricted posteriorly, strongly sinuate in front of posterior angles; posterior angles prominent, approximately right; anterior transverse impression complete or not complete; basal lateral fovea with sides continuous posteriorly, shape as in fig. 54. Prosternal process with shallow or obsolete longitudinal groove. Middle femur with four to six setae on anterior face.

Elytra slightly glossy; apical sinuation sharply defined (fig. 78); intervals slightly convex or completely flat; one to three setae on the third interval of elytron; striae very shallow with impunctate obsolete dashes, or of average depth and indistinctly punctate; plica large and prominent (fig. 77).

Last external abdominal segment with prominent dorsolateral knob which fits onto plica.

Male genitalia (fig. 116 – 117): median lobe strongly arcuate, angle approximately right; apical blade elongate, apex evenly rounded, right paramere extended to halfway point of median lobe or shorter, apically slightly curved or straight, tapered apically; internal sac with apical serrulate field, apical sclerite light, elongate. The genitalia of 23 males were studied.

Stylus of female ovipositor of average size, slightly tapered apically.

Geographical variation. – The pronotum is not markedly constricted posteriorly in specimens from the southern end of the species range. In specimens from the state of Durango, Mexico, for example, the sides of the pronotum are generally less prominent than those of fig. 54. Further north in the state of Chihuahua, Mexico, specimens have a pronotum with produced sides (fig. 54). The shape of the pronotum gradually changes northward until the common condition is a pronotum with strongly produced sides and a marked posterior constriction, which is like that of *constrictus* shown in fig. 55.

There is also a south-north cline in the depth of the striae of the elytra. In Mexico the striae are obsolete and impunctate. These become gradually deeper and more distinctly punctate northward.

The intervals of the elytra correspondingly change clinally from a completely flat condition in Mexico to distinctly convex in Kansas and Nebraska.

The male genitalia of Durango specimens differ from those of individuals from the rest of the species range (fig. 117 cf. fig. 116). In Durango, the median lobe is usually strongly arcuate, and the right paramere is slightly curved. Further north the median lobe is more broadly rounded and the right paramere is straighter.

Notes on synonymy. – The lectotype of *latebrosus* LeConte is a *substriatus* specimen with impressed elytral striae.

The type specimen of *evanescens* Casey represents an average *substriatus* specimen that is found in northern Mexico. The type specimen of *pantex* Casey is a *substriatus* specimen of the average kind found in Texas.

Collecting notes. – G. E. Ball collected specimens of this species in dry pine forest in Mexico, and under tumbleweed in desert areas of New Mexico. Specimens are also found under cover in open places such as pastures and corn fields.

Geographical distribution (fig. 134). – This species ranges from Durango, Mexico, north to southern Wyoming and Minnesota, and from eastern Arizona east to the eastern regions of Nebraska, Kansas, Oklahoma and Texas. I have seen 525 specimens from the following localities.

Mexico – CHIHUAHUA: Guerrero (USNM); Miñaca (GEB); 31.9 miles south of Miñaca (GEB). DURANGO: Arroyo Hondo near LaFlor (DRW, GEB); Ciudad (AMNH); 18 miles east of El Salto (AMNH); J. Manuel 9300', El Salto (CAS); Otinapa (DRW, GEB); two miles east of La Ciudad (CNC).

United States – ARIZONA: Cochise County: Huachuca Mountains (GEB). Pima County: Madera Canyon, St. Rita Mountains (GEB). COLORADO: Fremont County: Canon City (UASM). Huerfano County: Walsenburg (UMMZ). Las Animas County: Trinidad (USNM). Logan County: Sterling (AMNH, USNM). Prowers County: Granada (CAS, MCZ).

County not determined: Regnier (AMNH). KANSAS: Chase County: Elmdale (KSU). Clark County: (CNC, UK). Dickinson County: (CNHM). Douglas County: (UK). Ford County: (UMMZ); Dodge City (UK). Geary County: Fort Riley (CAS); Junction City (UMMZ). Gove County: (UK). Hamilton County: (CNHM, UK). Harvey County: Sedgewick (CAS, USNM). Kearny County: Lakin (MCZ). Kiowa County: Belvidere (UK). Meade County: (USNM). Ness County: Ness City (UK). Pottawatomie County: Onaga (CAS). Reno County: (UMMZ, USNM). Riley County: (USNM); Manhattan (FDPI, KSU, USNM). Scott County: Scott City (USNM). Sedgwick County: Mount Hope (USNM). Shawnee County: Topeka (CNHM, USNM). Sheridan County: State Lake, near Studley (RF, UK). Sherman County: five miles west of Goodland (RF); Goodland (CAS). Thomas County: Colby (RF). Wallace County: (CAS, UK, USNM); Sharon Springs (CNHM). Wilson County: Benedict (UK). MINNESOTA: Hennepin County: Bloomington (AMNH). NEBRASKA: Furnas County: Cambridge (MCZ). Lancaster County: Lincoln (CAS). Red Willow County: Indianola (MCZ). NEW MEXICO: Colfax County: Raton (CAS). Lincoln County: Ruidoso (CAS). McKinley County: Coolidge (AMNH, MCZ, USNM); near Ramah (GEB). Otero County: Cloudcroft (ANSP, CAS, CNHM, CNC, GEB, MCZ, UASM, UK, USNM); Mescalero Reservation (MCZ); Sacramento (MCZ); Sacramento Mountains (CAS); 16 Springs Canyon, Sacramento Mountains (GEB). Quay County: Tucumcari (MCZ, USNM). San Miguel County: Las Vegas (CAS); Las Vegas near Hot Springs (UK); Porvenir (CAS). Santa Fe County: Sante Fe (ANSP, CAS). Torrance County: Tajique (UK). County not determined: Tajano Experimental Station (CAS). OKLAHOMA: Beckham County: (CAS). Cleveland County: Norman (CAS). Comanche County: Fort Sill Military Reservation (UMMZ); Wichita National Forest (CAS, UMMZ). Custer County (CAS). Garfield County: Enid (AMNH). Harmon County: seven miles southwest of Hollis (UMMZ). Oklahoma County: Oklahoma City (CAS). Woods County: (CAS). SOUTH DAKOTA: Yankton County: Yankton (VMK). TEXAS: Baylor County: eight miles south of Seymour (CNHM). Bastrop County: Bastrop State Park (CNC). Bexar County: Somerset (CAS). Blanco County: (UMMZ); Round Mountain (AMNH, CAS, CNHM, RU). Brazos County: College Station (RU). Brewster County: Alpine (USNM); two miles south of Alpine (CAS). Brown County: Brownwood (RU). Comal County: New Braunfels (USNM). Coryell County: Gatesville (AMNH). Crockett County: Ozona (AMNH). Dallam County: Rita Blanca Lake, Dalhart (AMNH). Dallas County: Dallas (MCZ). DeWitt County: Cuero (AMNH). Edwards County: eight miles northeast of Rocksprings (TCB). Gillespie County: Fredricksburg (RU). Hays County: San Marcos (CNHM). Howard County: Big Spring (CAS, USNM). Jeff Davis County: Davis Mountains (CAS); Davis Mountains, six – ten miles west of Fort Davis (GEB); Davis Mountains, 10 miles north of Fort Davis (DL); Fort Davis (CNC, MCZ); Limpia Canyon (DRW, GEB). Kerr County: Kerrville (CNC); nine miles southwest of Kerrville (GEB); 20 miles southeast of Kerrville (CNC). Kleberg County: Riviera (DRW). Llano County: Llano (AMNH). Pecos County: Blackstone Ranch, 16 miles south of Sheffield (GEB); Fort Stockton (UMMZ). Runnels County: Ballinger (RU). San Patricio County: Lake Corpus Christi (UMMZ). Taylor County: Abiline (AMNH, CAS); 25 miles southwest of Abiline (CNHM). Terrell County: Chandler Ranch (GEB); 16 miles north of Dryden (GEB). Tom Green County: Christoval (AMNH, TAM); San Angelo (RU). Travis County: (UMMZ); Austin (CAS, MCZ, USNM). Uvalde County: one mile south of Montell (TCB); Uvalde (CNHM). Wichita County: Wichita Falls (CAS). Williamson County: Georgetown (TCB); Leander (TCB). County not determined: Camp Bullis (DRW). WYOMING: Laramie County: Cheyenne (UMMZ).

Evarthrus constrictus Say, 1823

Figures 55, 79–80, 118, 134

Feronia constricta Say, 1823b:147. Type lost. TYPE LOCALITY, Arkansas River near the Rocky Mountains. – LeConte, 1848:344 (*Feronia*). – LeConte, 1852:233 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:345 (*Anaferonia*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*). – Van Dyke, 1943:27 (*Anaferonia*). – Blackwelder and Blackwelder, 1948:2 (*Evarthrus*).

Feronia (Molops) ovipennis LeConte, 1848:345. LECTOTYPE (here selected) a female, labelled as follows: "green disc; Type 5619; E. ovipennis Lec." MCZ. TYPE LOCALITY, near the Rocky Mountains. – LeConte, 1852:232 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:319. – Schaupp, 1880:49. – Casey, 1918:343 (*Anaferonia*). – Leng, 1920:56. – Csiki, 1930:671 (*Pterostichus*). – Van Dyke, 1943:26 (*Evarthrus*). – Blackwelder and Blackwelder, 1948:2.

Anaferonia vernicata Casey, 1918:344. HOLOTYPE, male, labelled as follows: "N. M. CASEY bequest 1925; TYPE USNM 47105; vernicata Csy." USNM. TYPE LOCALITY, Alamogordo, New Mexico. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia pimalis Casey, 1918:345. HOLOTYPE, female, labelled as follows: "Ari; CASEY bequest 1925; TYPE USNM 47106; pimalis Csy." USNM. TYPE LOCALITY, Southern Arizona. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia latebrosus; Casey, 1918:346 (not LeConte).

Anaferonia pudica Casey, 1918:346. HOLOTYPE, female, labelled as follows: "Tex; CASEY bequest 1925; TYPE USNM 47101; pudica Csy." USNM. TYPE LOCALITY, Texas. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia papago Casey, 1918:346. HOLOTYPE, female, labelled as follows: "Ari; CASEY bequest 1925; TYPE USNM 47102; papago Csy." USNM. TYPE LOCALITY, Arizona. NEW SYNONYMY. – Leng, 1920:56 (*Anaferonia*). – Csiki, 1930:671 (*Pterostichus*).

Anaferonia lixa; Leng, 1920:56 (not LeConte).

Pterostichus (Pterostichus) (Sect *Anaferonia) lixa*; Csiki, 1930:671 (not LeConte).

Recognition. – Specimens of *constrictus, substriatus* and *iowensis* are structurally similar. Their distinguishing features are described in the recognition sections of the two preceeding species.

Description. – Body length 9.5 – 12.8 mm. Form relatively less robust than other species of the subgenus *Evarthrus*.

Microsculpture: head between eyes, disc of pronotum with lines partially or completely effaced; sparsely distributed sinuous lines; intervals of elytra with largely effaced to distinct isodiametric meshes.

Head glossy; frontal grooves of average depth, curved with convexity directed medially. Penultimate article of labial palpus with two median and four apical setae.

Pronotum glossy; shape as in fig. 55; disc strongly convex; sides markedly produced, strongly constricted posteriorly with marked sinuation in front of posterior angles; posterior angles produced, acute or nearly so; anterior transverse impression complete; basal lateral fovea with sides continuous posteriorly. Prosternal process with shallow or obsoletely impressed longitudinal groove. Middle femur with six or seven setae on anterior face.

Elytra of males moderately glossy; females slightly duller; apical sinuation not sharply defined (fig. 80); intervals of average convexity or slightly flatter; striae distinctly impressed with small punctures anteriorly; impunctate posteriorly; plica not prominent (fig. 79).

Last external abdominal segment with low dorsal convexity articulating with plica.

Male genitalia (fig. 118) with median lobe strongly arcuate, angle almost right, ventral median hump present or absent; apical blade elongate, apex almost truncate, apical lateral edges strongly deflected dorsally; right paramere extended to halfway point of median lobe, slender apically; internal sac with serrulate field apically, apical sclerite dark, elongate. The genitalia of 11 males were examined.

Stylus of female ovipositor of average size, slightly tapered apically.

Notes on synonymy. – The original description of *constrictus* Say was used to identify this species. The lectotype of *ovipennis* LeConte is an average specimen of *constrictus*. The type specimens of *vernicata* Casey, *pimalis* Casey, *pudica* Casey, and *papago* Casey are all average *constrictus* specimens.

Collecting notes. – This species has been collected in corn fields, and open pasture under rocks.

Geographical distribution (fig. 134). – The range of this species extends as a relatively narrow band from Arizona east to Kansas and Nebraska. I have seen 218 specimens from the following localities.

United States – ARIZONA: Apache County: eight – 15 miles northeast of White River (AMNH); McKay's Peak, White Mts. (AMNH); White Mts. (AMNH, CAS, MCZ); Springville (UMMZ); White Mountain Reservation, east of McNary (AMNH). Coconino County: five miles northwest of Flagstaff (AMNH); eight miles south of Flagstaff (GEB); Flagstaff (CAS); 23 miles southwest of Heber (UMMZ); Williams (CAS, USNM). Gila County: Globe (MCZ). Navajo County: Heber (UMMZ); Show Low (CAS). COLORADO: Denver County: Denver (CAS). El Paso County: Colorado Springs (AMNH, CAS, MCZ, USNM). Huerfano County: Gardner (AMNH); LaVeta (CAS). Otero County: LaJunta (MCZ). Prowers County: Granada (CAS, MCZ). Pueblo County: (MCZ). County not determined: Clayton (CNHM). IOWA: Woodbury County: Sioux City (USNM). Clark County: (CAS, CNHM, MCZ, UASM, UK). Douglas County: (UK). Ford County: Dodge City (UK). Grove County: (UK). Greeley County: (UK). Hamilton County: (UK). Harvey County: Sedgewick (CAS). Reno County: (UMMZ, USNM); Hutchinson (CAS); Medora (UK). Scott County: Scott City (USNM). Wallace County: (UK); Sharon Springs (CNHM); Wallace (USNM). County not determined: Fort Hayes (MCZ). NEBRASKA: Lancaster County: Lincoln (CAS). NEW MEXICO: Catron County: Luna (UMMZ); seven miles south of Luna (AMNH). Colfax County: Koehler (USNM); Prairie, near Koehler (CAS, USNM). Quay County: Tucumcari (USNM). San Doval County: Jemez Mountains (CAS). San Miguel County: Beulah (ANSP, CAS); Las Vegas (INHS); Porvenir (CAS). Counties not determined: Pinedale (GEB); Tres Ritos (CAS); Water Canon (UK). SOUTH DAKOTA: Hutchinson County: Menno (VMK). Yankton County: Yankton (VMK). County not determined: Cedar Pass (USNM). TEXAS: Bell County: Belton Dam (CU). Bexar County: 20 miles north of San Antonio (CAS). Hemphill County: Canadian (CAS). McLennan County: China Springs (CNHM). Tarrant County: Fort Worth (MCZ). Travis County: Austin (MCZ).

The *torvus* Group

Characteristics. – Penultimate article of labial palpus with five to seven setae. Pronotum more or less quadrate, not markedly constricted posteriorly, disc usually rugose, sides not very prominent, distinctly sinuate in front of posterior angles; anterior transverse impression complete. Prosternal process with shallow or obsolete longitudinal groove, without setae. Middle femur with six – ten setae on anterior face. Male genitalia with apical blade of median lobe relatively short and evenly rounded.

The species *torvus* and *gravidus* are included in this group. Both occur west of the Mississippi River and occupy the Great Plains from Texas north to South Dakota.

Evarthrus torvus LeConte, 1863

Figures 56–57, 119–120, 135

Evarthrus torvus LeConte, 1863b:9. LECTOTYPE (here selected) a male, labelled as follows: "Col; Type 5657; E. torvus Lec." MCZ. TYPE LOCALITY, Colorado. – LeConte, 1863a:8 (*Evarthrus*). – Schaupp, 1880:49. – Casey, 1918:356 (*Eumolops*). – Leng, 1920:57. – Csiki, 1930:672 (*Pterostichus*).

Feronia (Evarthrus) acuminata Chaudoir, 1868:52. LECTOTYPE, male, one of two unlabelled specimens of both sexes, beside which is a box label: "Tejas." MHNP. NEW SYNONYMY.

Eumolops prominens Casey, 1918:353. HOLOTYPE, female, labelled as follows: "Fla; CASEY bequest 1925; TYPE USNM 47128; prominens Csy." USNM. TYPE LOCALITY, Florida (this locality is probably incorrect). NEW SYNONYMY. – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Eumolops sexualis Casey, 1918:354. HOLOTYPE, male, labelled as follows: "N. M.; CASEY bequest 1925; TYPE USNM 47124; Eumolops sexualis, Csy." USNM. TYPE LOCALITY, New Mexico. PARATYPE, one male and one female, labelled as follows: "N. M.; CASEY bequest 1925; *sexualis* –2 and *sexualis* –3; PARATYPE USNM 47124." NEW SYNONYMY. – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Eumolops inflatula Casey, 1918:354. HOLOTYPE, female, labelled as follows: "Col; CASEY bequest 1925; TYPE USNM 47127; inflatula Csy." USNM. TYPE LOCALITY, Akron, Colorado. NEW SYNONYMY. – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Eumolops (Evarthrinus) decepta Casey, 1918:357. HOLOTYPE, female, labelled as follows: "Ind; CASEY bequest 1925; TYPE USNM 47356; Evarthrinus deceptus Csy." USNM. TYPE LOCALITY, Indiana (this locality is incorrect). NEW COMBINATION. – Casey 1920:194 (*Evarthrinus*). – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Eumolops (Evarthrinus) impolita Casey, 1918:358. HOLOTYPE, male, labelled as follows: "Tex; CASEY bequest 1925; TYPE USNM 47130; impolita Csy." USNM. TYPE LOCALITY, Texas. PARATYPE, female, labelled as follows: "Tex; CASEY bequest 1925; impolita –2 PARATYPE USNM 47130." USNM. NEW SYNONYMY. – Casey, 1920:195 (*Evarthrinus*). – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:673 (*Pterostichus*).

Evarthrinus (Evarthrinus) minax Casey, 1920:194. HOLOTYPE, male, labelled as follows: "L; CASEY bequest 1925; TYPE USNM 47124; minax Csy." USNM. TYPE LOCALITY, Indiana (this locality is probably incorrect). PARATYPE, female, labelled as follows: "Ind; CASEY bequest 1925; minax –2 PARATYPE USNM 47129." USNM. NEW SYNONYMY. – Leng and Mutchler 1927:10 (*Evarthrinus*). – Csiki, 1930:673 (*Pterostichus*).

Recognition. – The following characteristics are diagnostic for *torvus*: pronotum moderately constricted anteriorly and posteriorly, subcordiform, almost quadrate, sides not strongly produced (figs. 56–57), disc and basal fovea rugose north and west of Oklahoma; male genitalia (figs. 119–120).

Specimens of the similar species *gravidus* are generally broader than are those of *torvus*. In addition the pronotum of *gravidus* is more quadrate with distinctly crenulated sides in front of the basal angles, and the sides of the basal foveae are not continuous posteriorly (fig. 58). Further these two species can be separated by their different genitalic structures, (figs. 119–120 cf. fig. 121).

Specimens of *iowensis* are also similar to southern *torvus* individuals. The species are allopatric and are also distinguished by their genitalia (fig. 115 cf. figs. 119–120).

Description. – Body length 12.7 – 19.5 mm. Form robust or slender and elongate.

Microsculpture: head between eyes and disc of pronotum with sinuous lines distinctly defined or effaced; intervals of elytra with isodiametric meshes occasionally slightly stretched longitudinally.

Head moderately glossy; frontal grooves of average depth, somewhat broad, curved with convexity directed medially. Penultimate article of labial palpus with five or six setae.

Pronotum slightly or moderately glossy, more or less rugose or smooth; shape as in figs. 56–57; disc of average convexity; sides not strongly produced, slightly or moderately constricted anteriorly, moderately constricted posteriorly, distinctly sinuate in front of posterior angles; posterior angles prominent, approximately right; anterior transverse impression complete; basal lateral fovea markedly rugose or not, sides almost always continuous posteriorly. Prosternal process with longitudinal groove slightly impressed or obsolete. Middle femur with six to nine setae on anterior face.

Elytra glossy to dull; apical sinuations slight or obsolete; intervals distinctly convex to flat; one to three setae on third interval; striae of average depth, with small distinct punctures in anterior half, impunctate posteriorly.

Male genitalia (figs. 119–120) with median lobe moderately arcuate, angle broadly obtuse; apical blade of average length or shorter, apex evenly rounded; right paramere extended to apical half of median lobe or shorter, strongly tapered apically; internal sac with apical serrulate field, apical sclerite light, elongate, basal and curled in or not. The genitalia of 11 males were examined.

Stylus of female ovipositor of average size, slightly tapered apically.

Geographical variation and subspecies. – This species can be divided into two geographically separate groups of populations, one south and east of Oklahoma, the other north and west of Oklahoma. In Oklahoma there are intermediate forms. Specimens of western and northern populations are characterized by the following structures: body form robust; pronotum with disc and basal lateral foveae deeply rugose; elytra of male glossy, female slightly glossy, usually one seta in third interval; scutellar striae present; median lobe of male with apical blade of average length; internal sac of median lobe with light apical sclerite recurved basally. The corresponding structures of southern specimens differ as follows: body more slender and elongate; pronotum with disc and basal lateral foveae with normal sculpturing; elytra of males slightly glossy, females matte, two or three setae normally in third interval; scutellar striae absent; apical blade of median lobe short; internal sac with light apical sclerite not recurved basally.

I regard these populations as subspecies, *torvus torvus* north and west of Oklahoma, and *torvus deceptus* further south and east.

Notes on synonymy. – The lectotype of *torvus* is similar to the common form that inhabits Colorado. The type specimens of *prominens* Casey, *sexualis* Casey, and *inflatula* Casey all look like the lectotype of *torvus* LeConte. The type specimens of *decepta* Casey, *impolita* Casey, and *minax* Casey are the average specimens from southern portions of this species range that have dull elytra and three punctures in the third interval of the elytron.

Collecting notes. – D. J. Larson and I collected *t. torvus* specimens under logs in a dried out stream bed near Castle Rock, Colorado and under boards in a farmyard near Colby, Kansas. G. E. Ball collected some specimens under rocks near the river, Cache la Poudre, Colorado. Specimens have also been taken in corn fields.

Geographical distribution (fig. 135). – This species inhabits the Great Plains from southern Texas north to South Dakota.

E. torvus torvus

I have seen 307 specimens from the following localities.

United States – ARKANSAS: Hempstead County: Hope (UMMZ). COLORADO: Adams County: Bennett (CAS). Boulder County: Boulder (CNC). Clear Creek County: Empire (CAS). Denver County: Denver (CAS, CNHM, CU, GEB, USNM). Douglas County: *ten miles north of Castle Rock* (DL, RF). Jefferson County: Golden (CAS). Larimer County: Fort Collins (CAS, KSU, RTB); Loveland (CAS); Poudre Canyon (GEB). Weld County: Greeley (CAS). Counties not determined: Genessee Mountain Park (CAS); Lookout Mountain (CAS). IOWA: Louisa County: Oakville (ISU). O'Brien County: four miles east of Sanborn (ISU). KANSAS: Chase County: Elmdale (KSU). Cheyenne County: (KSU). Clay County: (ANSP, CAS, UMMZ, USNM). Doniphan County: Wathena (USNM). Douglas County: (CU, KSU, MCZ); five miles north of Baldwin City (DL). Geary County: Junction City (UMMZ). Harper County: Harper (USNM). Kiowa County: Belvidere (KSU). Marion County: Marion (CAS). Pottawatomie County: Onaga (CAS, MCZ, USNM, UW). Riley County: (CNHM, USNM); Manhattan (KSU, USNM). Sedgwick County: Mount Hope (ANSP, UMMZ, USNM). Sherman County: Goodland (CAS, CNHM). Sumner County: Wellington (USNM). Thomas County: Colby (RF). Wabaunsee County: (KSU). Wallace County: Sharon Springs (CNHM); Wallace (KSU). Wilson County: (CNHM); Benedict (CAS). Wyandotte County: Argentine (AMNH, MCZ). MISSOURI: Carter County: Van Buren (UMMZ). Greene County: Willard (ANSP). St. Charles County: St. Charles (MCZ). Vernon County: (GEB). NEBRASKA: Cedar County: Randolph (MCZ). Furnas County: Cambridge (MCZ). Hall County: Jct. U. S. 34 and Platte River near Grand Island (GEB). Lancaster County: Lincoln (CAS, CNHM, USNM). Phelps County: Holdredge (CAS). Platte County: near Platte (CAS). Red Willow County: McCook (USNM). NEW MEXICO: Dona Ana County: near Rincon (MCZ). Otero County: Bent (CU); Cloudcroft (CAS, GEB, MCZ, USNM); Mescalero Reservation (CU). San Miguel County: Gallinas Cañon (MCZ); Las Vegas (CAS, INHS, KSU); Sapello Creek (GEB). OKLAHOMA: Canadian County: Yukon (CAS). Cleveland County: (CAS). Kingfisher County: Kingfisher (ANSP). Murray County: (CAS). Tulsa County: Tulsa (CAS, CNHM). County not determined: Wichita National Forest (CAS). SOUTH DAKOTA: Custer County: (VMK). Fall River County: five miles south of Hot Springs (AMNH). Lawrence County: Spearfish (VMK). TEXAS: Hidalgo County: Edinburg (UMMZ), (probably incorrectly labelled).

E. torvus deceptus

I have seen 28 specimens collected in the following localities.

United States – TEXAS: Dallas County: Dallas (MCZ, RTB). DeWitt County: Cuero (AMNH). El Paso County: El Paso (CM). Grayson County: Sherman (MCZ). Grimes County: Roans Prairie (AMNH). Lee County: Fedor (CM). Montague County: Forestburg (UMMZ). Tom Green County: Cristoval (AMNH).

Evarthrus gravidus Haldeman, 1853

Figures 58, 121, 135

Evarthrus gravidus Haldeman, 1853:361. Type lost. TYPE LOCALITY, Texas (here selected). – LeConte, 1858:28 (*Evarthrus*). – LeConte, 1863a:8. – LeConte, 1873:318. – Schaupp, 1880:49. – Casey, 1918:354 (*Eumolops*). – Leng, 1920:57. – Csiki, 1930:672 (*Pterostichus*).

Eumolops ampla Casey, 1918:353. HOLOTYPE, female, labelled as follows: "Tex.; CASEY bequest 1925; TYPE USNM 47126; ampla Csy." USNM. TYPE LOCALITY, Texas. NEW SYNONYMY. – Leng, 1920:57 (*Eumolops*). – Csiki, 1930:672 (*Pterostichus*).

Recognition. – The robustness of the body, crenulate sides near the basal angles of the pronotum, and lateral basal foveae of pronotum broad with sides not continuous posteriorly, combined, distinguish members of *gravidus* from specimens of all other species of *Evarthrus*.

The pronotum of specimens of *torvus* is more constricted posteriorly than that of specimens of *gravidus*. Also the sides of the basal lateral foveae of the pronotum are continuous posteriorly in *torvus* but not in *gravidus*.

Description. – Body length 15.5 – 21.7 mm. Form robust.

Microsculpture: head between eyes and disc of pronotum with sinuous lines and amorphic meshes, sometimes partially effaced; intervals of elytra with isodiametric meshes. Integument of dorsum moderately glossy.

Head: frontal grooves of average depth, bent with convexity directed medially. Penultimate article of labial palpus with six or seven setae.

Pronotum with surface more or less rugose; shape somewhat quadrate as in fig. 58; disc of average convexity; sides not strongly produced, moderately constricted anteriorly, slightly constricted posteriorly, slightly sinuate in front of posterior angles, crenulated posteriorly; posterior angles sharp, approximately right; anterior transverse impression complete; basal lateral fovea with sides usually not continuous posterio-medially. Prosternal process with longitudinal groove shallow or obsolete. Middle femur with eight to ten setae on anterior face.

Elytra slightly or obsoletely sinuate apically; intervals of normal convexity or completely flat; one to three setae on third interval; striae of average depth or more shallow, apical two thirds with small punctures, impunctate posteriorly.

Male genitalia (fig. 121): median lobe strongly arcuate, angle slightly acute; apical blade short with apex evenly rounded; right paramere large, extended to apical third of median lobe, moderately tapered apically; internal sac with apical serrulate field, apical sclerite light, elongate, with basal tooth. The genitalia of four males were examined.

Stylus of female ovipositor slightly tapered apically with apex broadly rounded.

Notes on synonymy. – I selected Texas as the type locality because *gravidus* is known from Texas only. The type specimen of *ampla* Casey is an average *gravidus* specimen.

Geographical distribution (fig. 135). – This species is confined to Texas. I have seen 137 specimens from the following localities.

United States – TEXAS: Collin County: Plano (USNM). Comal County: New Braunfels (CU, USNM). Dallas County: Dallas (USNM). El Paso County: El Paso (CAS). Kerr County: Kerrville (CNC). Lee County: Fedor (CAS, CM). McLennan County: China Springs (CNHM); Waco (MCZ). Montague County: Forestburg (UMMZ). Travis County: Austin (MCZ, USNM). Victoria County: Victoria (USNM). County not determined: Therman (MCZ).

The *gigas* Group

Characteristics. – Body size large. Penultimate article of labial palpus with five or six setae. Pronotum strongly constricted posteriorly, posterior angles prominent, anterior transverse impression complete, prosternal process with obsolete longitudinal groove. Middle femur with 7 – 11 setae on anterior face. Male genitalia with short, stub-like, right paramere and apical blade of median lobe twisted 45° from horizontal plane, or right paramere long and apical blade with left side deflected dorsally.

The species *gigas, heros* and *sallei* form this group. All three are known from eastern Texas, southern Oklahoma, and Arkansas.

Evarthrus sallei LeConte, 1873

Figures 59, 122, 136

Evarthrus sallei LeConte, 1873:319. LECTOTYPE (here selected) a male, labelled as follows: "9; red disc; Type 5663; E. sallei Lec." MCZ. TYPE LOCALITY, Texas. – Schaupp, 1880:49 (*Evarthrus*). – Casey, 1918:356 (*Eumolops*). – Leng, 1920:57. – Csiki, 1930: 672 (*Pterostichus*).

Recognition. – The following combination of characteristics is diagnostic of this species: basal lateral fovea of pronotum with sides continuous posteriorly forming straight base; elytra with marked apical sinuation, intervals of males with transversely stretched meshes comprising microsculpture; male genitalia with reduced stub-like paramere, apical blade of median lobe twisted 45° from horizontal plane.

The subspecies *sodalis colossus* is similar to *sallei* in general appearance, but the basal lateral fovea is U-shaped at the base. In addition these species are allopatric.

Description. – Body length 18 – 21 mm. Form robust, body with relatively parallel sides.

Microsculpture: head between eyes and disc of pronotum with sparsely distributed sinuous lines often effaced or nearly so; intervals of males with transversely stretched meshes, females with isodiametric meshes.

Head moderately to markedly glossy; frontal grooves of average depth, bent medially with convexity directed medially. Penultimate article of labial palpus with five setae.

Pronotum moderately or slightly glossy; shape as in fig. 59; disc of average convexity; sides strongly produced, moderately constricted anteriorly, strongly constricted posteriorly, sharply sinuate in front of posterior angles; posterior angles very prominent, acute; anterior transverse impression complete; basal lateral fovea with sides continuous posteriorly forming straight base. Middle femur with seven or eight setae on anterior face.

Elytra of males moderately glossy iridescent in a few specimens, females less glossy; apical sinuation sharply defined; intervals distinctly convex in males, slightly convex in females. Striae of average depth, distinctly punctate anteriorly, apical parts indistinctly punctate.

Male genitalia (fig. 122) median lobe strongly arcuate, angle slightly obtuse, often with low ventral medial bump; apical blade short with apex evenly rounded, twisted more than 45° from horizontal plane; right paramere very small, stub-like; internal sac with serrulate field apically, apical sclerite dark elongate tooth. The genitalia of four males were examined.

Stylus of female ovipositor slightly tapered apically with broadly rounded apex.

Geographical distribution (fig. 136). – This species is known from Texas, only. I have seen 48 specimens from the following localities.

United States – TEXAS: Comal County: New Braunfels (USNM). Dallas County: (CAS, INHS, UMMZ); Dallas (CAS, INHS, KSU, MCZ, USNM). Jackson County: (USNM); Baroncuhua (USNM). Victoria County: Victoria (USNM).

Evarthrus gigas Casey, 1918

Figures 60, 123, 136

Megasteropus gigas Casey, 1918:350. HOLOTYPE, female, labelled as follows: "Tex; CASEY bequest 1925; TYPE USNM 47123; Megasteropus gigas Csy." USNM. TYPE LOCALITY, Texas. PARATYPE, female, labelled as follows: "Tex; CASEY bequest 1925; gigas –2 PARATYPE USNM 47123." USNM. – Leng, 1920:57 (*Megasteropus*). – Csiki, 1930:672 (*Pterostichus*).

Recognition. – The combination of large body size, elytra with flat intervals and very shallow impunctate striae, and male genitalia (fig. 123), distinguishes *gigas* from all other species of *Evarthrus*. Specimens of *heros* superficially resemble individuals of *gigas* but are distinguished by their distinctly punctate elytral striae.

Description. – Body length 19.4 – 23.8 mm. Form robust.

Microsculpture: head between eyes and disc of pronotum with sinuous lines, almost effaced in males, very dense in females; intervals of elytra with isodiametric, flat meshes in males, markedly amorphic meshes in females.

Head markedly glossy in males, slightly so in females; frontal grooves short, of average depth, sometimes bent with convexity directed medially. Penultimate article of labial palpus with five setae.

Pronotum markedly glossy in males, slightly glossy in females; shape as in fig. 60; disc of average convexity; sides strongly produced, moderately constricted anteriorly, strongly constricted posteriorly, sharply sinuate in front of posterior angles; posterior angles acute and very prominent; anterior transverse impression complete; basal lateral fovea with sides not continuous posteriomedially. Middle femur with seven to ten setae on anterior face.

Elytra of males markedly glossy, those of females slightly glossy; distinctly sinuate apically; intervals completely flat. Striae very shallowly impressed almost effaced, impunctate, series of dashes rather than continuous lines in some specimens.

Male genitalia (fig. 123) with median lobe strongly arcuate, angle slightly obtuse, large lobe-like evagination ventromedially; apical blade twisted more than 45° from horizontal plane; right paramere very small, stub-like; internal sac with apical serrulate field, apical sclerite dark elongate tooth. The genitalia of three males were examined.

Stylus of female ovipositor slightly tapered apically with broadly rounded apex.

Geographical distribution (fig. 136). – This species inhabits southeastern Texas. I have seen 22 specimens from the following localities.

United States – TEXAS: Kleberg County: Kingsville (CU). Victoria County: Victoria (USNM).

Evarthrus heros Say, 1823

Figures 61, 65, 76, 124, 136

Feronia heros Say, 1823b:145. Type lost. TYPE LOCALITY, "The Arkansa." MCZ. – LeConte, 1848:350 (*Feronia*). – LeConte, 1852:233 (*Evarthrus*). – Haldeman, 1853: 361. – LeConte, 1858:28. – LeConte, 1863a:8. – LeConte, 1873:318. – Schaupp, 1880:49. – Casey, 1918:352. – Leng, 1920:57. – Csiki, 1930:672 (*Pterostichus*). – Van Dyke, 1943:27 (*Eumolops*). – Blackwelder and Blackwelder, 1948:2 (*Evarthrus*).

Feronia (Pterostichus) americana; LeConte, 1848:350 (not Dejean).

Megasteropus gigas; Van Dyke, 1943:27 (not Casey).

Recognition. – The following combination of characteristics is diagnostic of *heros*: large body size; scutellar stria of elytron long, separate from second stria; base of second stria beginning near basal seta; intervals of elytra very shallow, usually indicated by rows of distinctly impressed punctures; apex of median lobe of male with left side deflected dorsally.

Specimens of the similar species *gigas* are distinguished from *heros* by possession of very shallow impunctate elytral striae.

Description. – Body length 18.7 – 27.1 mm. Form robust.

Microsculpture: head between eyes and disc of pronotum with sinuous lines, sometimes almost effaced; intervals of elytra with isodiametric meshes.

Head glossy; frontal grooves of average depth, usually bent posteriorly with convexity directed laterally. Penultimate article of labial palpus with five or six setae.

Pronotum glossy; shape as in fig. 61; disc of average convexity; sides strongly produced, moderately constricted anteriorly, strongly constricted posteriorly, sharply sinuate in front of posterior angles; posterior angles produced and acute; anterior transverse impression complete; basal lateral foveae with sides not continuous posteriomedially. Middle femur with 9 – 11 setae on anterior face (fig. 76).

Elytra of males markedly glossy, those of females moderately glossy, slightly sinuate apically; intervals completely flat; striae very shallowly impressed, usually only rows of punctures; scutellar stria long and separated from second stria which begins near basal seta (fig. 65).

Male genitalia (fig. 124) with median lobe moderately arcuate, angle broadly obtuse; apical blade with left side of apex deflected dorsally; right paramere extended to apical half of median lobe; internal sac with apical serrulate field, apical sclerite elongate light plate. The genitalia of five males were examined.

Stylus of female ovipositor slightly tapered apically with broadly rounded apex.

Collecting notes. – The original description of *E. heros* was used to identify this species. Specimens of this species have been collected in cotton fields.

Geographical distribution (fig. 136). – This species is found in Arkansas, Oklahoma, and eastern Texas. I have seen 69 specimens from the following localities.

United States – ARKANSAS: County not determined: Arkansa (MCZ). OKLAHOMA: McCurtain County: Millerton (USNM). TEXAS: Collin County: Plano (USNM). Comal County: New Braunfels (CNHM, USNM). Cooke County: Gainesville (USNM). Dallas County: Dallas (ANSP, CNHM, MCZ, UMMZ, USNM). Delta County: Cooper (USNM). Ellis County: Waxahachic (USNM). Fannin County: Ladonia (USNM). Lee County: (UMMZ). McLennan County: Waco (CAS). Montague County: Forestburg (UMMZ).

The *gravesi* Group

Characteristics. – Body size average. Penultimate article of labial palpus with three setae. Pronotum constricted posteriorly, posterior angles prominent, sides of basal fovea not continuous posteriorly, anterior transverse impression complete; posterior lateral setae on bead. Middle femur with four setae on anterior face. Plica of elytron absent. Only one species, *gravesi*, is included in this group.

Evarthrus gravesi new species

Figures 62, 136

Recognition. – The combination of the glossy dorsum, form of the pronotum, and complete anterior transverse impression, absence of the plica of the elytron, and four setae on the anterior face of the middle femur, distinguishes *E. gravesi* from all the other species of *Evarthrus*. The general habitus of *gravesi* resembles that of *substriatus* or *constrictus*.

Description. – HOLOTYPE, female, labelled as follows: "Pearl (Jackson) Rankin Co. Miss. 23–III–1959 R. C. & A. Graves; HOLOTYPE Evarthrus gravesi R. Freitag." MCZ.

Body length 12.8 mm., width 5.5 mm. Form robust.

Microsculpture on head between eyes effaced; sparsely distributed, almost effaced, sinuous lines on disc of pronotum; isodiametric meshes on intervals of elytra. Dorsum glossy.

Head length 1.5 mm., width 3.0 mm.; frontal grooves of average depth, sharply defined, straight, oblique. Penultimate article of labial palpus with three setae: two medial and one apical.

Pronotum length 3.5 mm., width 4.5 mm.; form cordiform in outline as in fig. 62; disc moderately convex; sides produced, constricted slightly anteriorly, strongly posteriorly, distinctly sinuate in front of posterior angles; posterior angles produced, obtuse; anterior transverse impression complete and deeply impressed. Middle femur with four setae on anterior face; lateroventral margins of last article of tarsus with setae.

Elytra length 7.8 mm., width 5.6 mm.; not sinuate apically; plica absent; intervals moderately convex; intervals deeply impressed and indistinctly punctate.

Stylus of ovipositor broad, slightly tapered apically.

This is the only specimen of this species seen by me. The position of the type locality is indicated on fig. 136.

Derivation of specific name. – The type specimen was collected by Dr. Robert C. Graves, Department of Biology, Bowling Green State University, Ohio. This species is named in honour of the collector.

FOSSIL MATERIAL

Of the nominal fossil species *Evarthrus tenebricus* Scudder, only the head is preserved. Scudder (1900) placed it in the genus *Evarthrus* "on account of the brevity of the last joint of the labial palpus." This structure is not diagnostic for the genus *Evarthrus*. Furthermore the other characteristics given by Scudder in his description are common to many carabid genera. I have not seen the specimen. It may or may not be a member of the genus *Evarthrus*.

PHYLOGENY AND ZOOGEOGRAPHY OF THE SPECIES OF *EVARTHRUS* LECONTE

Phylogeny

My views concerning the phylogeny of *Evarthrus* are based on structural similarities and differences of extant species, because a fossil record is not available. Fig. 137 is a time divergence dendrogram of the history of *Evarthrus*. It is based on the principle that similar organisms are related. Species that have many similar structures are closely related, while those which are dissimilar are more remotely related. Since rate of divergence is unknown the slopes of the branches of the dendrogram are not significant.

To determine the relationships of the genus *Evarthrus*, I compared its characteristics with those of a representative selection of Nearctic and Palaearctic genus-group taxa of the tribe Pterostichini. I believe *Evarthrus* is most closely related to the *Molops* group (tribe Molopini Jeannel, 1942 and 1948) of Europe and Africa. Among other structures the three that *Evarthrus* and the *Molops* group share, and which I regard as patristic affinities are: pleura and thoracic and abdominal sterna impunctate; basal portion of interval 7 of the elytron raised and not deflected downward like other intervals; and antennae of larva with five articles each (Van Emden, 1942).

Because the genera *Evarthrus* and *Pterostichus* have many structural similarities a word about their relationships is necessary. A remarkably stable characteristic of *Pterostichus* is the presence of punctures on the ventral sclerites, particularly in the groove of the mesepisternum. Rarely the punctures are feebly developed but they usually can be found on the mesepisternum. Also the known larvae of species of *Pterostichus* have antennae of four articles each. Because adults of *Evarthrus* and of the *Molops* group have impunctate ventral sclerites and the larvae have antennae of five articles, and are similar to *Pterostichus* in most other features, I believe *Pterostichus* is a distant relative of these genera.

The progenitor of the genus *Evarthrus* probably had characteristics which are present in extant species of the *Molops* group and *Evarthrus*, and some which are widespread in other pterostichine genera. The hypothetical ancestor of *Evarthrus* probably possessed in combination the primitive states of characters presented in Table 1. Advanced conditions of these characters are also listed in Table 1, and illustrate the extent of evolutionary change. The determination of the trends of change in these characters or morpho-clines (Maslin 1952) provide a basis for establishing a phylogeny of *Evarthrus*.

One trend that is apparent is the increase of body size in all three subgenera and it is most evident in the subgenus *Evarthrus*. The largest species of this subgenus are specialized, and there is no doubt that large size is the specialized condition.

Another evolutionary trend is in the increase in the number of setae of the penultimate article of the labial palpus. Most of the species in *Fortax* and *Cyclotrachelus* have two setae, several species have three, or four, while *E. unicolor* has four, five, or six setae. In the subgenus *Evarthrus* most species possess five or six setae.

Two setae on the penultimate article of the labial palpus is the primitive condition because it is common in pterostichine genera which are related to *Evarthrus*. Similarly the setae on the anterior face of the middle femur tend to increase in number. Four setae is the common condition in *Fortax, Cyclotrachelus*, and in the less specialized species of the subgenus *Evarthrus*. This is probably the primitive condition. The setae range in number from seven to eleven in specialized species of the subgenus *Evarthrus*.

There are two distinct trends in the direction of the eversion of the internal sac of the median lobe. The internal sac everts dorsoapically in all species of *Cyclotrachelus*. In the subgenus *Fortax*, the internal sac tends to evert to the left while in the subgenus *Evarthrus* the eversion is to the right. The intermediate dorsoapical eversion is probably the primitive state.

TABLE I. Primitive and Specialized conditions of some characters of *Evarthrus*.

CHARACTER	PRIMITIVE	ADVANCED
BODY:		
Size	Small	Large
Colour	Black	Unchanged
Surface	Glossy	Dull
Venter	Impunctate	Unchanged
MICROSCULPTURE:		
Head, pronotum and elytra	Almost effaced, sinuous, sparsely distributed lines	Amorphic meshes or isodiametric meshes
HEAD:		
Frontal grooves	Deep, straight, parallel	Shallow, crescent-shaped, oblique
Gula	Without knobs on each side	Flanked by raised knobs
Penultimate article of labial palpus	With two medial setae	With more than two medial setae
PRONOTUM:		
Outline, dorsal aspect	Quadrate	Cordate
Basal angles	Not prominent	Prominent
Anterior transverse impression	Complete with medial portion feebly present	Medial portion absent or medial portion clearly impressed
Basal lateral fovea	Monostriate	Bistriate or punctiform
Basal seta	Near basal angle beside lateral bead	In front of basal angle on lateral bead
PROSTERNAL PROCESS:		
Basal and preapical portion	With obsoletely impressed longitudinal groove	With deep longitudinal groove
Apex	Not marginate, glabrous	Marginate with setae
METEPISTERNUM:	Short	Unchanged
ELYTRA:		
Intervals	Low convexity	High convexity
Interval 3	With one puncture	With two or more punctures
Interval 7	Raised at base	Unchanged
Striae	Shallow, finely punctate	Deeply impressed or coarsely punctate
Umbilicate series	Distinct ridges separating first three anterior punctures	Without distinct ridges between first three anterior punctures
Plica	Small	Large or absent
LEGS:		
Colour	Rufopiceous	Red
Middle femur	With four setae on anterior face	With more than four setae on anterior face
Basal article of middle and hind tarsus	With lateral groove	Without lateral groove
Last tarsal article	With ventral lateral setae	Without ventral lateral setae
ABDOMEN:		
Last external sternum of female	With two setae	Unchanged
MALE GENITALIA:		
Median lobe	Moderately arcuate	Strongly arcuate or slightly arcuate
Right paramere	Extended to halfway point of median lobe	Very long or very short and stub-like
Eversion of internal sac	Dorsoapical	Right or left
Apex of internal sac	With light apical serrulate field	With serrulate field and sclerite
FEMALE GENITALIA:		
Stylus	Slightly tapered apically	Broadly rounded apically or strongly tapered apically

The progenitor of *Evarthrus* probably differentiated into the "ancestors" of the subgenus *Fortax* and the *Cyclotrachelus-Evarthrus* lineage. The *Fortax* ancestor acquired a cordiform pronotum and the basal foveae became deeper posteriorly and shorter. Most of the structures of the ancestor of the *Cyclotrachelus-Evarthrus* group underwent slight modifications. The *Fortax* stock diverged into the *morio* group and *obsoletus* group lineages. The basic stock of the *morio* group lost the ventral lateral setae of the last tarsal articles. It differentiated and first gave rise to *laevipennis* which acquired sharp and somewhat produced basal angles of the pronotum, but retained a relatively primitive eversion of the internal sac. A later stock in which a left eversion of the internal sac developed, diverged into *morio* and *hernandensis*. The primitive stock of the *obsoletus* group acquired a cordiform pronotum with punctiform basal lateral foveae and basal setae which were developed anteriorly a short distance in front of the basal angles. It evolved into the extant species *obsoletus* in which developed a modified median lobe of the male, and the progenitor of *iuvenis* and *approximatus*. The latter two species inherited a more primitive median lobe, but *iuvenis* acquired a derived eversion of the internal sac, to the left and when everted curled around the left ventral side of the median lobe. This type of eversion is convergent with that of *hernandensis* and *morio* because *iuvenis* is not closely related to them.

The basic stock of *Cyclotrachelus* acquired a modified pronotum with constricted posterior sides and basal setae which became situated in the head. It retained the primitive monostriate basal lateral foveae of the pronotum, and dorsoapical eversion of the internal sac of the median lobe.

The complementary stock which gave rise to the subgenus *Evarthrus* gained more setae on the penultimate article of the labial palpus. It also acquired modified bistriate basal lateral foveae of the pronotum and an internal sac that everted to the right.

The ancestral stock of the subgenus *Cyclotrachelus* differentiated into two stocks. One gave rise to the *spoliatus* group. It retained the primitive internal sac with an apical sclerite. The other evolved into the *ovulum-faber* complex, and it acquired a light-colored sclerite in the internal sac. The species *brevoorti* is the earliest derivative of the *spoliatus* group because the other members of the group are more closely related to one another than to *brevoorti*. It evolved a modified truncate apex of the median lobe and lost the apical serrulate field of the internal sac. The stock complementary to *brevoorti* gave rise to *unicolor* and the ancestor of *fucatus* and *spoliatus*. It retained the primitive apex of the median lobe and light serrulate apical field in the internal sac. The species *unicolor* gained a few extra setae on the penultimate article of the labial palpus, and evolved a modified internal sac. The progenitor of *fucatus* and *spoliatus* perhaps closely resembled the latter. The acquisition of an extra seta on the penultimate article of the labial palpus of some *fucatus* individuals is probably a recent modification.

The species *vinctus* evolved early in the history of the *ovulum-faber* complex for it is not closely related to any of the other members of the group. It inherited the primitive sclerite of the internal sac, and evolved produced, sharp, basal angles of the pronotum. The sister stock of *vinctus* acquired a cleft apical sclerite characteristic of the *ovulum* group and the *faber* group. The one which differentiated into *alabamensis* and the ancestor which gave rise to *texensis*, *macrovulum* and *ovulum* evolved sharp, produced basal angles of the pronotum.

The early derivative *alabamensis* acquired a deep longitudinal groove in the prosternal process, and lost the glossiness of the elytra, while its diverging sister stock developed crescent-shaped frontal grooves on the head before evolving into the ancestor of *macrovulum* and *texensis* and *ovulum*. The species *ovulum* developed a deep longitudinal groove in the prosternal process, but the ancestral stock, *macrovulum-texensis* retained the primitive condition of that structure. Recently, *macrovulum* evolved a short paramere, while the paramere of *texensis* has not changed from the primitive condition. The three members of the *faber* group possess a deep groove in the prosternal process which was probably a feature inherited from the ancestral stock of this group. It first gave rise to *parafaber*, a somewhat distant relative of *faber* and *levifaber*, which retained the cleft apical sclerite of the internal sac. Later the sister stock of *parafaber* acquired a modified C-shaped sclerite of the internal sac and then differentiated into *faber* and *levifaber*.

Returning to the ancestor of the subgenus *Evarthrus*, this stock differentiated into two stocks. One stock retained four setae on the anterior face of the middle femur, and then it evolved the ancestor of the *incisus* group and the progenitor of the *blatchleyi* and *sigillatus* groups. The other stock gained an extra seta on the anterior face of the middle femur, and it gave rise to the *seximpressus* group ancestor and the forerunner of the rest of the lineages in the subgenus *Evarthrus*.

The posterior constriction of the pronotum, short right paramere and median dorsal hump on the median lobe of the male, and the dark elongate apical sclerite of the internal sac, which are characteristic of *incisus* and *whitcombi*, were modifications acquired by their common ancestor.

A change in the shape of the basal lateral foveae of the pronotum and formation of a deep medial longitudinal groove in the prosternal process were modifications which occurred in the stock that gave rise to the ancestors of the *blatchleyi* and *sigillatus* groups. Both characteristics are present in all of the extant species of the two groups.

The ancestor of *blatchleyi* and *floridensis* probably evolved a slightly arcuate median lobe and narrow apical blade; both extant species probably resemble their common ancestor in most features.

The primitive stock that differentiated into *sigillatus* and the ancestor of *sinus* and *convivus* acquired a light-colored apical sclerite in the internal sac but retained the primitive type of median lobe and parameres of the male. Because the male genitalia of *sigillatus* are unlike that of *convivus* and *sinus*, I believe *sigillatus* is an earlier derivative of this lineage. The species *sigillatus* probably evolved as the sister stock of the ancestor of *convivus* and *sinus*. Geographical variation in non-genitalic structures of *sigillatus* such as the shape of the pronotum and elytra is probably evidence of recent differentiation. The ancestor of *convivus* and *sinus* acquired modified genitalia which were inherited by both species.

One of the extraordinary structural modifications in the history of *Evarthrus* was the acquisition of apical setae on the prosternal process by the basic stock of the *seximpressus* group. This ancestor gave rise to two stocks: one which differentiated into *alabamae* and *seximpressus*, gained rounded basal angles of the pronotum; and one that gave rise to *engelmanni* and *nonnitens* acquired distinct produced basal angles of the pronotum.

The relationships of *hypherpiformis* are not clear because besides having its own distinct appearance it shares structures with two distinctly related groups. Specimens of this species have the general external habitus of the members of the *seximpressus* group, but lack the setae of the prosternal process. They have 3 – 5 punctures on the third interval of the elytron and the stump-like right paramere of the male genitalia which resembles that of sallei and *gigas* of the *gigas* group. I have placed *hypherpiformis* close to the *seximpressus* group on the dendrogram. This position requires that similar male genitalia were evolved in unrelated lineages.

The sister stock of the one which gave rise to the *seximpressus* group acquired a pronotum with a posterior constriction and small basal angles. It gave rise to the ancestors of two stocks. One of them retained the primitive pronotal form, and differentiated into the basal stocks of the *sodalis* group. Its sister group gained prominent angles of the pronotum and diverged into the primitive stocks of the *substriatus* group, and the *torvus* and *gigas* groups.

The extant species *furtivus*, *parasodalis* and *sodalis* are descendants of a common form which inherited and maintained a primitive pronotum with small basal angles. The prominent angles of the pronotum of *sodalis colossus* are probably a recent modification. Also the narrow apical blade of *sodalis* has probably evolved recently. The species *alternans* and *iowensis* evolved from an ancestor that acquired prominent basal angles of the pronotum. The three punctures on the disc of the elytron of some specimens of *iowensis* is probably a recent change.

The species *constrictus* and *substriatus* are characterized by the absence of normal ridges between the first three anterior punctures of the umbilicate series. This feature was probably acquired by their common ancestor. Some specimens of *substriatus* have three punctures on the third interval of the elytron which is probably a recent modification.

Only insignificant structural changes developed in the stock which gave rise to the ancestors of the *torvus* and *gigas* groups. The derivative stock which evolved the *torvus* group retained the primitive pronotal shape. The presence of three punctures in the third interval of the elytron in some *gravidus*, *torvus* and *deceptus* individuals is probably a recent modification.

A more pronounced posterior constriction of the pronotum was acquired by the ancestor of the *gigas* group. It first gave rise to *heros* which inherited the primitive type of right paramere of the male genitalia. The sister stock of *heros* evolved a stump-like right paramere and differentiated into the extant species *sallei* and *gigas*.

The *gravesi* group is not closely related to any other *Evarthrus* group. Its members have lost the plica and resemble the species of *Cyclotrachelus* in some detail, but generally look like western species of the subgenus *Evarthrus*.

According to this phyletic scheme, the following characteristics have evolved more than once in the *Evarthrus* lineage: pronotum with posterior constriction, four times; posterior setae on lateral bead, twice; deep, sharply defined medial longitudinal groove of the prosternal process, four times; three or more setae on the third interval of the elytron, five times; short stump-like parameres, three times; and sclerite of the internal sac, at least four times.

Zoogeography [1].

Introduction. – The chief objective of historical zoogeography is to interpret the geographical relationships of extant organisms in terms of past climate and physiography. These events often provide evidence of former barriers, or alternatively, opportunities for dispersal now no longer available. When a measure of concordance is found between such evidence and present distributions of extant species, it may be assumed that these distribution patterns are explained by changes which occurred in the past. In turn, geographical relationships of species judged to be closely related phylogenetically can provide evidence about past changes. The distribution of the species of *Evarthrus* is considered from both aspects. In the sections which follow, we provide an account of the historical background, a description of the distribution pattern of the extant species, and an analysis of the distribution pattern in historical terms.

The hypotheses we propose below are weakened by two defects in our data: we cannot relate in detail the distribution of the species to different vegetation types, although the patterns suggest such a relationship; and many of the species are rarely encountered so that their ranges may be incompletely known. The following essay must, therefore be regarded as only a first approximation to a description of the geographical distribution of *Evarthrus*. Our analysis is thus preliminary, but we hope not too premature.

Historical background. – The history and dispersal of the genus *Evarthrus* must be related to that of the biota of eastern North America, and to the geological history of that area. Much has been written about this topic, and the following references have been consulted: Auffenberg and Milstead, 1965; Ball, 1956, 1959; Berry, 1922, 1926; Blair, 1965; Braun, 1950; Carlston, 1950; Clarke, 1896; Coleman, 1946; Davis, 1965; Flint, 1965; Graham, 1964; Hibbard *et al*, 1965; Howden, 1963, 1969; King, 1959; Muller, 1965; Richards and Judson, 1965; Ross, 1965; Schafer and Hartshorn, 1965; Selander, 1965; Stebbins, 1951; and Whitehead, 1965. The most important events are: the history of the distribution of the Arcto-Tertiary Geoflora; and Pleistocene events which relate to changes in water level, and climate.

Briefly, the Arcto-Tertiary Geoflora in the early Tertiary was Holarctic in distribution, occurring at higher latitudes than now. At present, its elements are concentrated in more southern temperate regions, especially eastern Asia and eastern North America. Concerning the Pleistocene, it is fairly well established that the glacial periods had two important effects: there was a lowering of temperatures, resulting in a certain amount of faunal and floral shifting; and second, sea level was lowered, resulting in the appearance of additional land in coastal areas. During interglacial stages, the reverse changes occurred, and the Mississippi River became greatly enlarged, as a result of glacial meltwater. Thus, this river probably became a highly effective barrier to movement of flightless terrestrial animals.

The cyclical nature of these events during the Pleistocene should have led to alternation of range contraction and expansion of organisms, with consequent geographical isolation resulting from fragmentation of once-continuous ranges during unfavorable time, with the reverse taking place during favorable times. Evolution occurred as a result of both sets of circumstances.

The distribution pattern, in general. – This is simply illustrated by means of a grid (Table 2), oriented like a map, with columns representing longitude and rows representing

1. This section was written jointly by G. E. Ball and me.

TABLE 2

THE NUMBER OF SPECIES OF *Evarthrus* PLOTTED IN 5° INTERVALS OF LONGITUDE AND LATITUDE*

Degrees N. Latitude	Degrees W. Longitude									Total Interval Value	Avg. Interval Value	No. Species
	110-114	105-109	100-104	95-99	90-94	85-89	80-84	75-79	70-74			
45 – 49					2					2	2.00	2
40 – 44			2	7	7	5	6	5	2	34	4.86	13
35 – 39	1	3	4	7	8	6	9	7	–	45	5.65	19
30 – 34	2	4	3	11	10	17	12	3	–	62	7.75	35
25 – 29		1		9	1	–	6	–	–	17	4.25	13
20 – 24		1			–	–	1	–	–	2	1.00	2
Total Interval Value	3	9	9	34	28	28	34	15	2			
Avg. Interval Value	1.50	2.25	3.00	8.55	5.60	9.35	6.80	5.00	2.00			
No. Species	2	4	4	15	15	18	21	9	2			

* Intervals entirely or partly occupied by sea contain a dash.

latitude. Each square represents 5° longitude and 5° latitude, as in figs. 125–136. The number in each square represents the total number of species recorded from within that space in figs. 125–136. The numbers are totalled horizontally and vertically to obtain a "total interval value" for each 5° interval of longitude and latitude, and the "average 5° interval value" is obtained by dividing the total interval value by the number of squares relevant to the total interval value. In addition, the total number of species found in each 5° interval is recorded. The absence of continental land is indicated by short horizontal lines in the appropriate squares.

In general, the number of species is maximum in the southeast (30° – 34°N., east of 90°W.), and decreases in all directions. In part, the decrease is the result of restriction of land area (for the squares 30 – 34; 79 – 75; and 20 – 24; 80 – 84, occupied mainly by ocean, and the square 25 – 29; 80 – 84, including peninsular Florida). However, other factors must be considered to explain the northern, western, and southern decreases.

The simplest explanation probably involves historical factors. The genus *Evarthrus* was probably warm temperate and forest adapted, and has probably undergone most of its evolution under these conditions. All three subgenera are represented in warm temperate forest. With one exception, spread into peripheral areas has been accomplished by the most highly evolved subgenus, *Evarthrus s. str.* The exception is *E. (Cyclotrachelus) faber*, which is represented in the Florida keys, at the southeastern extremity of the range of the genus.

Howden (1969) suggests that the principal factor accounting for reduction of species toward the north is Pleistocene glaciation and its associated drastic climatic and other effects on species living in or near glaciated areas. We agree that these factors probably influenced the diversity of *Evarthrus* toward the north, but we also believe that even if glaciation had not taken place the genus would still have exhibited maximum diversity in the southeast.

The Floridian *Evarthrus* fauna seems to be especially poor. Could this be the result of climate encountered on the peninsula? Rohwer and Woolfenden (1969) provide historical evidence that peninsular climate is one of the major factors accounting for Florida's depauperate breeding bird fauna, and reasoning by analogy we suggest that the impoverishment of the *Evarthrus* fauna can be accounted for in similar fashion.

Simply expressed, the distribution pattern of *Evarthrus* is one of subtraction from a fauna of maximum diversity on the eastern Gulf Coast. However, in detail, the distribution pattern is much more complex, and the complexities must be described before it is possible to present a more detailed account of historical zoogeography. For purposes of this analysis, taxa of subspecific and specific rank are treated as equivalent. This more detailed analysis is considered under four headings: extent of range, centers of concentration, effects of the Pleistocene, and species pairs.

Extent of range. – One of the striking features of the distribution pattern is the relatively small range of many of the species. This is illustrated by the data presented in Table 3. We used as an index of range extent the linear distance between the most widely separated localities because it was simply obtained and was sufficiently accurate for our purposes. Because *gravesi* and *parafaber* are known from single localities only, they were excluded from this analysis. Note that almost one-half of the taxa have ranges less than 500 miles long, and that 80% of the taxa have ranges of 1000 miles or less.

TABLE 3

FREQUENCY DISTRIBUTION OF MAXIMUM LINEAR EXTENT OF GEOGRAPHICAL RANGE IN MILES OF THE SPECIES OF *Evarthrus*.

CLASS	N
2001 - 2250	2
1751 - 2000	1
1501 - 1750	3
1251 - 1500	1
1001 - 1250	2
751 - 1000	8
501 - 750	5
251 - 500	10
0 - 250	12

Restricted ranges seem to suggest the existence of barriers to dispersal, or alternatively, that the present ranges of many of the species are less extensive than they once were, and that the surviving populations are relics of a once more extensive group of populations. This second alternative is discussed below.

A simple test for the existence of barriers would be to compare the present known ranges of species with physical features of the landscape suspected of being effective barriers to flightless, lowland terrestrial animals. In the east are two obvious candidates: the Mississippi River and the Appalachian Mountains. Data on distribution of species and subspecies with reference to the Mississippi River are presented in Table 4.

TABLE 4

COMPARISON OF DISTRIBUTION OF THE SPECIES OF *Evarthrus* IN RELATION TO THE MISSISSIPPI RIVER

	WEST ONLY	%	BOTH SIDES	%	EAST ONLY	%	TOTAL
ALL SPECIES	13	28	6	13	27	59	46
ONLY SPECIES NEAR RIVER	9	33	6	22	12	12	27

Two groups are compared: the total *Evarthrus* fauna and that segment of the fauna whose taxa are either known to reach the banks of the Mississippi or can reasonably be expected to be there. Both sets of data show that less than one-third of the total number of species are represented on both sides of the river. Additional details are provided in the following section.

The effectiveness of the Appalachian system as a barrier was measured in terms of the distribution patterns of 11 taxa whose ranges flank the mountains (Table 5). Less than one-third of these taxa occur on both sides. Of this group, two species are mainly to the east and one is mainly to the west of the mountains.

TABLE 5

COMPARISON OF DISTRIBUTION OF THE SPECIES OF *Evarthrus* IN RELATION TO THE APPALACHIAN MOUNTAINS

	WEST ONLY	BOTH SIDES	EAST ONLY	TOTAL
ONLY SPECIES NEAR MOUNTAINS	5	3	3	11

These data appear to support the view that topographical features are important in restricting the ranges of the species of *Evarthrus*.

Centers of concentration. – Although the distribution patterns of the extant taxa of *Evarthrus* appear to have been influenced by obvious barriers, these are not the limiting factors for all of the species. This can be seen most clearly by a comparison of the patterns of the species with more or less restricted ranges.

The object of this comparison was to attempt to locate centers of concentration, to be used in conjunction with a consideration of historical zoogeography of the species of *Evarthrus*. Excluded from the analysis initially were the wide-ranging species, and those represented on both sides of the major barriers. The ranges of the remaining species were examined for concordance, and centers of concentration were discovered. Subsequently, the species with restricted ranges but occurring in two or more centers of concentration were excluded. The species included in the analysis are called "centrant" species; those excluded are "radiant" species (terminology after Hultén, 1937).

The distribution patterns of the centrant species are indicated in Table 6. The vertical lines represent lines of longitude, the horizontal lines represent lines of latitude. Each resulting square containing one or more species was lettered. The squares which contained a number of species in common were combined to provide the centers of concentration, as in Table 7.

TABLE 6

THE DISTRIBUTION OF THE SPECIES OF *Evarthrus* WITH RESTRICTED RANGES

DEGREES N. LATITUDE	DEGREES WEST LONGITUDE					
	95-99	90-94	85-89	80-84	75-79	70-74
45 – 49		alternans A				
40 – 44	iowensis alternans B	iowensis alternans C				furtivus I
35 – 39		whitcombi parasodalis alternans D		iuvenis approximatus vinctus furtivus K	iuvenis approximatus spoliatus levifaber furtivus J	
30 – 34	nonnitens engelmanni heros sallei G	whitcombi nonnitens parasodalis gravesi texensis E	laevi. paraf. brev. sinus unicol. hypherp. alabam. M	laevi. ovul. brev. vinctus unicol. spol. levif. blatch. L		
25 – 29	engelmanni gigas heros sallei H	texensis F		ovulum blatchleyi floridensis hernandensis N		

TABLE 7

CENTERS OF CONCENTRATION OF THE SPECIES OF *Evarthrus*.

CENTER NUMBER	INTERVALS INCLUDED [1]	LIMITS
1	N	Peninsular Fla., s. of 30°N.
2	L, M [2]	Coastal plain north to Fall Line, e. to South Carolina, w. to Mississippi River.
3	I, J	East of Appalachian Mts., between 35° and 40°N.
4	K	West of Appalachian Mts., to Mississippi River, N. of 35°N.
5	F, G, H [3]	Texas east of 100°W., and south of 35°N.
6	D, E	West Arkansas, South Missouri.
7		North of 35°N., West of 95°W., South of Missouri River, and Texas West of 100°W.
8	A, B, C	West of Mississippi River, North of Missouri River.

1. Letters are designations for intervals in Table 6.
2. species *gravesi* is included, from E.
3. species *nonnitens* is included, from E.

The locations of the centers are illustrated in Fig. 138. We are doubtful about the reality of Center 6. It is based on the presence of two species there, known from nowhere else.

Center 7 contains no endemic species, but it seems central for a number of wide-ranging western species.

These Centers of Concentration, several of which are at least partly independent of the Appalachian-Mississippi barriers, suggest the existence of additional barrier systems. The restricted ranges may be simply by-products of biotype impoverishment, discussed below.

The distribution of all species, in terms of these centers of concentration, is indicated in Table 8.

TABLE 8

DISTRIBUTION OF THE SPECIES OF *Evarthrus* IN RELATION TO THE CENTERS OF CONCENTRATION

NAME OF SPECIES	CENTER NUMBER							
	1	2	3	4	5	6	7	8
morio	x	x						
hernandensis	x							
laevipennis		x						
iuvenis			x					
approximatus			x					
obsoletus		x		x				
brevoorti		x						
spoliatus		x	x					
fucatus				x				
unicolor		x						
vinctus		x	x					
alabamensis		x						
macrovulum		x						
texensis					x			
ovulum	x	x						
parafaber		x						
levifaber		x						
faber	x	x						
incisus				x	x		x	x
whitcombi						x		
blatchleyi	x	x						
floridensis	x							
sigillatus		x	x	x				
sinus		x						
convivus		x		x				
seximpressus				x	x	x	x	x
alabamae		x			x			
engelmanni					x			
nonnitens		x			x			
hypherpiformis		x						
s. sodalis			x	x				x
s. colossus						x	x	
s. lodingi				x				
parasodalis						x		
furtivus			x	x				
alternans								x
iowensis				x				x
substriatus					x		x	x
constrictus					x		x	x
t. torvus					x	x	x	x
t. deceptus					x		x	
gravidus					x		x	
sallei					x			
gigas					x			
heros					x			
gravesi		x						
TOTALS	6	21	7	10	14	5	8	8

Degree of difference among these centers is indicated in Table 9, by means of an index of difference (Greenslade, 1968). Of 28 comparisons, 12 were scored as 100, i.e., pairs of centers shared no species in common. Five scored between 91 and 94.

TABLE 9

DISSIMILARITY VALUES AMONG CENTERS OF CONCENTRATION OF THE GENUS *Evarthrus*.

CENTER NUMBER	STATISTICS	CENTER NUMBER 2	3	4	5	6	7	8
1	t [1.]	23	13	16	20	11	14	14
	c [2.]	4	0	0	0	0	0	0
	t - c	19	13	16	20	11	14	14
	$\frac{t-c}{t}$ x 100	**83**	**100**	**100**	**100**	**100**	**100**	**100**
2	t [1.]		23	24	33	26	29	29
	c [2.]		3	3	2	0	0	0
	t - c		20	21	31	26	29	29
	$\frac{t-c}{t}$ x 100		**87**	**87**	**94**	**100**	**100**	**100**
3	t [1.]			14	21	12	15	14
	c [2.]			3	0	0	0	1
	t - c			11	21	12	15	13
	$\frac{t-c}{t}$ x 100			**78**	**100**	**100**	**100**	**93**
4	t [1.]				22	14	16	14
	c [2.]				2	1	2	4
	t - c				20	13	14	10
	$\frac{t-c}{t}$ x 100				**91**	**93**	**88**	**71**
5	t [1.]					17	15	17
	c [2.]					2	7	5
	t - c					15	8	12
	$\frac{t-c}{t}$ x 100					**88**	**53**	**71**
6	t [1.]						10	12
	c [2.]						3	1
	t - c						7	11
	$\frac{t-c}{t}$ x 100						**70**	**92**
7	t [1.]							11
	c [2.]							4
	t - c							7
	$\frac{t-c}{t}$ x 100							**64**

1. Total number of species in each pair of centers.
2. Number of species in common between each pair of centers.

In general, the peripheral centers differ strongly from one another. Center 7, for example, shares no species with Centers 1, 2 and 3, and Center 8 shares a single species with Centers 2 and 3. Centers 4 and 8 are each connected with six other Centers, and, consequently, are the least distinctive.

Because of its central position, one would expect Center 4 to be minimally distinctive. Center 8, on the other hand, is peripheral, and for this reason, might be expected to hold a more distinctive fauna. The expectation is not realized, probably because the area, although suitable for a variety of species, has few endemics.

In striking contrast to Centers 4 and 8 is Center 1. It shares species with only one other Center, and consequently, has the most distinctive fauna of any Center.

A more interesting comparison involves the Centers of about the same latitude, but on different sides of the Mississippi River. Centers 2 (southeastern) and 5 (southwestern), have a combined fauna of 35 species, of which only two are shared (Index 94). Centers 4 (northeastern) and 8 (northwestern) have a combined fauna of 13 species of which three are shared (Index 77). In each case, few species occur on both sides of the river. The difference in Index values is the result mainly of the much more diverse southern fauna. However, this fact is of less interest than is the thought that the effectiveness of the river as a barrier is less in the north than in the south. This may be the result of one of two factors: the river, being narrower, is easier to cross, and consequently a greater proportion of the northern fauna has done so; or, the species occurring in the north are more adept at crossing water barriers. Probably both factors are involved.

The barriers marking off other centers are not clear. Probably they are complexes of direct climatic factors, and indirect ones, transmitted through conditions of soil and vegetation. Barriers of this type may have been as consequential in the development of diversity in *Evarthrus* as have been the more obvious barriers. How did these barriers develop? We suggest it was through loss of variability brought about as a by-product of the glacial stages.

Effects of the Pleistocene epoch. – The fact that Centers of Concentration of species with limited ranges can be identified suggests the operation of some powerful factor. We suggest that this factor was climatic fluctuation during the Pleistocene, which is known to have caused range expansion and contraction of many species. Especially during glacial stages, one might expect the ranges of more or less warm adapted species to have become more or less restricted, with a consequent reduction in population size and number. During interglacials and post-glacial time, the ranges of more broadly adapted species, the radiants, might be expected to expand, whereas species which lost too much variability as a result of reduction in population size and number would not be able to spread. This is essentially Hultén's Theory of Equiformal Progressive Areas (1937).

The position of the Centers of Concentration probably do not coincide precisely with the former distribution of the centrant species during the Pleistocene epoch. The northern species must have been south of their present ranges during the glacial stages, and the coastal species must have been north of their present ranges during the interglacial periods. However, at a more general level, a correlation is apparent. The centrant species on each side of the Mississippi River and Appalachian Mountains were probably in the same longitudinal zones in the past as they are now, and it seems unlikely that the ranges of centrant

species from different centers overlapped. Can this be taken as evidence that the southeastern biota was not radically displaced by the cold glacial periods (Braun, 1950)? We think it can be.

Thus the significance of the Centers is that they indicate in part positions of refugia during the glacial stages. One can also infer from the locations that different species have different ecological tolerances of rather narrow range, and that the evolution of diversity in *Evarthrus* has involved development of these limited tolerances. Although evolution in general seems to have led to the development of species of limited tolerances, especially in the east, more broadly adapted species have evolved in the west. Some of the latter may be of relatively recent origin, an inference based on their postulated phylogeny.

Species-pairs. – The analysis of the distribution of pairs of closely related species (sister species) seems to be the most fruitful approach to historical zoogeography at the local level. Their distributions are likely to provide the clearest evidence of location of former barriers and of patterns of phylogeny. Of course, this is true only if the two sister species are largely allopatric.

The two members of some species pairs are largely or completely sympatric, and consequently, their present distribution gives no indication about their past geographical relationships. These are: *morio – hernandensis; iuvensis – approximatus; alternans – iowensis; substriatus – constrictus;* and *torvus – gravidus.* These are excluded from the following discussion. Also excluded are *gravesi* and *hypherpiformis*, both representing monotypic groups and lacking close living relatives.

The distribution patterns are of several types: east – west; Floridian – Gulf Coast; and north – south (Table 10). The last category is common among the western species of the subgenus *Evarthrus*.

The range disjunctions of most of the east-west pairs of vicariant species are correlated with the Mississippi River or with the Appalachian Mountains. In these cases, speciation has taken place between present Centers of Concentration, and it is easy to imagine how the isolation and consequent differentiation came about. There are also several instances of vicariant distributions within Centers 2 and 5. These involve species with coastal ranges, and one can imagine the requisite range disjunctions arising as a result of changes in coast line with fluctuation in sea level and sizes of rivers during the waxing and waning of the glacial stages. The same explanation is relevant for vicariant distributions within Florida, and between Florida and the mainland.

The north-south disjunctions are more difficult to explain, because, for the most part, obvious barriers do not occur between the northern and southern members of the pairs. However, during glacial stages, one can imagine that range restriction occurred, as described above, with isolates of once more wide-ranging species surviving and differentiating.

Vicariance relationships of these same kinds are evident within sister species-groups, and are presumably the result of the same causes having been effective at an earlier time in the phylogeny of the genus.

These distribution patterns suggest to us a model of how diversity has been generated in the genus *Evarthrus*. Beginning with a species of relatively restricted range and tolerance (Stage A), range expansion takes place as tolerances are expanded (Stage B). If a wide

TABLE 10

DISTRIBUTION PATTERNS OF ALLOPATRIC SISTER SPECIES OF THE GENUS *Evarthrus*

A. EAST – WEST RELATIONSHIPS

WESTERN VICAR		EASTERN VICAR	
NAME	CENTER	NAME	CENTER
fucatus	4	spoliatus	2, 3
macrovulum	2	texensis	5
blatchleyi	1	floridensis	1
engelmanni	5	nonnitens	2, 5
sodalis	3, 4, 6, 7, 8	furtivus	3
s. colossus	6, 7	s. sodalis	3, 4, 8
gigas	5	sallei	5

B. FLORIDA – COASTAL PLAIN RELATIONSHIPS

COASTAL PLAIN VICAR	FLORIDIAN VICAR
faber	levifaber

C. NORTH – SOUTH RELATIONSHIPS

NORTHERN VICAR		SOUTHERN VICAR	
NAME	CENTER	NAME	CENTER
incisus	4, 5, 7, 8	whitcombi	6
convivus	2, 4	sinus	2
seximpressus	4, 5, 6, 7, 8	alabamae	2, 5
sodalis	3, 4, 6, 7, 8	parasodalis	6
s. sodalis	3, 4, 8	s. lodingi	4
t. torvus	5, 6, 7, 8	t. deceptus	5, 7

temperature tolerance evolves, the species may spread longitudinally into climatic zones different from the ancestral one. If not, the species spreads latitudinally. Major physical barriers may be crossed, or barriers may appear and become effective subsequently, breaking the range of Stage B species. Differentiation of the resulting segregates takes place, leading initially to divergence to the subspecies level (Stage C), and later to the species level (Stage D). At this stage, two allopatric species are present in place of the original ancestral species. Next, the ranges of these sister species may expand. The sister species may meet one another, and eventually, the two sister species become sympatric (Stage E). Examples of all of these stages are found among the extant species of *Evarthrus*. Stage A, Stage D and some Stage E species form the nuclei of the Centers of Concentration – the centrants. Stage B and Stage E species usually are widespread in more than one center – the radiant species.

It is suggested that the barriers are provided by permanent physiographical features, such as mountains, rivers and the sea, or by temporary interruptions of ranges as a result of Pleistocene climatic change.

Historical zoogeography. – In this section, an attempt is made to reconstruct the geographical history of the genus *Evarthrus*, based to a large extent on the considerations presented above. The primitive ancestry of this genus became separated from its Palaearctic sister stock (the ancestor of the Palaearctic molopine genera) sometime in the early Tertiary, when the Bering Land Bridge was covered by the sea. This New World group inhabited the Arcto-Tertiary forests in warm temperate regions during the middle Tertiary, possibly ranging across the north from the west coast to the east. As this biota withdrew from the west, so did *Evarthrus*, ultimately becoming restricted to the east. Probably representatives of the genus arrived too late on the Gulf Coast to be able to enter eastern Mexico. This suggests that they arrived in the area in post-Miocene time. Martin and Harrell (1957) suggest that grasslands formed in this area in the Miocene. Had the early members of *Evarthrus* been present before the grasslands formed they might be expected to be found today in Mexico.

Because of the present extensive overlap in ranges of the extant subgenera, it is impossible to guess the geographical relationships of these groups at the time of their origin. And, for the same reason, it is impossible to reconstruct much of the subsequent history of the genus. However, it is possible to suggest events which led to the development of many of the extant species pairs.

The general assumption is that much of the evolution of markedly similar allopatric species took place in the Pleistocene, a time span of several million years. Zoogeographers, such as Blair (1958), Hubbell (1954) and Howden (1963), have suggested that such species have arisen during the Pleistocene, because of the coincidence of the ranges of such species with barriers that could have arisen during this time, only. However, on the basis of fossil evidence, Shotton (1965) and Lindroth (1963) have denied that any stock diverged to species level. The difference may be that in general, the more widespread species have been collected as fossils, and they may be older, less rapidly evolving. In any event, it is clear that a number of vertebrates have undergone evolution to the species level during the Pleistocene, and we fail to see that insects should not have done the same. The taxa are discussed below, in phylogenetic sequence.

The *morio* and *obsoletus* groups of the subgenus *Fortax* are largely allopatric (Fig. 125, cf. Fig. 126). The *morio* group occupies the Gulf Coastal Plain, while the *obsoletus* group has a more northern distribution. Possibly the ancestral stock of these groups became divided during early Pleistocene or late Pliocene time into a northern and southern stock.

Speciation of *hernandensis* and *morio* of the *morio* species group undoubtedly took place in Floridian refuges, possibly during an interglacial period, when Florida was isolated by water barriers from the mainland. Both species are presently almost completely confined to Florida (Fig. 125). Because these are sympatric their geographical history is difficult to determine. The species *laevipennis* and the ancestor of *morio* and *hernandensis* were probably separated during an early interglacial. *E. laevipennis* evolved on the mainland coast just west of Florida, and has moved northward in recent times.

The Appalachian Mountains are an effective barrier between the species *obsoletus* and the other two members of the *obsoletus* group (Fig. 126). The *obsoletus* group ancestor probably became disjunct and gave rise to *obsoletus* west of the mountains while its sister stock which ultimately give rise to *approximatus* and *iuvenis* speciated east of the mountains. Since *approximatus* and *iuvenis* are very closely related and sympatric, little can be said about the history of their geographical distribution.

Widespread sympatry among the species groups of the subgenus *Cyclotrachelus* masks most of their distributional history. Within the species groups, however, the distribution pattern among some species merits comment.

In the *spoliatus* group the more remotely related species *brevoorti* and *unicolor* are sympatric on the Gulf Coastal Plain (Fig. 127). Little can be said about their geographical history. The sister species *fucatus* and *spoliatus* flank the Appalachians. Since both extant species are cool tolerant the separation of the ancestral population could have occurred as follows: the ancestral population was distributed somewhere at the southern end of the Appalachian System during a glacial period; with the coming of an interglacial the biota began to shift northward and along with it went the ancestral population; as it moved north it became divided at the base of the mountains; the northward shift continued and the two populations, now completely separated, moved north one on either side of the mountains, then differentiated into *fucatus* and *spoliatus*.

Each species of the *ovulum* group has a highly restricted geographical distribution (Fig. 128). The species *vinctus* is confined to high elevations of the southern Appalachians. It may have become disjunct in the mountains during early stages of the Pleistocene. The remaining species, *alabamensis* and the closely related *ovulum, macrovulum,* and *texensis* are southern Gulf Coastal forms. The ancestor which gave rise to *alabamensis* and the basic stock of *ovulum, macrovulum* and *texensis* was probably distributed along the coast from southern Alabama down into Florida. During an early interglacial the Florida stock of the species probably became isolated in a Florida refuge where it evolved, while the mainland population evolved into *alabamensis*. With the advent of another glacial period and consequent lowering of sea level, Florida was again united with the mainland. The ancestor of *ovulum*, *macrovulum*, and *texensis* then moved north and became distributed from Florida along the coast to Mobile, Alabama where it became sympatric with *alabamensis*. In the following interglacial period this stock, just as its ancestor, became divided into a mainland

population and one separated on a Floridian island. The mainland form differentiated into the ancestor of *macrovulum* and *texensis*, and the other into *ovulum*. The *macrovulum-texensis* stock crossed the Mississippi River, and differentiated into two species.

The zoogeography of the *faber* group probably parallels that of the *ovulum* group (Fig. 129). The ancestor of *faber* and *levifaber*, and *parafaber* probably ranged along the Gulf Coast from Mobile, Alabama to peninsular Florida. During an interglacial it became divided into a mainland population which speciated into *parafaber* and a Floridian isolate which also speciated. During the following glacial period the Florida population radiated. When the next interglacial occurred this population was separated. One portion became isolated in a Florida refuge, while another part remained on the mainland northeast of Florida. Both populations differentiated giving rise to *faber* in Florida and to *levifaber* on the mainland.

The subgenus *Evarthrus* is the only subgenus with extensive representation west of the Mississippi River, although it is rich in species to the east of the river, as well. Clearly the subgenus has been on both sides of the Mississippi for an extended period of time.

The two species of the *incisus* group are exclusively or largely west of the Mississippi River (Fig. 130), and of these *whitcombi* is confined to Center 6, south of the Arkansas River. To the north occurs the radiant species *incisus*. Possibly the Arkansas River constituted a partial barrier to dispersal, and the *incisus* stock differentiated to the north and south of that barrier.

Figure 131 illustrates the distribution of the taxa of the *blatchleyi* and *sigillatus* groups. The barrier effect of the Mississippi River and the Appalachian System is shown in remarkable clarity. In addition Florida contains two more essentially endemic species. The ancestral stock of the *blatchleyi* group undoubtedly had a southern distribution perhaps near northeastern Florida, while its sister stock which gave rise to the *sigillatus* group was isolated further north. Possibly during an interglacial, the species *floridensis* evolved in a Floridian refuge while *blatchleyi* evolved on the mainland near Florida; then during the following glacial period *blatchleyi* moved south into Florida. Alternatively, the two could have evolved from a discontinuously distributed Floridian stock.

Because of Pleistocene north-south biotic shifts, the ancestral stock of the *sigillatus* group was divided into two populations one on either side of the Appalachians. That on the east evolved into *sigillatus*. The western population then became disjunct. The species *sinus* must have evolved on the Gulf Coast, while *convivus* evolved further north.

Extant species of the *seximpressus* group are mainly Gulf Coastal Plain species where they are largely sympatric (Fig. 132). Only *seximpressus* ranges northward to Minnesota and Wisconsin. Two species *alabamae* and *nonnitens*, have managed to cross the Mississippi River. The ancestral stocks of the present species probably evolved on or near the Gulf Coastal Plain. The species *seximpressus* probably evolved further north as a cool adapted form, while the other three species arose on the Gulf Coastal Plain.

Because the relationships of the *hypherpiformis* group are not clearly understood there is nothing to write concerning the zoogeography of it (Fig. 132).

All of the extant species of the *sodalis* group are relatively northern forms and as a group cross the northern headwaters of the Mississippi River (Fig. 133). There is no doubt that the primitive ancestors of this species group also had northern ranges and were cool adapted.

Geographical variation in the species *sodalis* is probably recently acquired because at present some distinct populations are partially isolated west of the Missouri River and some in northern Alabama. The species *parasodalis* is confined to central and western Arkansas while its sister species *sodalis* occurs further north, where it probably evolved.

The species *furtivus* may have been pinched off to the east of the Appalachians from its immediate ancestral population during a general southward biotic glacial shift (Fig. 133).

The closely related species *alternans* and *iowensis* are sympatric (Fig. 134). They may have evolved in the general region where they are now found, near the upper reaches of the Mississippi River, but they could not have survived the glacial stages in this area. Therefore, their present distribution is post-glacial.

The sympatric species *substriatus* and *constrictus*, which make up the *substriatus* group, are two of the most widespread forms in the genus *Evarthrus* (Fig. 134). Together they occupy the Great Plains from Durango, Mexico north to Minnesota and from central Arizona east to the margin of the Mississippi River valley. They evolved in the Great Plains. They, along with the species *torvus* and possibly *gravidus* are the only extant species of *Evarthrus* which occur mainly on dry prairie.

E. gravidus occurs mainly in southeastern Texas but it has been collected as far west as El Paso, Texas (Fig. 135). It is not as widespread in the Great Plains as its sister species *torvus*. The subspecies of *torvus* occur north and south of one another in the Great Plains. This suggests that southeastern Texas and the northern Great Plains could be centers of speciation in which population became disjunct during the south-north Pleistocene biotic shifts. *E. gravidus* could have speciated in isolation in southeastern Texas after a northward interglacial shift while *torvus* speciated in the northern Great Plains. A southern shift during the next glacial stage (Wisconsin?) brought *torvus* south into *gravidus* territory. During the next interglacial (Recent?) again *torvus* moved north and southern and northern populations which were partially separated subspeciated.

Because the members of the *gigas* group are largely sympatric the historical zoogeography of the *gigas* group is almost impossible to reconstruct (Fig. 136). Speciation must have occurred in the southeastern Great Plains area.

Phylogenetic relationships between the species *gravesi* and other *Evarthrus* species is uncertain. We cannot comment on the geographical history of this species.

The present distributions of the species of *Evarthrus* indicate that Pleistocene events profoundly affected the genus as a whole. At the present time forest species which live in warm temperate regions have distinctly restricted distributions. Conversely, cold tolerant and/or dry tolerant species are clearly more widespread and some may be undergoing further divergence at the present time. Those species which were specifically suited for warm temperate forest conditions, i.e. species on the Gulf Coastal Plain, probably moved southward along with their biotic neighbourhood as a northern ice mass developed. Species which could not tolerate even a slight depression in the temperature probably perished along the Gulf Coastal Plain. Some moved into peninsular Florida. Other slightly more broadly adapted forest species probably moved southward or eastward on the Gulf Coastal Plain as sea level dropped and land emerged. At the height of the glacial periods, the ranges of these species may have been greatly reduced, and their ranges have remained restricted to the present time.

On the other hand broadly adapted species made adaptive shifts during the Pleistocene. Some became successful cold tolerant forms and others invaded dry regions west of the Mississippi River. These species are dominant at the present time.

Because the species of *Evarthrus* are wingless it is not surprising that water is an effective barrier to these species. The Mississippi drainage system and ocean around Floridian islands were undoubtedly the two most important water barriers in the history of this genus. In addition, another great obstacle was, and remains the Appalachian Mountains. These barriers in conjunction with Pleistocene climatic changes forged the geographical patterns of the present species of *Evarthrus*.

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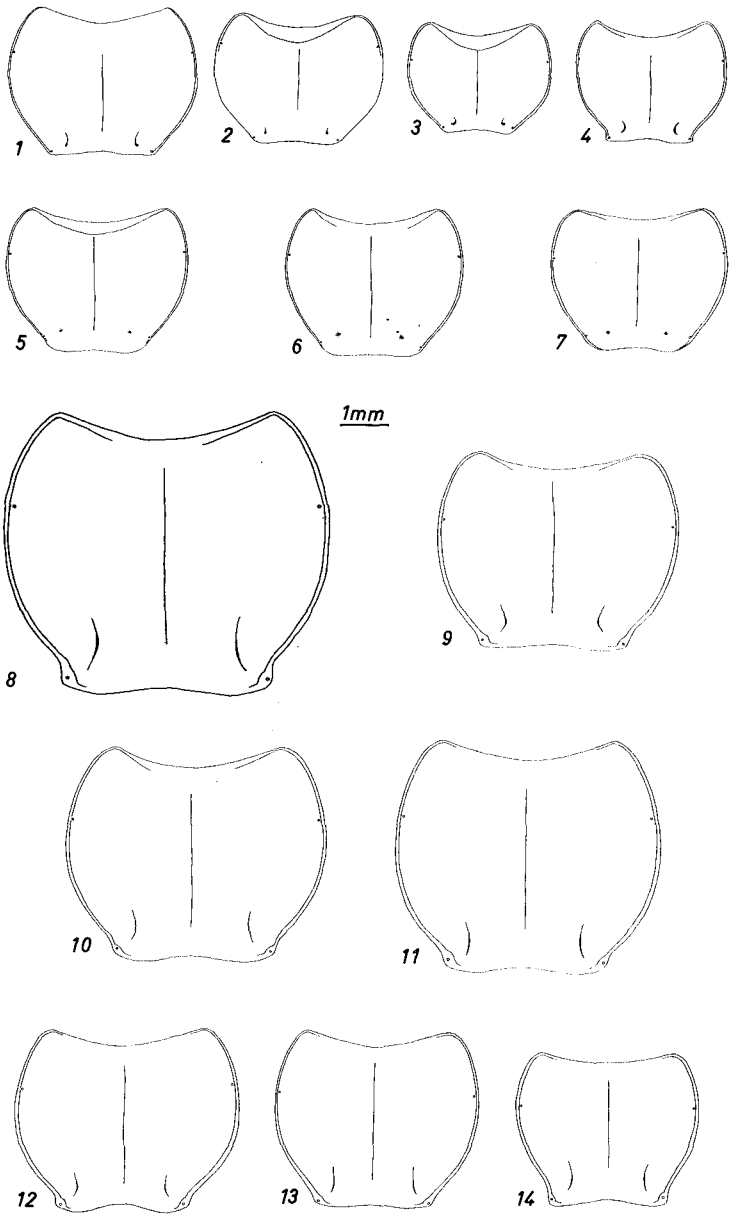
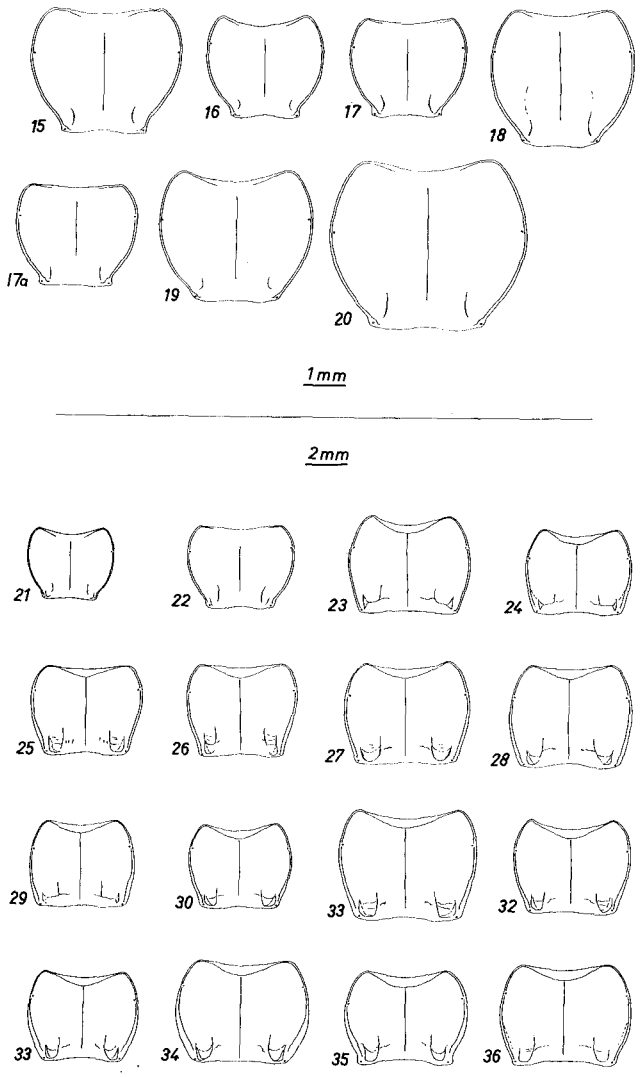
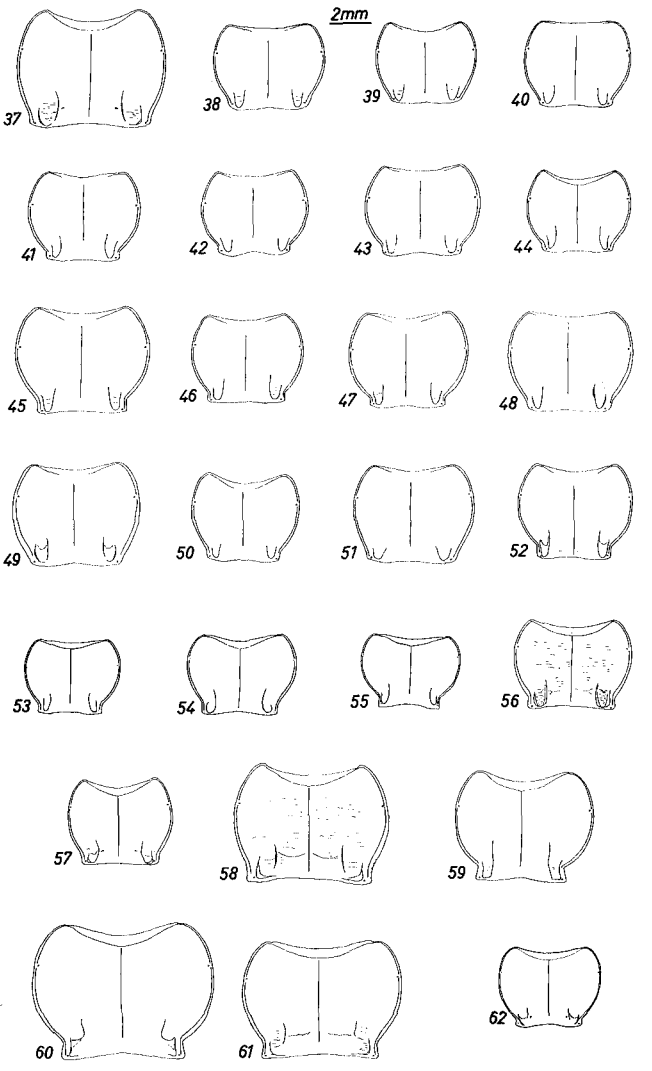


Figs. 1-14. Pronotum, dorsal aspect. 1. *E. hernandensis* (Citrus County, Florida). 2. *E. morio* (Alma, Georgia). 3. *E. laevipennis* (Mobile, Alabama). 4. *E. laevipennis* (near Spartensburg, South Carolina). 5. *E. approximatus* (Rosslyn, Virginia). 6. *E. iuvenis* (near Roanoak, Virginia). 7. *E. obsoletus* (near Tuscaloosa, Alabama). 8. *E. unicolor* (Umadilla, Georgia). 9. *E. fucatus* (Leesburg, Alabama). 10. *E. spoliatus* (Rock Creek, Washington, D. C.). 11-13. *E. brevoorti* (11. Mobile, Alabama; 12. Calvert, Alabama; 13. Clemson, South Carolina). 14. *E. vinctus* (Clayton, Georgia).



Figs. 15-36. Pronotum, dorsal aspect. 15. *E. alabamensis* (Mobile, Alabama). 16. *E. ovulum* (Tallahassee, Florida). 17. *E. macrovulum* (Mobile, Alabama). 17a. *E. texensis* (Kirbyville, Texas). 18. *E. parafaber* (Mobile, Alabama). 19. *E. levifaber* (Georgia). 20. *E. faber* (Punta Gorda, Florida). 21. *E. incisus* (near Morrilton, Arkansas). 22. *E. whitcombi* (Hot Springs, Arkansas). 23. *E. blatchleyi* (Jacksonville, Florida). 24. *E. floridensis* (Winter Park, Florida). 25-28. *E. sigillatus* (25. Easton, Pennsylvania; 26. Black Mountains, North Carolina; 27. Climax, North Carolina; 28. Auburn, Alabama). 29. *E. sinus* (Alabama Port, Alabama). 30-32. *E. convivus* (30. Beamsville, Ohio; 31. Talladega, Alabama; 32. near Toomsuba, Mississippi). 33. *E. seximpressus* (Le Flore County, Oklahoma). 34. *E. alabamae* (Gulfport, Mississippi). 35. *E. engelmanni* (Cuero, Texas). 36. *E. nonnitens* (Bradley County, Arkansas).



Figs. 37-62. Pronotum dorsal aspect. 37. *E. hypherpiformis* (near Demopolis, Alabama). 38-44. *E. sodalis sodalis* (38. near Lake Chautauqua, New York; 39. Cleveland, Ohio; 40. Albany, Wisconsin; 41. near Frankfort, Kentucky; 42. Chicago, Illinois; 43. Dubois, Illinois; 44. near Luka, Mississippi). 45-47. *E. sodalis colossus* (45. near Yates Centre, Kansas; 46. St. Joseph, Missouri; 47. St. Louis, Missouri). 48. *E. s. lodingi* (Monte Sano State Park, Alabama). 49. *E. parasodalis* (Washington County, Arkansas). 50-51. *E. furtivus* (50. N. Cumberland, Pennsylvania; 51. Rosslyn, Virginia). 52. *E. alternans* (Ames, Iowa). 53. *E. iowensis* (Iowa City, Iowa). 54. *E. substriatus* (Cloudcroft, New Mexico). 55. *E. constrictus* (Hamilton County, Kansas). 56. *E. torvus torvus* (near Grand Island, Nebraska). 57. *E. torvus deceptus* (Cuero, Texas). 58. *E. gravidus* (Austin, Texas). 59. *E. sallei* (Victoria, Texas). 60. *E. gigas* (Victoria, Texas). 61. *E. heros* (Dallas, Texas). 62. *E. gravesi* (Pearl, Mississippi).

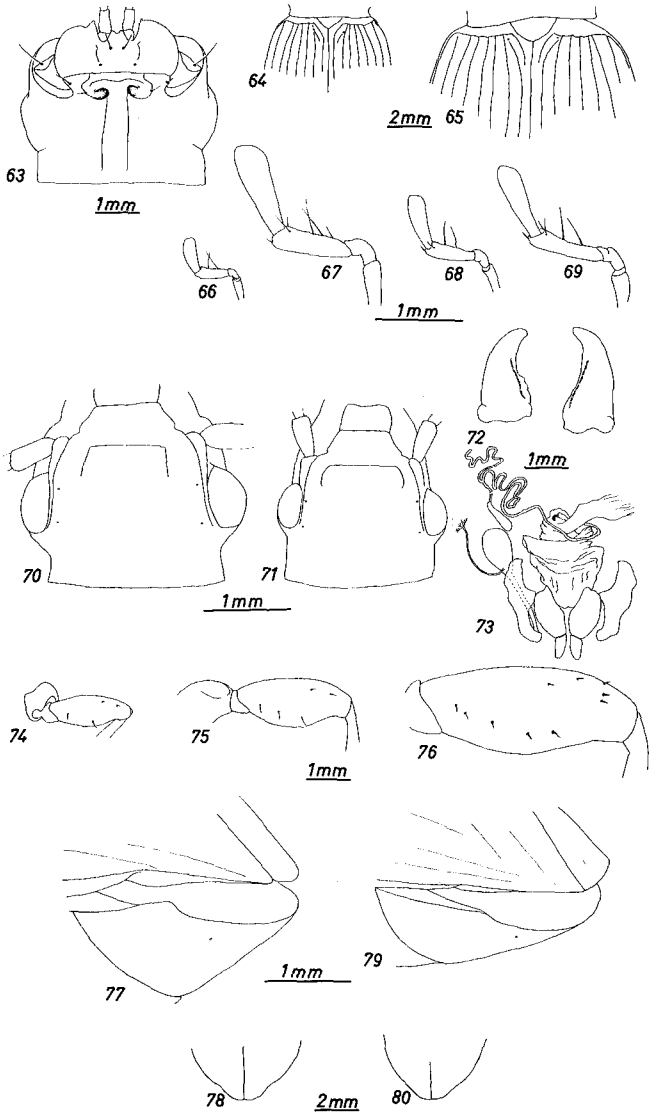
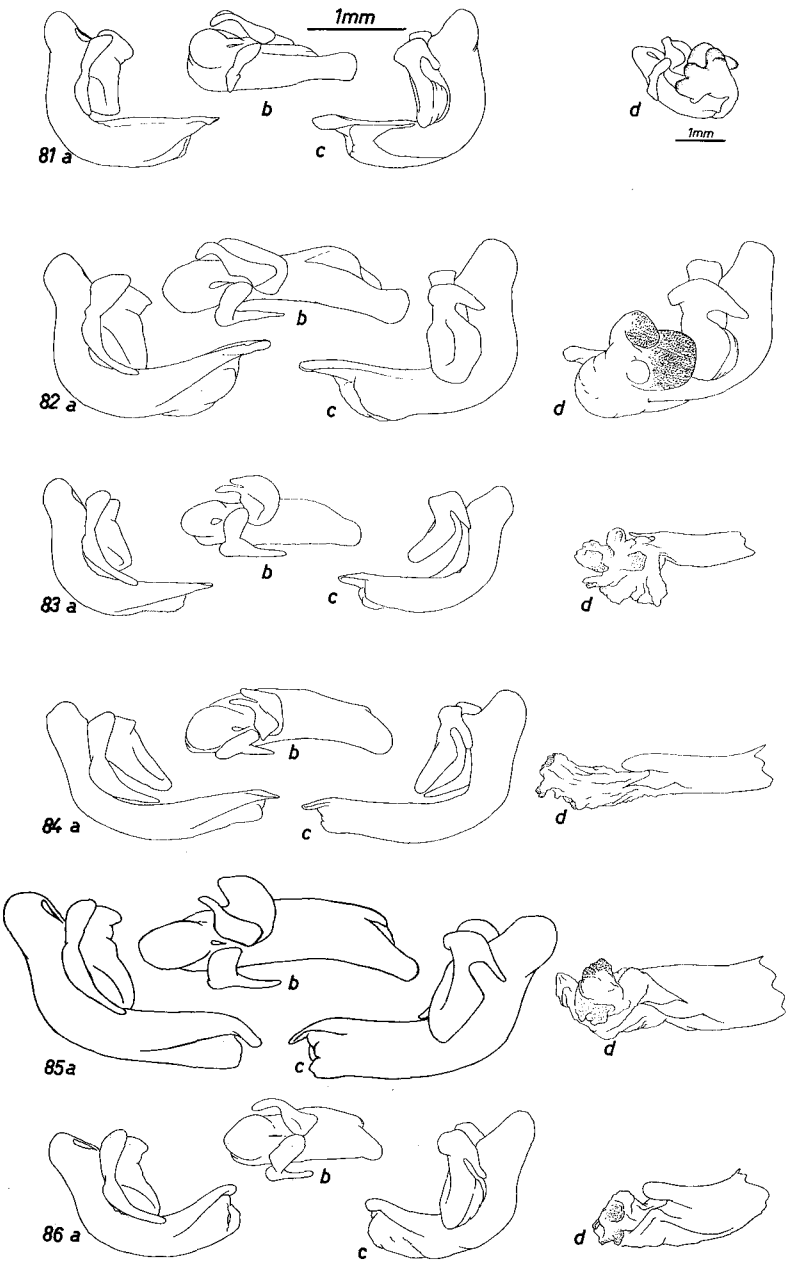
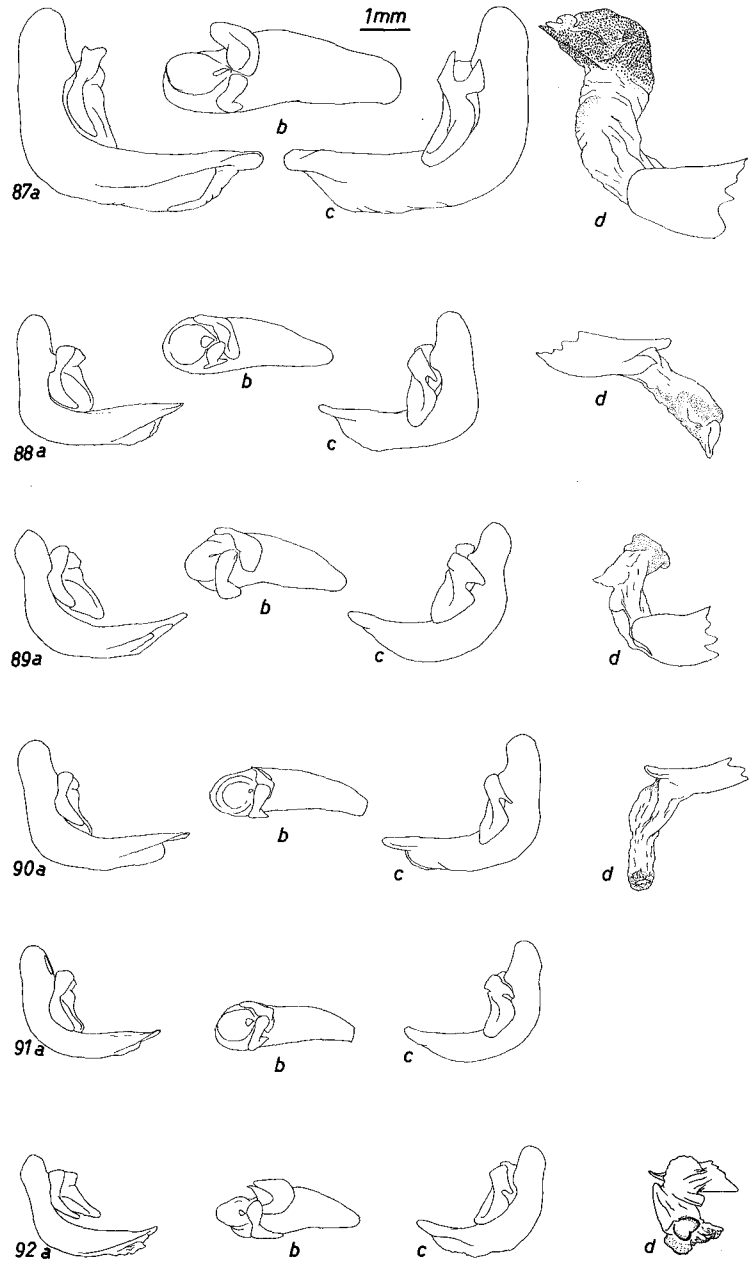


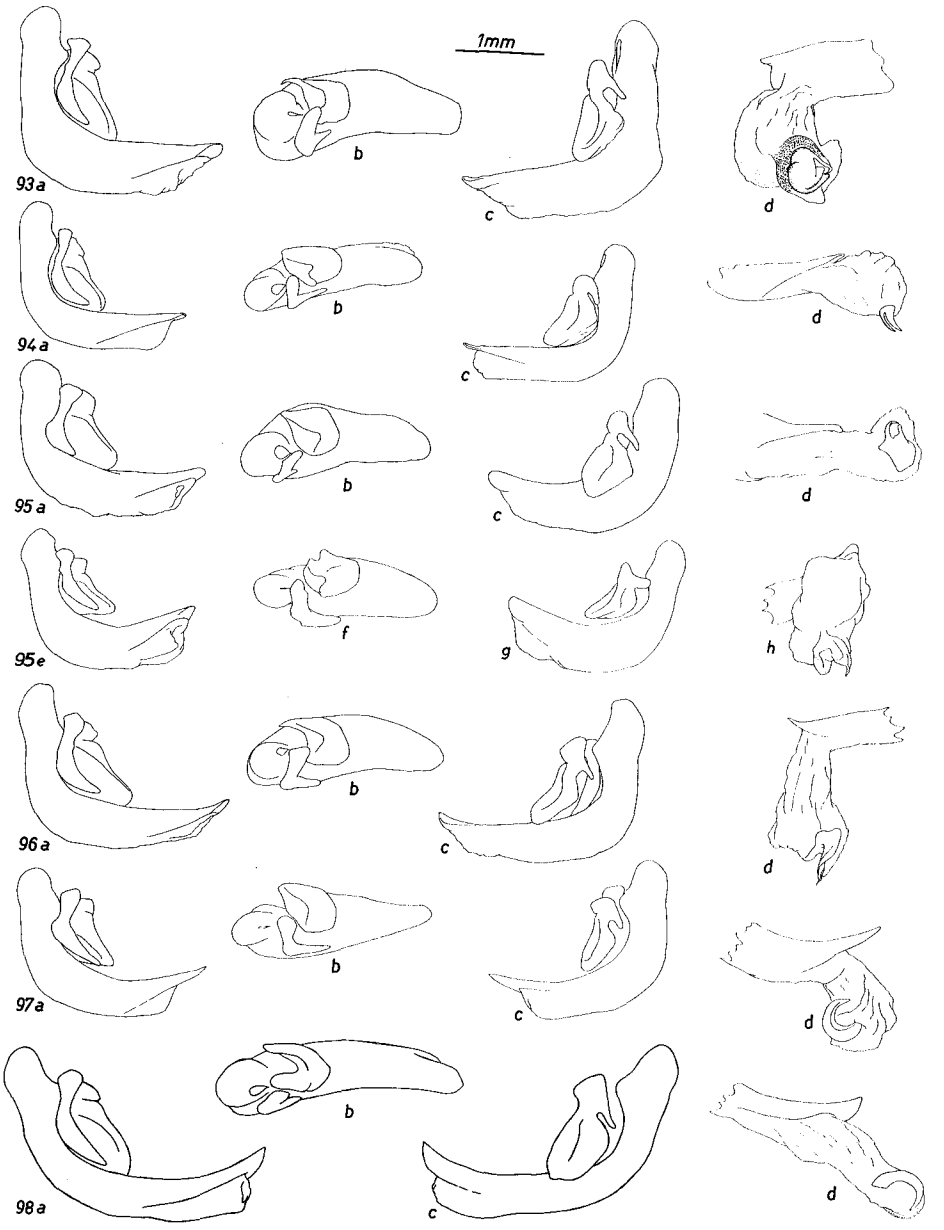
Fig. 63. Ventral aspect of head of *E. unicolor*. Figs. 64-65. Elytra, basal portion. 64. *E. sodalis colossus* (St. Joseph, Missouri). 65. *E. heros* (Dallas, Texas). Figs. 66-69. Palpus of labium. 66. *E. hernandensis*. 67. *E. unicolor*. 68. *E. faber*. 69. *E. blatchleyi*. Figs. 70-71. Head, dorsal aspect. 70. *E. alabamensis*. 71. *E. ovulum*. Fig. 72. Ventral aspect of mandibles of *E. sigillatus*. Fig. 73. Genitalia of female *E. sigillatus*. Figs. 74-76. Middle femur, anterior face. 74. *E. hernandensis*. 75. *E. seximpressus*. 76. *E. heros*. Fig. 77. Plica of elytron and dorsal hump of abdomen of *E. substriatus* (Kerrville, Texas). Fig. 78. Dorsal aspect of posterior portion of elytra of *E. substriatus* (near Ft. Davis, Texas). Fig. 79. Plica of elytron and dorsal hump of abdomen of *E. constrictus* (Denver, Colorado). Fig. 80. Dorsal aspect of posterior portion of elytra of *E. constrictus* (Clark County, Kansas).



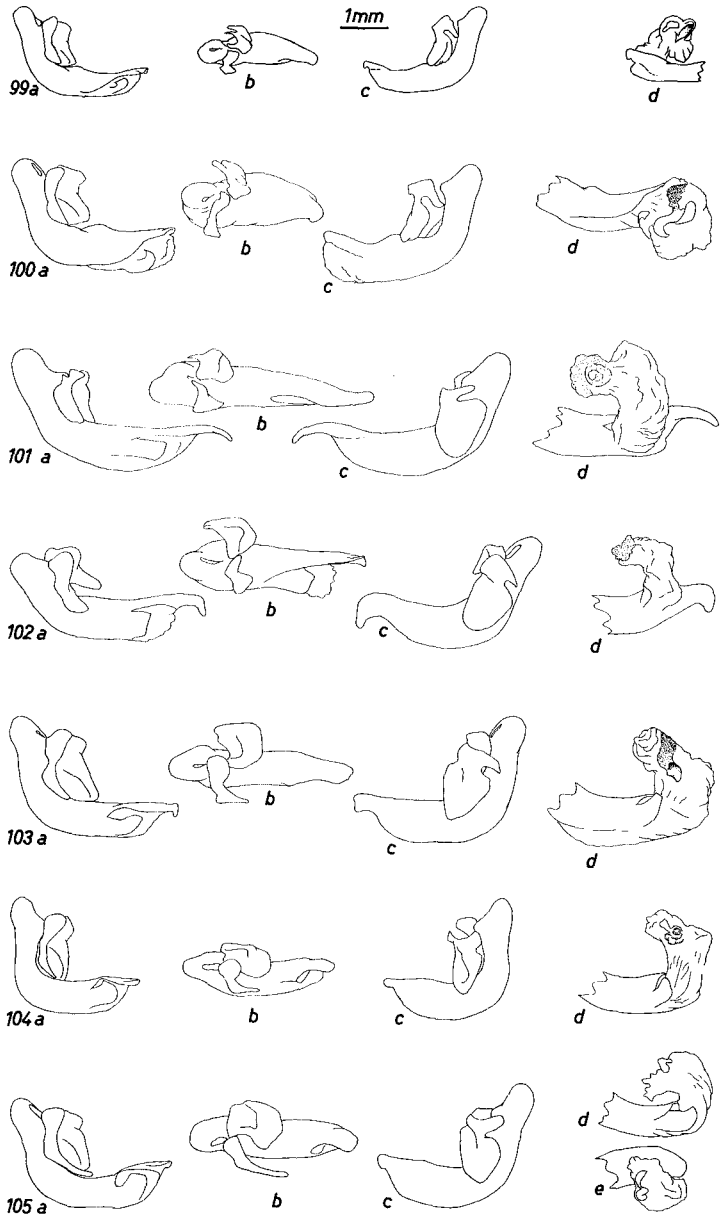
Figs. 81-86. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted. 81. *E. hernandensis* (Juniper Springs, Florida), d, right apical aspect. 82. *E. morio* (Wellborn, Florida), d, left lateral aspect. 83. *E. laevipennis* (Mobile, Alabama), d, left lateral aspect. 84. *E. approximatus* (Fairfax County, Virginia), d, left lateral aspect. 85. *E. iuvenis* (near Roanoke, Virginia), d, left lateral aspect. 86. *E. obsoletus* (Talladega, Alabama), d, left lateral aspect.



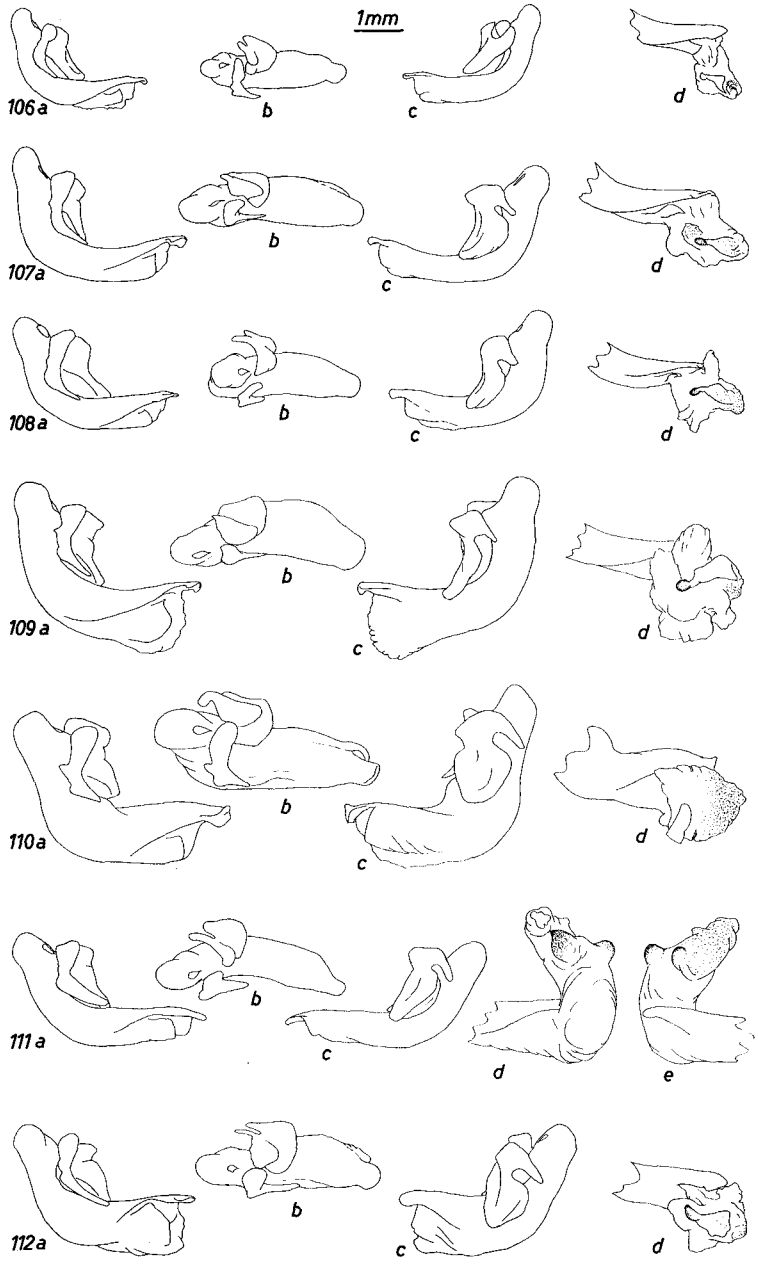
Figs. 87-92. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted. 87. *E. unicolor* (Leesburg, Alabama), d, ventral aspect. 88. *E. fucatus* (Leesburg, Alabama), d, right lateral aspect. 89. *E. spoliatus* (Rock Creek, Washington, D. C.), d, ventral aspect. 90. *E. brevoorti* (Mobile, Alabama), d, left lateral aspect. 91. *E. brevoorti* (Lucedale, Mississippi). 92. *E. vinctus* (Rabun County, Georgia), d, left lateral aspect.



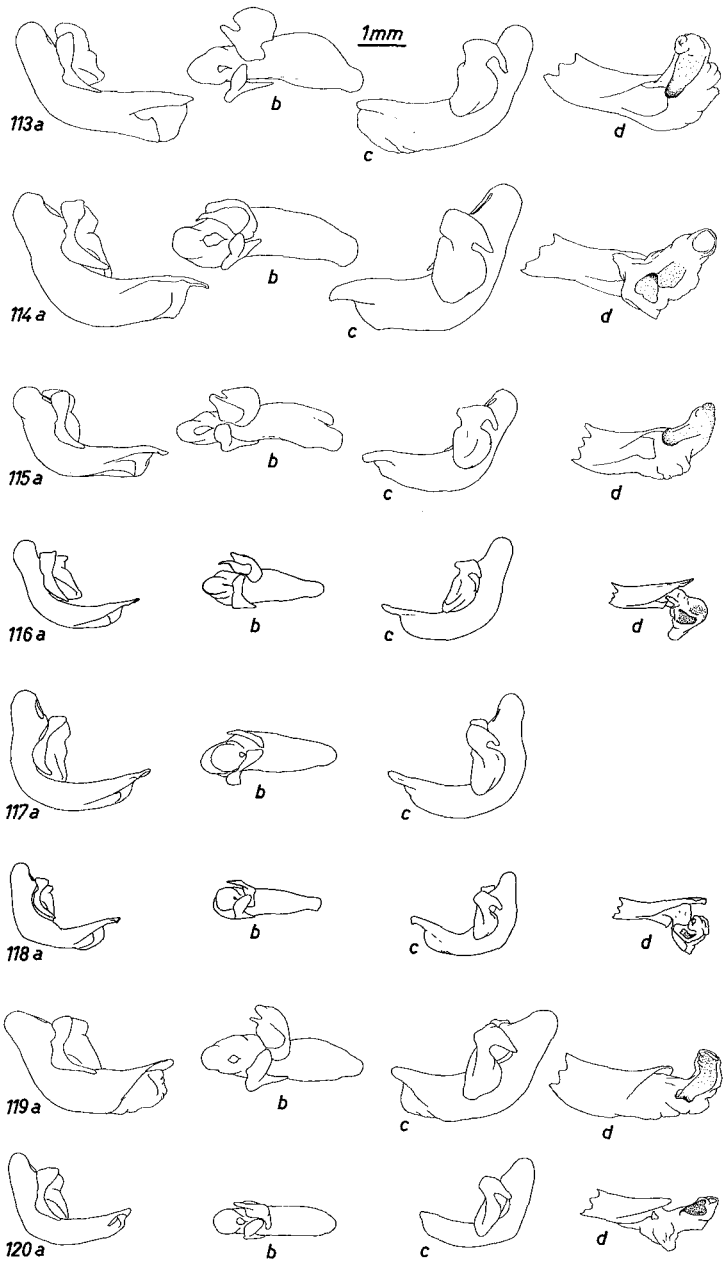
Figs. 93-98. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, similarily e-h. 93. *E. alabamensis* (Mobile, Alabama), d, left lateral aspect. 94. *E. ovulum* (Toombs County, Georgia), d, right lateral aspect. 95a-d. *E. macrovulum* (Mobile, Alabama), d, right dorsolateral aspect. 95e-h. *E. texensis* (Tyler Co., Texas). 96. *E. parafaber* (Mobile, Alabama), d, left lateral aspect. 97. *E. levifaber* (Georgia), d, right lateral aspect. 98. *E. faber* (Punta Gorda, Florida), d, right lateral aspect.



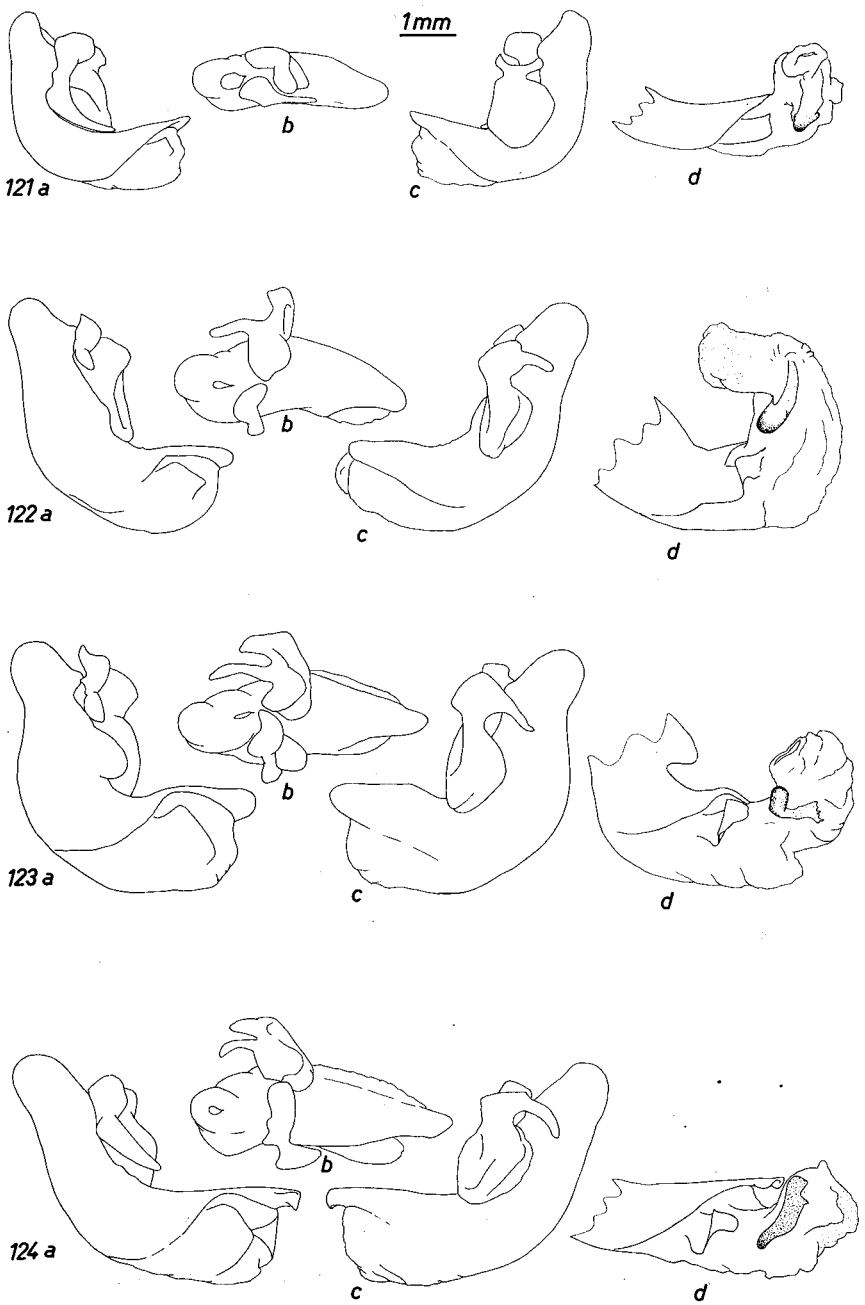
Figs. 99-105. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted. 99. *E. incisus* (Washington County, Arkansas), d, ventral aspect. 100. *E. whitcombi* (Hot Springs, Arkansas), d, right lateral aspect. 101. *E. blatchleyi* (Gainesville, Florida), d, right lateral aspect. 102. *E. floridensis* (Winter Park, Florida), d, right lateral aspect. 103. *E. sigillatus* (Easton, Pennsylvania), d, right lateral aspect. 104. *E. sinus* (Alabama Port, Alabama), d, right lateral aspect. 105. *E. convivus* (near Toomsuba, Mississippi), d, right lateral aspect; e, median lobe with internal sac everted, ventral aspect.



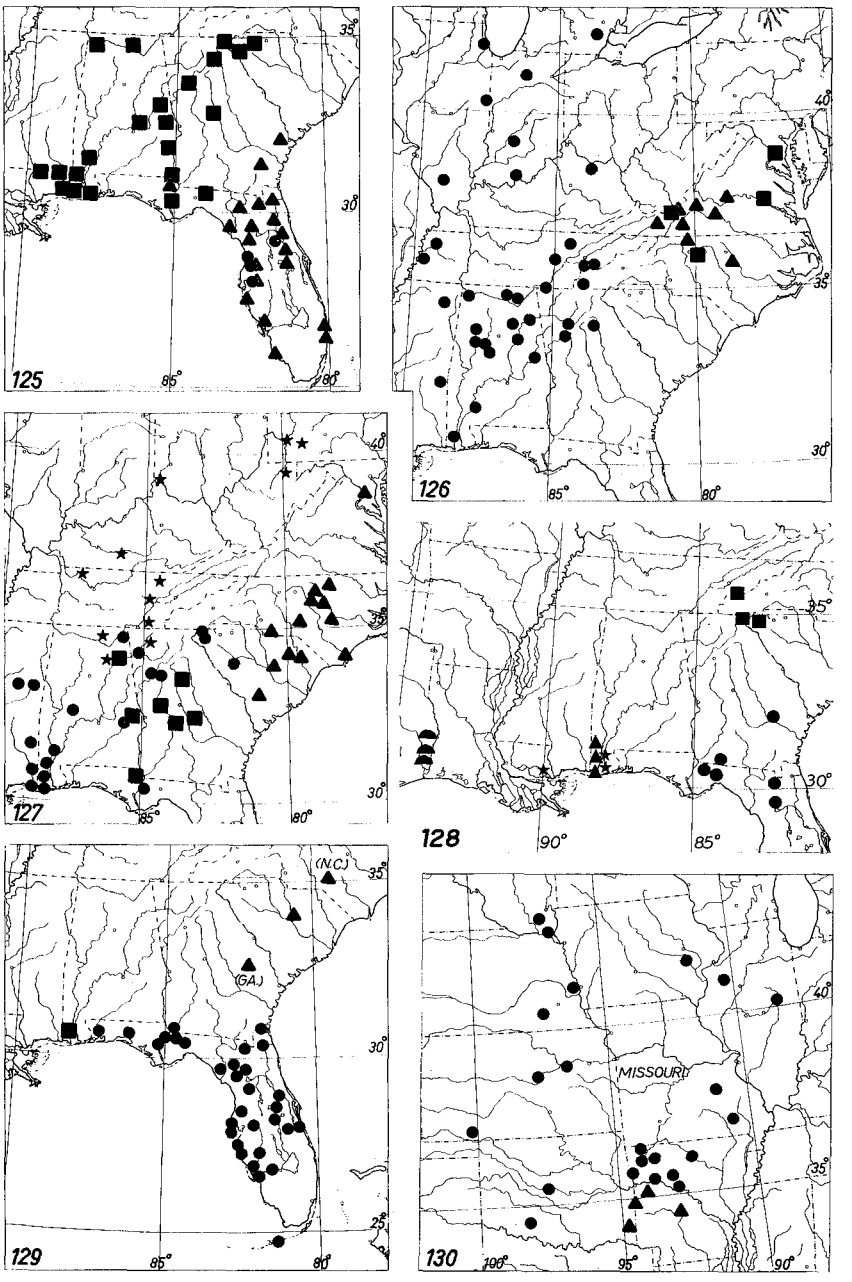
Figs. 106-112. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. 106. *E. seximpressus* (Washington County, Arkansas). 107. *E. alabamae* (Mobile, Alabama). 108. *E. engelmanni* (College Station, Texas). 109. *E. nonnitens* (Bradley County, Arkansas). 110. *E. hypherpiformis* (Manego County, Alabama). 111. *E. sodalis* (Mayville, N. Y.). 112. *E. parasodalis* (Washington County, Arkansas).



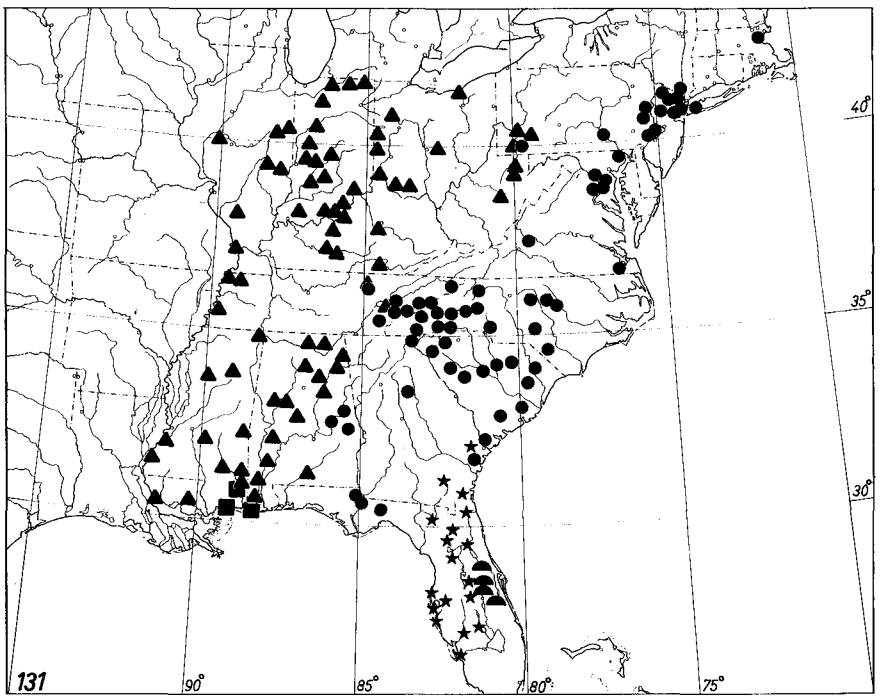
Figs. 113-120. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. 113. *E. furtivus* (Mt. Vernon, Virginia). 114. *E. alternans* (Adams County, Illinois). 115. *E. iowensis* (Iowa City, Iowa). 116. *E. substriatus* (Minaca, Chihuahua, Mexico). 117. *E. substriatus* (Durango, Mexico). 118. *E. constrictus* (Austin, Texas). 119. *E. torvus torvus* (near Castle Rock, Colorado). 120. *E. torvus deceptus* (Texas).

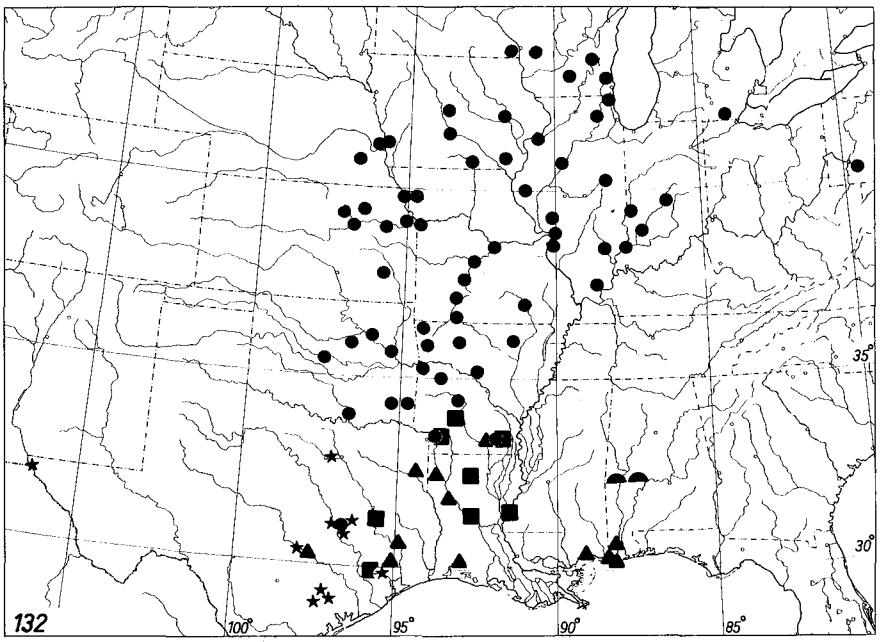


Figs. 121-124. Male genitalia, median lobe and parameres: a, right lateral aspect; b, ventral aspect; c, left lateral aspect; d, median lobe with internal sac everted, right lateral aspect. 121. *E. gravidus* (Forestburg, Texas). 122. *E. sallei* (Victoria, Texas). 123. *E. gigas* (Kingsville, Texas). 124. *E. heros* (Gainesville, Texas).

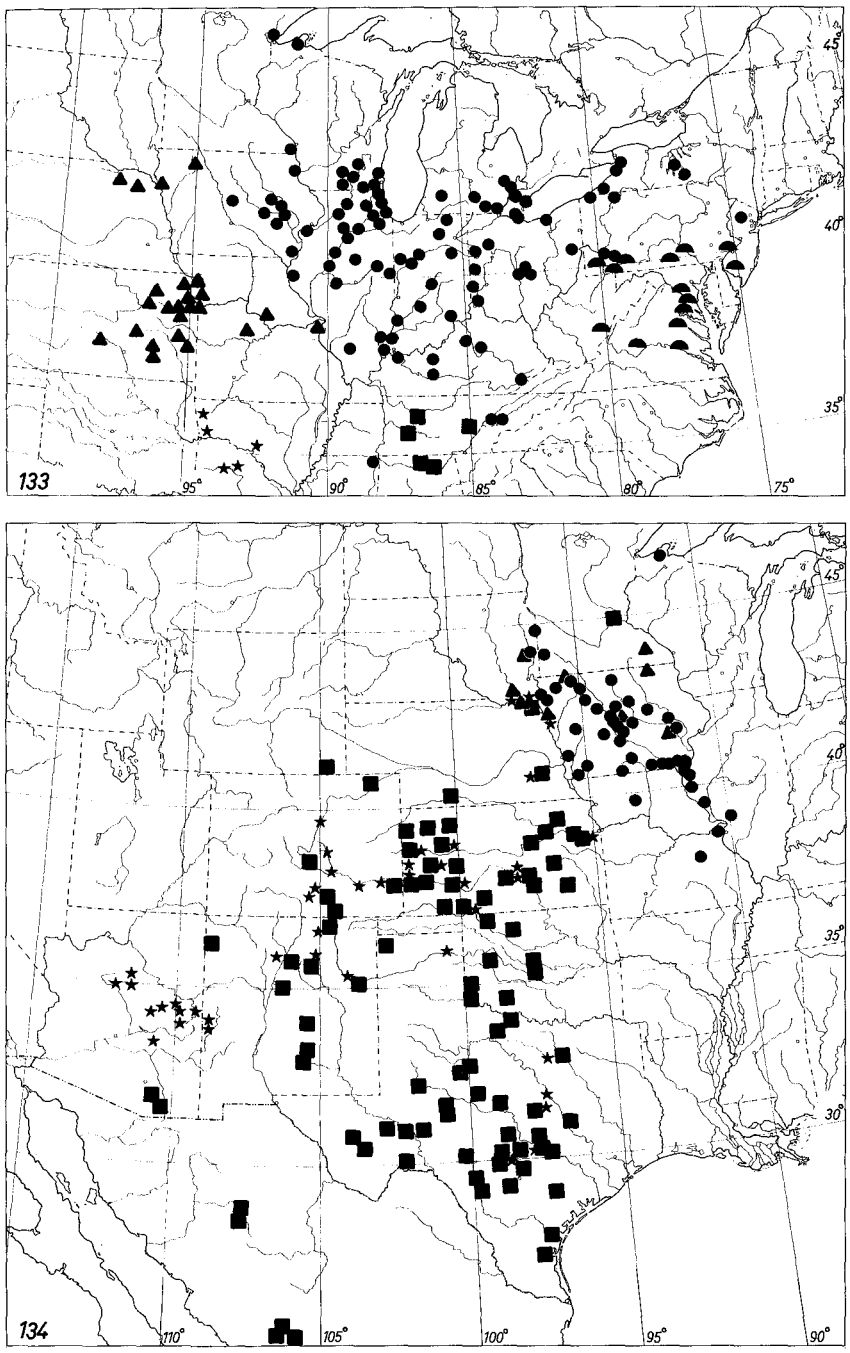


Figs. 125-130. Maps of geographical distribution. 125. *E. hernandensis* (●), *E. morio* (▲), *E. laevipennis* (■). 126. *E. approximatus* (■), *E. iuvenis* (▲), *E. obsoletus* (●). 127. *E. unicolor* (■), *E. fucatus* (★), *E. spoliatus* (▲), *E. brevoorti* (●). 128. *E. vinctus* (■), *E. alabamensis* (▲), *E. ovulum* (●), *E. macrovulum* (★), *E. texensis* (▼). 129. *E. parafaber* (■), *E. levifaber* (▲), *E. faber* (●). 130. *E. incisus* (●), *E. whitcombi* (▲).

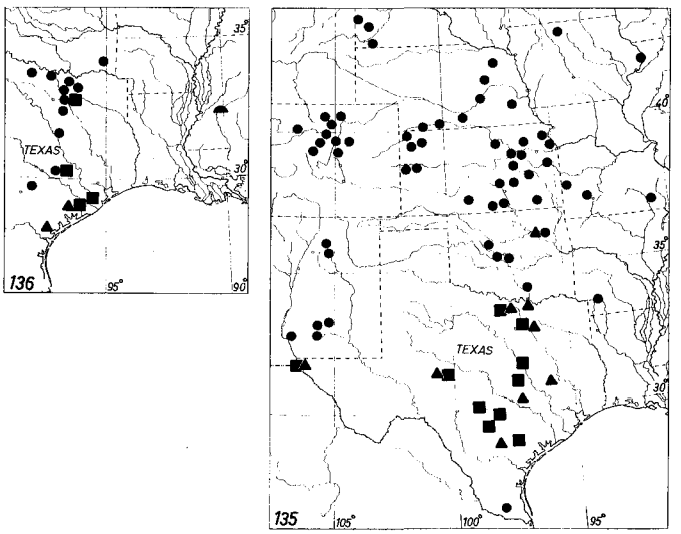


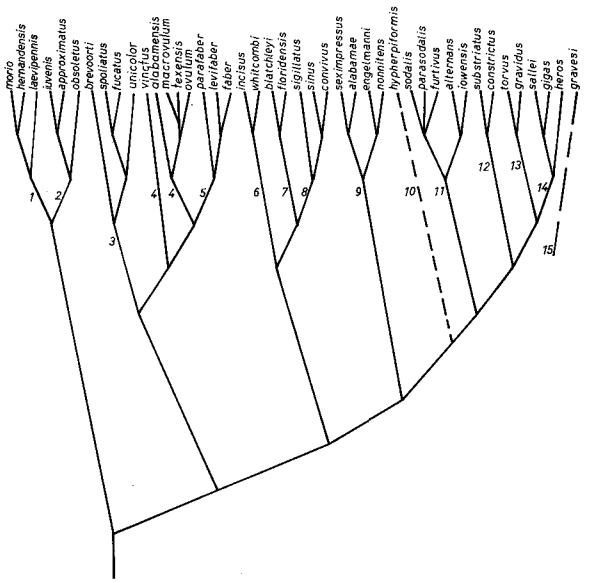


Figs. 131-132. Maps of geographical distribution. 131. *E. blatchleyi* (★), *E. floridensis* (◓), *E. sigillatus* (●), *E. sinus* (■), *E. convivus* (▲). 132. *E. seximpressus* (●), *E. alabamae* (▲), *E. engelmanni* (★), *E. nonnitens* (■), *E. hypherpiformis* (◓).



Figs. 133-134. Maps of geographical distribution. 133. *E. sodalis sodalis* (●), *E. sodalis colossus* (▲), *E. sodalis lodingi* (■), *E. parasodalis* (★), *E. furtivus* (◓). 134. *E. alternans* (●), *E. iowensis* (▲), *E. substriatus* (■), *E. constrictus* (★).





Figs. 135-136. Maps of geographical distribution. 135. *E. torvus torvus* (●), *E. torvus deceptus* (▲), *E. gravidus* (■). 136. *E. sallei* (■), *E. gigas* (▲), *E. heros* (●), *E. gravesi* (◓). Fig. 137. Hypothetical phylogeny of the species of the genus *Evarthrus*. Species groups are numbered as follows: 1 - the *morio* group, 2 - the *obsoletus* group, 3 - the *spoliatus* group, 4 - the *ovulum* group, 5 - the *faber* group, 6 - the *incisus* group, 7 - the *blatchleyi* group, 8 - the *sigillatus* group, 9 - the *seximpressus* group, 10 - the *hypherpiformis* group, 11 - the *sodalis* group, 12 - the *substriatus* group, 13 - the *torvus* group, 14 - the *gigas* group, 15 - the *gravesi* group.

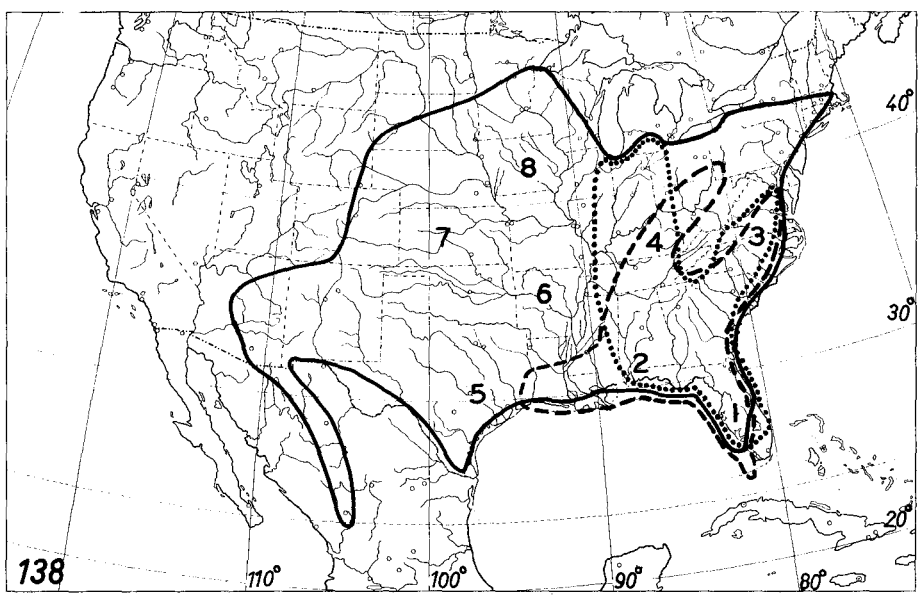


Fig. 138. Geographical distribution of the subgenera *Fortax* (• • •), *Cyclotrachelus* (- - -), and *Evarthrus* (——), and centers of speciation (1-8).

ERRATA – Quaest. ent. 1969: 5(1):

"New distributional records for Canadian soldier flies (Diptera:Stratiomyidae. Part I. Beridinae and Sarginae". By Max W. McFadden.

page 5. The species *Allognosta brevicornis* Johnson is known from Quebec, not Quebic.

page 7. The title of the paper by James (1951) is "The Stratiomyidae of Alaska", not Alberta.

. . . . . .

"A revision of the genera *Philophuga* Motschoulsky and *Tecnophilus* Chaudoir with notes on the North American Callidina (Coleoptera:Carabidae)". By David J. Larson.

page 29. Page references in key:

. . . . . *Tecnophilus* Chaudoir, p. 44, not page 38.

. . . . . *Philophuga* Motschoulsky, page 29, not page 24.

. . . . . *Infernophilus* new genus, page 43, not page 37.

page 67 - Table 17. The unnamed branch arising from the *Philophuga* stem was accidentally inserted by the Temporary Editor, and should be deleted.

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For all of these errors the Temporary Editor (G. E. Ball) apologizes to the authors and to the readers of *Quaestiones entomologicae*.