

THE SPECIES OF SCARABAEIDAE (COLEOPTERA)
ASSOCIATED WITH SUGARCANE IN SOUTH FLORIDA

R. D. GORDON AND D. M. ANDERSON

Systematic Entomology Laboratory, IIBIII, Agric. Res.,
Sci. and Educ. Admin., USDA¹

ABSTRACT

Those species of Scarabaeidae known to be associated with sugarcane in the Lake Okeechobee area of Florida are discussed and delineated. The species are: *Phyllophaga latifrons* (LeConte), *Anomala marginata* (F.), *Cyclocephala parallela* Casey, *Dyscinetus morator* (F.), *Ligyrus subtropicus* (Blatchley), and *Euphoria sepulchralis* (F.). Descriptions and illustrations of the larvae of all these species are presented as well as descriptions and illustrations of the adults of all species except *Euphoria sepulchralis* (F.). A key to the south Florida species of the genus *Cyclocephala* is also included.

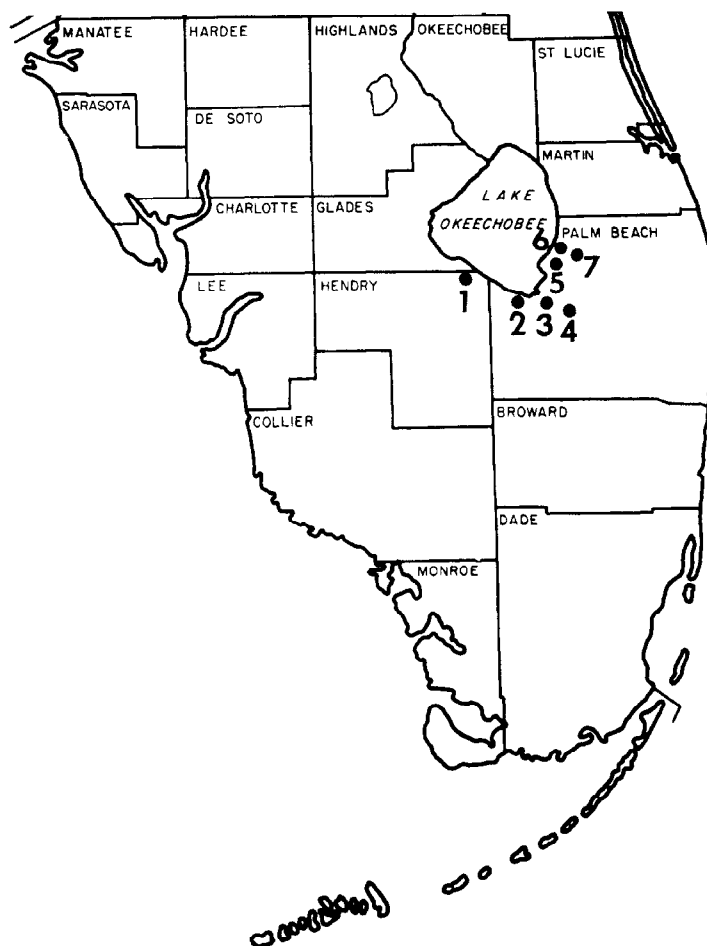
Specimens forming the data base for this paper were collected and/or reared by personnel of the Sugarcane Field Station, Canal Point, FL (USDA, SEA, AR, Southern Region). T. E. Summers, James Miller, and M. Griffin Bell, Jr. were the principal investigators. We have prepared the keys and illustrations presented herein at the request of these individuals and Robert D. Jackson, Staff Scientist, National Programs Staff, USDA, Beltsville, MD. The purpose is to enable researchers at the Canal Point Station and elsewhere to identify correctly the species of Scarabaeidae associated with the sugarcane growing region of south Florida.

In 1971, T. E. Summers observed a field of sugarcane in which the plants had fallen over. Investigation revealed that the roots had been severed at the base of each plant and that numerous white grubs were present in the soil. In 1972, samples of grubs taken from sugarcane fields in the same area were identified by D. M. Anderson as *Ligyrus* (then called *Bothynus*) sp., *Cyclocephala* sp., *Anomala* sp. (later identified as *A. marginata* (F.)), and *Phyllophaga latifrons* (LeConte). An adult from soil in one of those fields was identified as *Ligyrus subtropicus* (Blatchley) by R. D. Gordon. In 1973, some of these grubs were reared to the adult stage, and were identified as *Ligyrus subtropicus* by R. E. Woodruff, Florida Department of Agriculture.

Approximately 330,000 acres of sugarcane (essentially a monoculture) are grown in the area south of Lake Okeechobee from Moore Haven east to Canal Point, to about 20 miles south of South Bay (pers. comm., M. Griffin Bell, Jr.) (Map 1). Most of the cane is grown on "glades muck" (90% organic), but some is grown on a mixture of muck and sand. This difference in soil type is reflected in the species found; for example, *Cyclocephala parallela* Casey and *Phyllophaga latifrons* (LeConte) are found mainly in the sand-muck mixture, but *Ligyrus subtropicus* (Blatchley) is found mainly in the muck soil.

However, some specimens of all species except *Euphoria sepulchralis* (F.) were taken at nearly all of the light trap locations. The light trap locations

¹Mail address: c/o U.S. National Museum of Natural History, Washington, D.C. 20560 USA.



Map 1. Light trap locations. 1—Lykes Brothers, ca. 20 miles west of Clewiston; 2—Okeelanta, ca. 6 miles south of South Bay, 10 miles west of Hwy. 27; 3—Duda, ca. 8 miles south of South Bay, 5 miles east of Hwy. 27; 4—Big "B", ca. 10 miles south of South Bay and 8 miles east of Hwy. 27; 5—Pelican Lake, 2 miles south of village of Pelican Lake; 6—Canal Point, in Canal Point experiment station; 7—Bryant, in village of Bryant.

with the respective soil type indicated are as follows (Map 1): Big "B" Ranch—muck; Bryant—muck; Canal Point—muck; Duda—muck; Lykes Brothers—sand and muck mixture; Okeelanta—muck; Pelican Lake—muck.

These traps served both as survey tools and to collect live beetles for rearing purposes. Five species of Scarabaeidae representing 5 genera in 3 subfamilies were commonly collected at the light traps, and these are mainly the species we discuss. In addition, one species in another subfamily and genus is discussed, but it was found only in the larval stage; the adult activity is diurnal so it was not taken in light traps.

The locality data for the larval specimens used herein are listed below. All of these localities are in Palm Beach Co., FL, except that 2 specimens of

Anomala marginata (F.) from Mt. Vernon, KY, were used to prepare the larval descriptions of that species.

Phyllophaga latifrons (LeConte): Belle Glade; Lake Harbor; no locality.

Anomala marginata (F.): Pahokee; Mt. Vernon, KY, Coll. (by) P. O. Ritcher.

Cyclocephala parallela Casey: Belle Glade; Big "B"; Lykes Bros.; no locality.

Dyscinetus morator (F.): Belle Glade.

Ligyrrus subtropicus (Blatchley): Belle Glade; Big "B"; Canal Point, Sugarcane Field Station (reared from adult); "Reynold's Runyon, "USSC", no locality.

Euphoria sepulchralis (F.); Belle Glade.

With the exception of a few specimens returned to the Sugarcane Field Station, all adult and larval material used as the basis of this paper has been placed in the Coleoptera collection of the National Museum of Natural History, Washington, D.C.

We thank Ralph Dauito, who sorted the specimens received in alcohol, Linda Lawrence, who prepared the original line illustrations for this paper, and R. E. Woodruff, Florida Department of Agriculture, for information and constructive criticism.

Key to the Included Genera of Scarabaeidae (adults)

1. Tarsal claws of each tarsus unequal in length *Anomala*
- 1'. Tarsal claws of each tarsus equal in length 2
- 2(1). Mandible bent, expanded, visible beyond clypeus in dorsal view
(Fig. 9, 15); claw without tooth 3
- 2'. Mandible not bent or expanded, not visible beyond clypeus in
dorsal view; claw toothed *Phyllophaga*
- 3(2). Head and/or pronotum armed with teeth and/or tubercles (Fig.
15) *Ligyrrus*
- 3'. Head and pronotum and armature, without teeth or tubercles
(Fig. 9) 4
- 4(3). Dorsal surface black; mandible broadly rounded, dorsoventrally
flattened *Dyscinetus*
- 4'. Dorsal surface mostly yellow; mandible slender, elongate
..... *Cyclocephala*

Key to the Included Species of Scarabaeidae (larvae)

1. Abdominal raster (area bearing setae on underside of terminal
segment) bearing distinct pallidia (longitudinal rows of decum-
bent inward-pointing setae, or "pali") and also upright hamate
(hooked) or straight setae (Fig. 51, 55) 2
- 1'. Abdominal raster bearing no pallidia but having numerous up-
right, hamate setae (Fig. 52-54) 4
- 2(1). Anal opening V-shaped, the point of the V indenting lower anal
lip (Fig. 51); claws of metathoracic legs much smaller than
those of pro and mesothoracic legs (Fig. 47)
..... *Phyllophaga latifrons*

- 2'. Anal opening a single transverse slit (Fig. 52); claws of metathoracic legs not reduced 3
- 3(2). Claws stout, straight, blunt at tips, and bearing 3 or more setae (Fig. 49); terminal segment of antenna with 2 dorsal sensory spots; pallidia joined to form a point anteriorly (Fig. 55) *Euphoria sepulchralis*
- 3'. Claws sharp, curved, bearing only 2 setae (Fig. 48); terminal segment of antenna with 1 dorsal sensory spot (Fig. 33); pallidia not joined anteriorly *Anomala marginata*
- 4(1). Terminal segment of antenna bearing 4 to 7 dorsal sensory spots and 6 to 8 ventral sensory spots (Fig. 37, 38) *Ligyrrus subtropicus*
- 4'. Terminal segment of antenna bearing 2 dorsal and 2 ventral sensory spots (Fig. 35, 36) 5
- 5(4). Front of head densely covered with deep punctures between setae (Fig. 50); mandibles with 3 teeth on cutting edge; haptomeral process of epipharynx crenulate but not divided by a notch (Fig. 42) *Dyscinetus morator*
- 5'. Front of head bearing only a few punctures between setae; mandibles with 1 tooth on cutting edge; haptomeral process of epipharynx divided by a deep notch (Fig. 41) *Cyclocephala parallela*

Subfamily Melolonthinae

Genus *Phyllophaga* Harris

Phyllophaga latifrons (LeConte) 1856: 241.

ADULT: Length 15.0 to 20.0 mm; body elongate, slender (Fig. 1). Dorsal surface usually pale yellowish brown, but often dark brown, always faintly pruinose. Antenna of ♂ with club pale yellow, longer than stem (Fig. 6). Clypeal apex broadly explanate, slightly produced medially. Apical abdominal sternum of ♂ bidentate (Fig. 7). Male genitalia as in Fig. 16. Female genital plates as in Fig. 17.

LARVA: Mature larva ca. 30 mm long, head 4.2-4.6 mm wide. Head light brown, surface smooth, ocelli absent. Terminal segment of antenna with 1 large dorsal and 2 ventral sensory spots. Epipharynx (Fig. 39) with about 12 heli and with 4-6 weakly defined proplegma in each proplegmatium. Mandibles with bladlike cutting edge, separated from small posterior tooth by a scissorial notch, and with no ventral stridulatory area. Claw of metathoracic leg (Fig. 47) much smaller than that of pro- and mesothoracic legs. Raster of abdomen (Fig. 51) bearing 2 long, subparallel rows of 19-26 pali, which extend anteriorly slightly beyond all other setae. Anal opening V-shaped, the point of the V indenting the lower anal lip (Fig. 51).

A more detailed description of the larvae of this species was published by Böving (1942).

Discussion: Both male and female genitalis are usually diagnostic in this genus, and should be examined when positive identification of adults is needed. In addition, the broadly explanate, medially produced clypeus and bidentate apical sternum (♂) are characters not shared by other south Florida *Phyllophaga*. Most species of this genus were treated by Luginbill

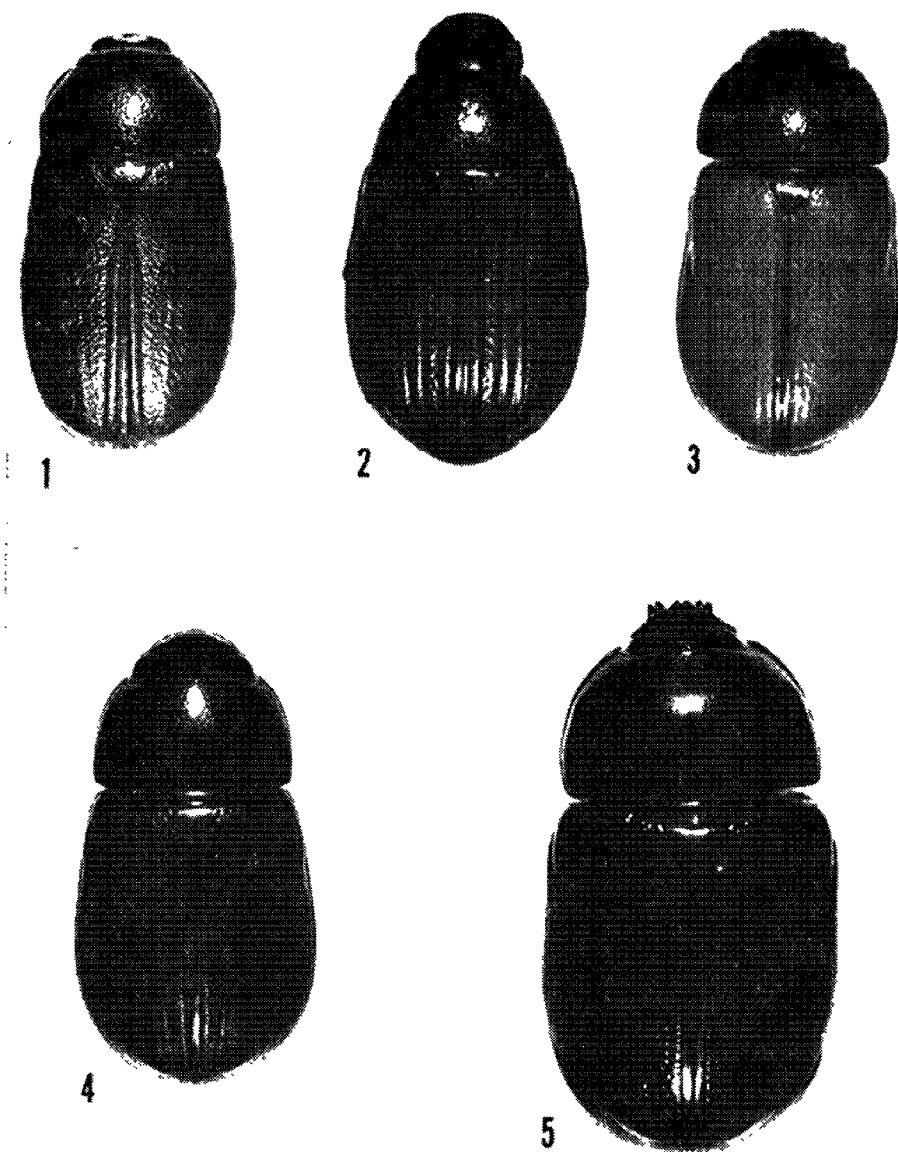


Fig. 1-5. Habitus views of adults. 1. *Phyllophaga latifrons*; 2. *Anomala marginata*; 3. *Cyclocephala parallela*; 4. *Dyscinetus morator*; 5. *Ligyris subtropicus*.

and Painter (1953) who provided photographs of both ♂ and ♀ genitalia. Woodruff (1973) listed 50 species in Florida, several of which are found in this area but are not known to be associated with sugarcane.

Larvae of *P. latifrons* are pests of sugarcane, but this species prefers a soil with at least a small percentage of sand mixed with the muck. It is not

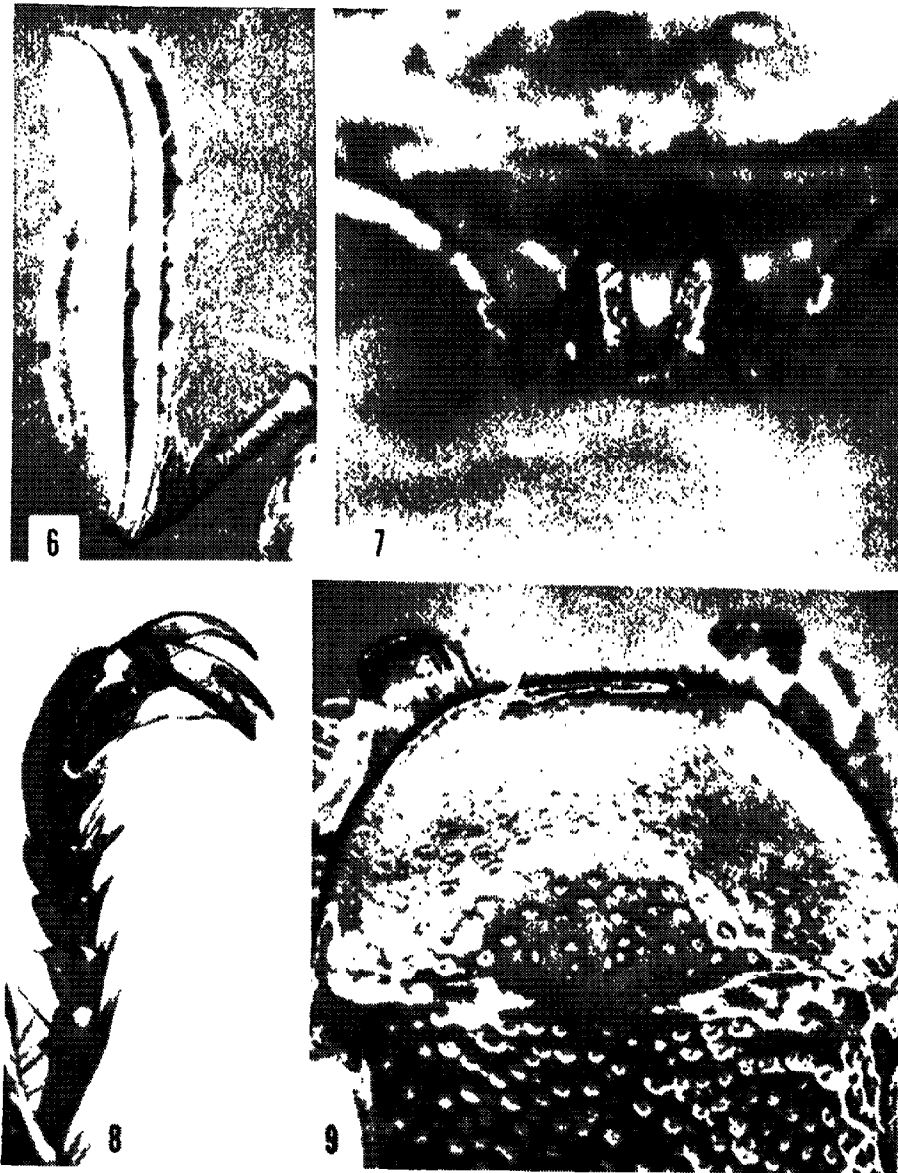


Fig. 6-9. External morphological structures of adults. 6. antenna of ♂ *Phyllophaga latifrons*; 7. last ventral sternum of ♂ *Phyllophaga latifrons*; 8. anterior tarsal claw of *Anomala marginata*; 9. clypeus of *Cyclocephala parallela*.

currently of primary importance as a pest, but significant damage has been observed.

Subfamily Rutelinae

Genus *Anomala* Samouelle

Anomala marginata (F.) 1972: 164.

ADULT: Length 10.0 to 16.0 mm; body robust, widest in posterior 3rd (Fig. 2). Head and pronotum reddish brown; pronotum with distinct, broad, yellow lateral border; elytron paler reddish brown than pronotum, entire dorsal surface with distinct, often strong, green tint. Anterior protarsal claw strongly cleft, 5th protarsal segment of ♂ enlarged and with basal projection present (Fig. 8). Male genitalia as in Fig. 18.

LARVAE: Mature larva ca. 29 mm long, head 3.6-4.2 mm wide. Head light brown, surface faintly reticulated, ocelli absent. Terminal segment of antenna (Fig. 33, 34) with 1 large elliptical dorsal sensory spot and 2 smaller ventral sensory spots. Epipharynx (Fig. 40) with 3 heli and without proplegmata. Mandible with the cutting edge divided by a deep posterior notch, and with a distinct ventral stridulatory area. Claws on all legs of similar size, slightly curved, tapered to a point, and bearing 2 setae (Fig. 48). Raster of abdomen

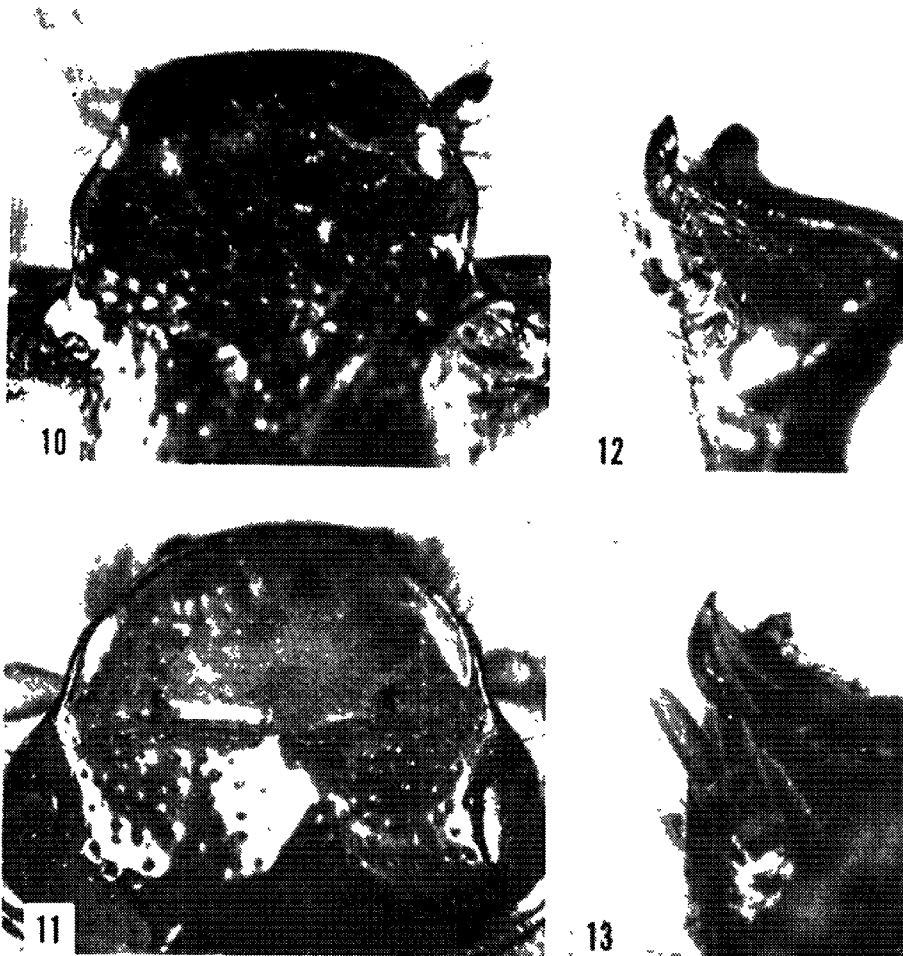


Fig. 10-13. External morphological structures of adults. 10. clypeus of *Cyclocephala seditiosa*; 11. clypeus of *Cyclocephala puberula*; 12. clypeus of *Cyclocephala borealis* (lateral view); 13. clypeus of *Cyclocephala immaculata* (lateral view).

bearing 2 longitudinal pallidia of 13-20 pali, which diverge posteriorly. Anal opening a single transverse slit.

A more detailed description of the larva of this species was published by Ritcher (1943, 1966).

Discussion: The large size and distinctive green lustre of the adult make *A. marginata* one of the most easily recognized species of the genus; certainly there are no similar appearing species in south Florida. A recent key to adults of *Anomala* north of Mexico has been prepared by Potts (1977b); also see Potts (1974, 1977a) for further information on the genera and species of Anomalini.

This species has not been observed damaging sugarcane, but is one of the scarabs commonly collected at light in the cane growing region, and larvae were collected in a cane field at Pahokee.

Subfamily Dynastinae

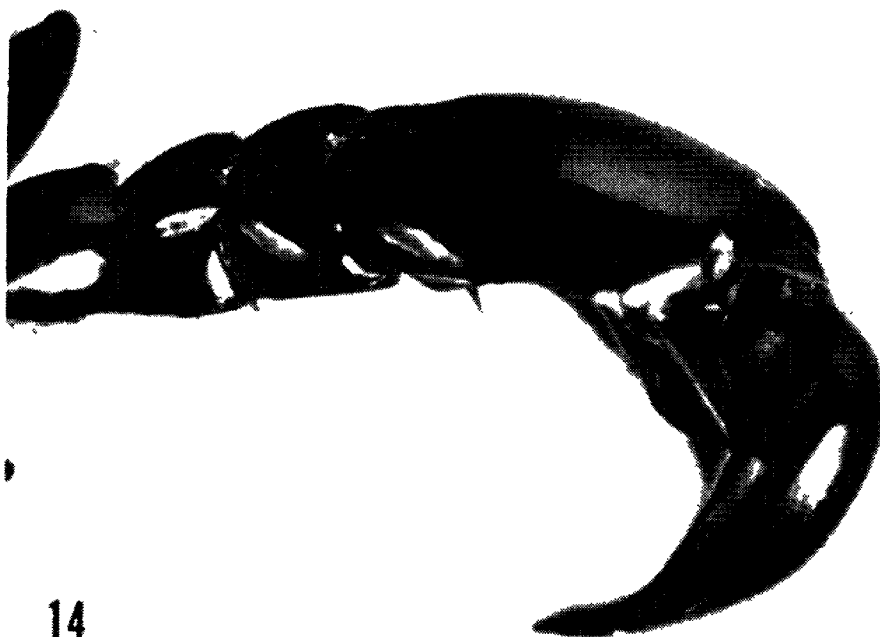
Genus *Cyclocephala* Latreille

Cyclocephala parallela Casey 1915: 144.

ADULT: Length 12.0 to 15.0 mm; form robust, widest behind middle (Fig. 3). Head dark reddish brown; pronotum light brownish yellow; elytron brownish yellow, paler than pronotum. Entire dorsal surface smooth, highly polished between punctures. Clypeal apex reflexed, more or less evenly rounded (Fig. 9); punctures on frons discrete, not contiguous, irregularly scattered. Pygidium smooth, polished, usually without pubescence, if pubescence present, then hairs very sparse, difficult to detect. Male genitalia as in Fig. 19, 20.

LARVA: Mature larva ca. 30 mm long, head 4.2-4.5 mm long. Head light yellow brown, surface faintly reticulate, 1 pair of ocellar spots, without lenses, present. Terminal segment of antenna (Fig. 35, 36) bearing 2 oval dorsal sensory spots and 1 oval, 1 deeply indented ventral sensory spot. Haptomeral process of epipharynx divided by a deep notch into 2 slightly unequal tooth-like parts (Fig. 41). Plegmata and proplegmata absent on epipharynx. Mandibles with cutting edge notched, forming an anterior blade-like portion and a tooth-like posterior portion, and with a distinct ventral stridulatory area. Claws tapered to a sharp point, slightly curved, bearing 2 setae. Abdominal raster without pallidia (rows of pali), bearing a subtriangular patch of approximately 45 erect or semi-erect hamate setae (Fig. 52). Lower anal lip bearing a sparse row of long, pointed setae. Anal opening a curved transverse slit.

Discussion: Saylor (1945) revised the United States species of *Cyclocephala* and considered 4 species, *C. immaculata* (Oliver), *C. borealis* Arrow, *C. seditiosa* LeConte, and *C. puberula* LeConte to occur east of Louisiana. Endrodi (1966) recognized all of these species and, in addition, retrieved *C. parallela* Casey from synonymy under *C. borealis* where Saylor (1945) had placed it. Woodruff (1973) listed 5 species from Florida (no records for *seditiosa*). Of these 5 species, 3 (*C. immaculata*, *C. borealis*, and *C. parallela*) have the same type of genitalia and are somewhat difficult to distinguish from one another. Howden and Endrodi (1966) described 1 additional species, *C. miamiensis* from south Florida. To facilitate identification of adult *Cyclocephala* that may occur in Florida, we have prepared the following key.



14



15

Fig. 14, 15. External morphological structures of adults. 14. anterior tarsus and claw of *Dyscinetus morator*; 15. clypeus and mandibles of *Ligyrus subtropicus*.

Cyclocephala seditiosa probably does not occur in Florida (Woodruff, pers. comm.)

1. Clypeus black, narrow, anterior margin abruptly reflexed, almost truncate (Fig. 10); pronotum with longitudinal brown spot on each side of middle from apex halfway to base; ♂

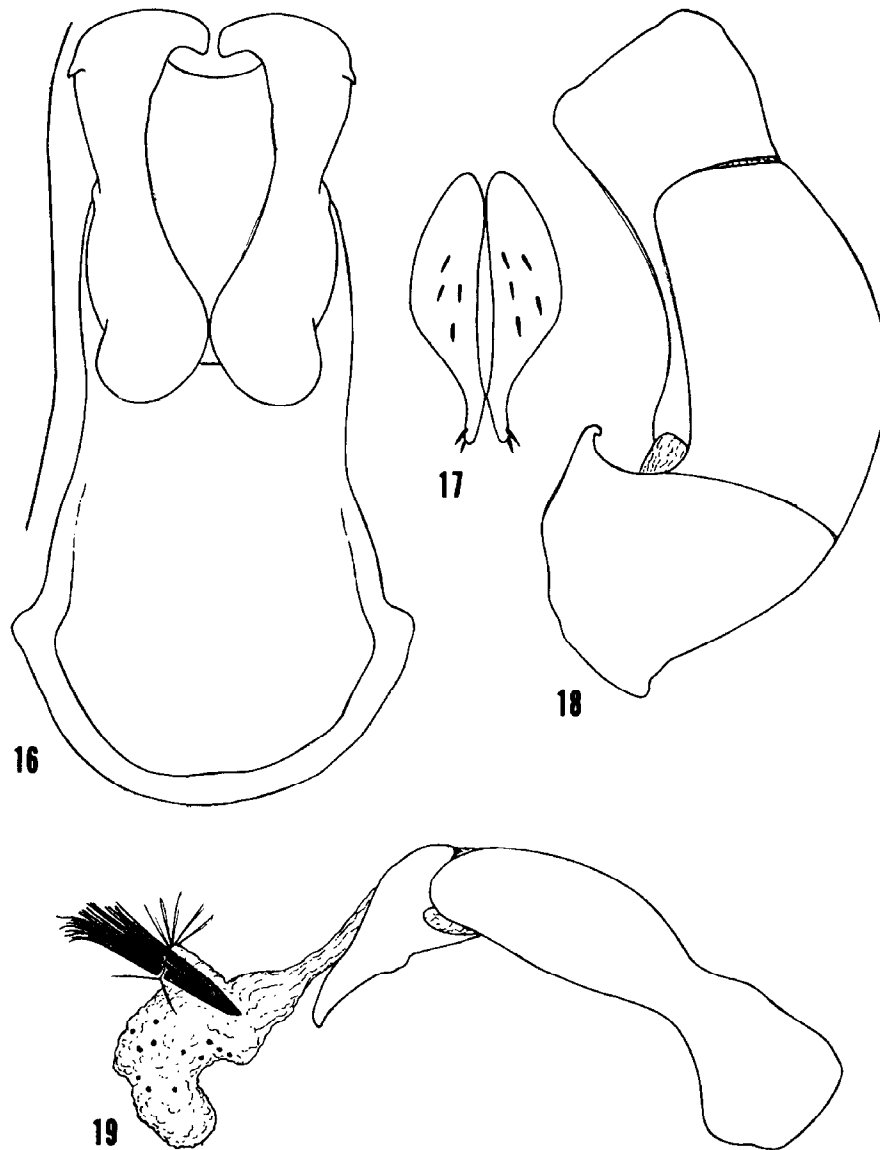


Fig. 16-19. Genitalia. 16. *Phyllophaga latifrons* (♂, ventral view); 17. *Phyllophaga latifrons* (♀); 18. *Anomala marginata* (♂, lateral view); 19. *Cyclocephala parallela* (♂, lateral view).

- protibia bisinuate externally; ♂ genitalia as in Fig. 21, 22 (no Florida records) *seditiosa* LeConte
- 1'. Clypeus not black, anterior margin rounded or semiarculate; pronotum immaculate or with small, obscure spot near lateral margin at middle; ♂ protibia tridentate 2
- 2(1). Head pubescent between eyes; clypeal suture strongly impressed; bisinuate, surface of clypeus impunctate or very feebly

- punctured (Fig. 11); pronotum pubescent; ♂ genitalia as in Fig. 23-25 *puberula* LeConte
- 2'. Head not pubescent between eyes; clypeal suture feebly impressed, surface of clypeus strongly punctured; pronotum not pubescent 3
- 3(2). Clypeal apex broad, feebly rounded, with strongly thickened border (Fig. 9); dorsal surface polished, sparsely punctured, shiny, without pubescence in either sex; pygidium highly polished, without trace of alutaceous sculpture; internal sac of ♂ genitalia with setal bundle composed of 25 or more major setae, very small denticles also present (Fig. 19, 20) *parallela* Casey
- 3'. Clypeal apex narrow, without strongly thickened border; dorsal surface usually densely punctured, giving a rough appearance; elytron pubescent in ♂ of *borealis*; pygidium with alutaceous sculpture at least basally and laterally; setal bundle not as above 4
- 4(3). Clypeal apex abruptly reflexed in lateral view (Fig. 12); elytron of ♂ pubescent; pubescence on metasternum dense, long, arising from small, dense punctures; internal sac of ♂ genitalia with setal bundle composed of ca. 5 major setae, numerous small, oval plates also present (Fig. 26, 27) *borealis* Arrow
- 4'. Clypeal apex feebly reflexed in lateral view (Fig. 13); elytron without pubescence in either sex; pubescence on metasternum sparse, short, arising from broad, flat punctures; internal sac of ♂ genitalia with setal bundle composed of more than 5 major setae, or setal bundle entirely absent 5
- 5(4). Pygidium of ♂ not alutaceous, or weakly so laterally; ♀ pronotum finely, sparsely punctate; ♂ genitalia with lateral lobes apically truncate, internal sac with setal bundle composed of 25 or more major setae, a row of elongate, acuminate denticles also present (Fig. 28, 29a) *immaculata* (Olivier)
- 5' Pygidium of ♂ completely alutaceous; ♀ pronotum coarsely punctate; ♂ genitalia with lateral lobes apically acuminate, internal sac without setal bundle or acuminate denticles (Fig. 29b) (known only from Miami and the Keys) *miamiensis* Howden and Endrodi

Cyclocephala parallela is the only species we have seen from the sugarcane traplight material. This species is found where cane is grown on a sand-muck mixture and is apparently the most serious pest species in the areas of sand-muck.

The larva of this species is distinguished from those of *C. immaculata* and *C. borealis* (described by Ritcher 1944, 1966) in having 2 setae, rather than no setae (or rarely 1 seta), on the scutellum (3rd dorsal fold) of the meso- and metathoraces, and in having the posterior margin of the 2nd ventral sensory spot on the terminal antennal segment deeply indented (Fig. 36). Larvae of the remaining Florida species of *Cyclocephala* are unknown. Harris (1959) reported a milky disease in "*Cyclocephala borealis* Arrow" larvae at Belle Glade. These are probably referable now to *C. parallela*, since there are no records of the true *borealis* from this area (Woodruff, pers. comm.).

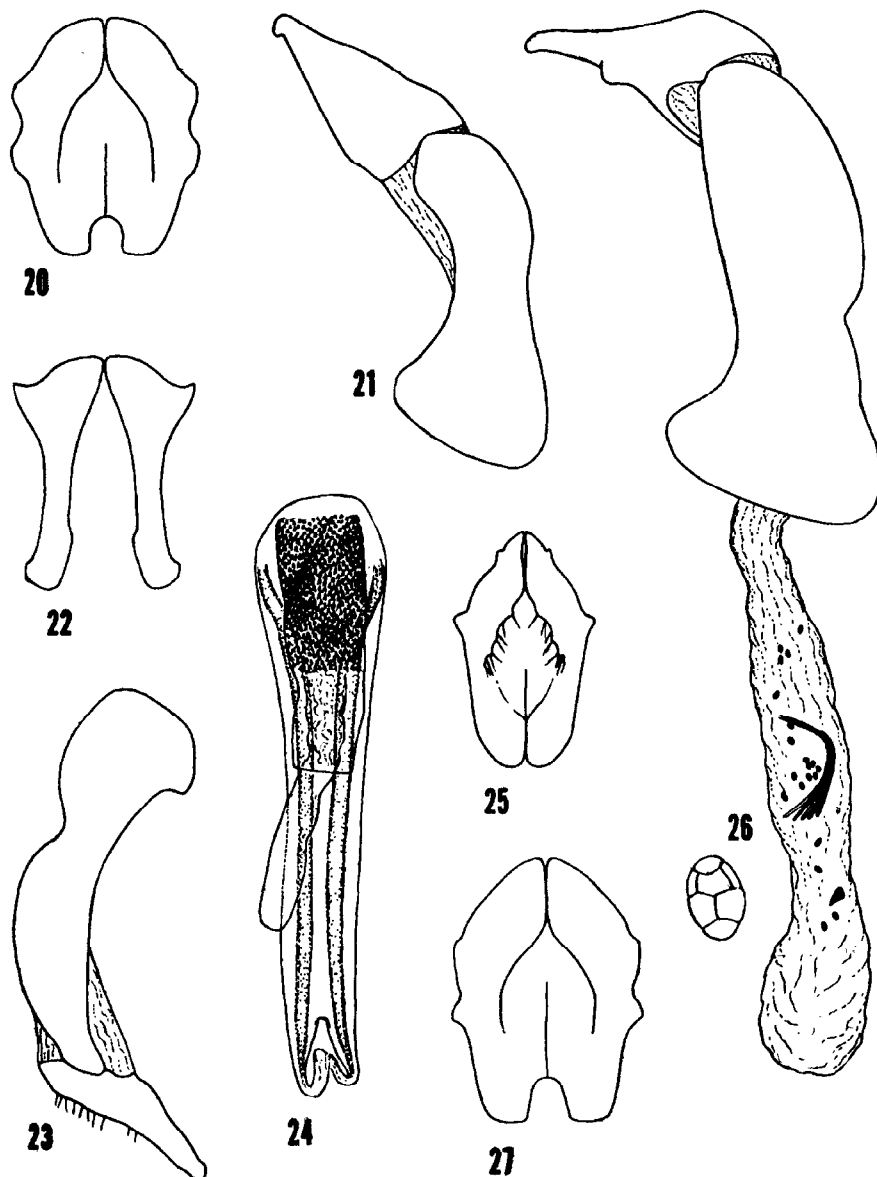


Fig. 20-27. Male genitalia 20. *Cyclocephala parallela* (caudal view); 21. *Cyclocephala seditiosa* (lateral view); 22. *Cyclocephala seditiosa* (caudal view); 23. *Cyclocephala puberula* (lateral view); 24. *Cyclocephala puberula* (internal sac); 25. *Cyclocephala puberula* (caudal view); 26. *Cyclocephala borealis* (lateral view); 27. *Cyclocephala borealis* (caudal view).

Genus *Dyscinetus* Harold

Dyscinetus morator (F.) 1798: 24.

ADULT: Length 15.0 to 20.0 mm; body robust, elongate, dorsoventrally flattened, widest behind middle of elytra (Fig. 4). Dorsal surface brownish

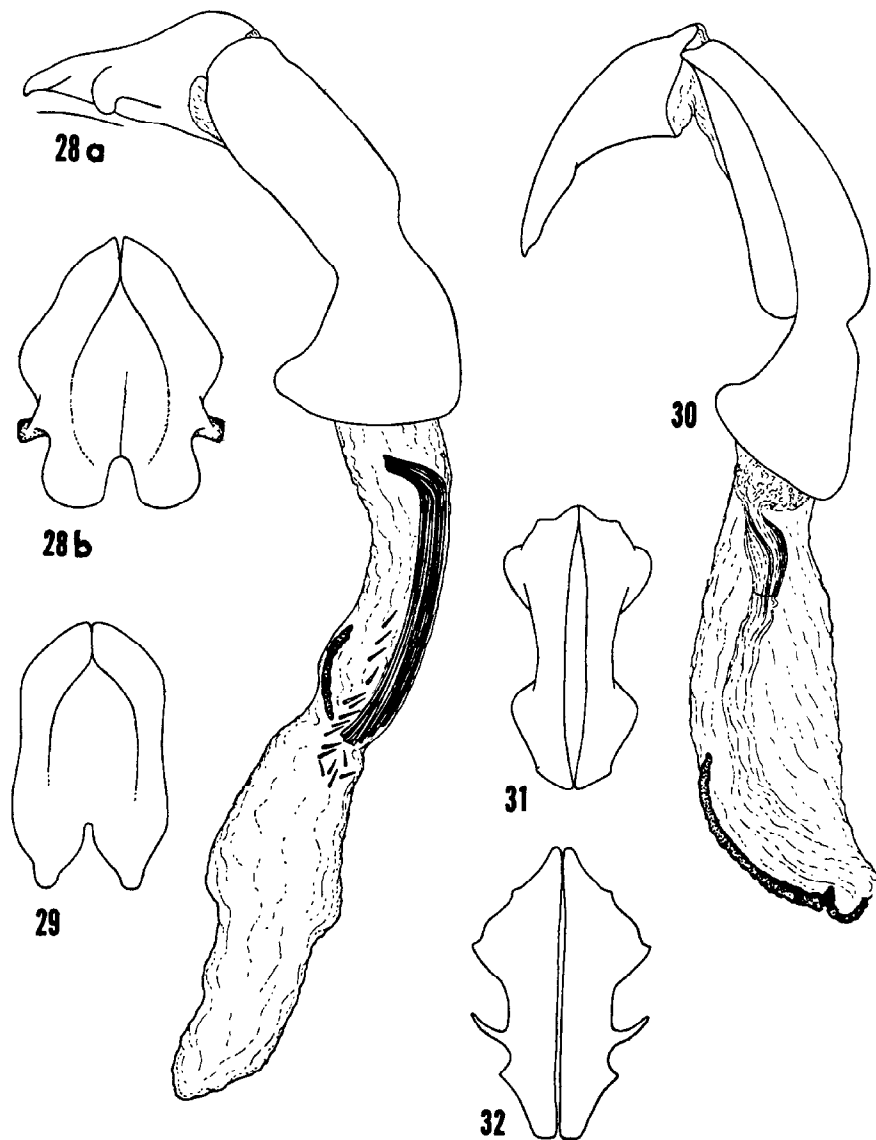


Fig. 28-32. Male genitalia. 28a. *Cyclocephala immaculata* (lateral view); 28b. *Cyclocephala immaculata* (caudal view); 29. *Cyclocephala miamiensis* (caudal view); 30. *Dyscinetus morator* (lateral view); 31. *Dyscinetus morator* (caudal view); 32. *Ligyrus subtropicus* (caudal view).

black with faint greenish tinge. Head broad, flat; clypeal apex truncate. Protarsus and claw like ♂ of *Cyclocephala*; last tarsal segment smaller, anterior claw thickened, cleft apically (Fig. 14). Pygidium closely, densely sculptured. Male genitalia as in Fig. 30, 31.

LARVA: Mature larva ca. 32 mm long, head 4.5-5.0 mm wide. Head orange brown, surface slightly roughened, covered anteriorly and dorsally with many small pits (Fig. 50). A single pair of ocelli present. Terminal segment

of antenna with 2 dorsal and 2 ventral sensory spots. Epipharynx (Fig. 42) without proplegmatia and with haptomeral process crenulate but not notched. Inner margin of both mandibles with 3 scissorial teeth. Ventral mandibular stridulatory areas distinct. Claws stout, tapered to a point, bearing 2 setae. Raster of abdomen (Fig. 53) bearing a large triangular patch of upright hamate setae, but without rows of pali. Anal opening a curved transverse slit.

A more detailed description of the larva of this species was published by Ritcher (1944, 1966).

Discussion: The large size, flattened body, truncate and unarmed clypeus, and the overall smooth appearance of this beetle in the adult stage are unlike any other Florida species of Dynastinae. *Dyscinetus morator* is a commonly collected, widespread species ranging through most of the eastern states from New York south, west to Texas and Mexico. This is the only species of *Dyscinetus* in eastern North America; the entire genus was treated by Endrodi (1966). Woodruff (1970) discussed the abundance of the species in light traps in south Florida and summarized the existing knowledge of the species.

The larvae of *D. morator* apparently do not affect the sugarcane plantings (pers. comm., Griffin Bell, Jr.) in south Florida, but the adults are extremely common at the traplights throughout the year, and larvae were collected at Belle Glade.

Genus *Ligyrrus* Burmeister

Ligyrrus subtropicus Blatchley 1922: 30.

ADULT: Length 21.0 to 25.0 mm; body oblong, convex (Fig. 5). Dorsal surface dark, shiny, piceous to nearly black. Apex of clypeus with 2 narrowly separated teeth (Fig. 15). Mandible with 2 large rounded, external teeth (Fig. 15). Pronotum with apical impression. Male protarsal claw and claw segment not modified. Prosternal process pubescent on margin, barely pubescent medially. Male genitalia as in Fig. 32.

LARVA: Mature larva ca. 50 mm long, head 8.0-8.5 mm wide. Head medium brown, surface distinctly roughened, with a few small pits. One pair of ocelli present. Frontal setae absent, except for 3 or 4 anterolateral angles. Terminal segment of antenna (Fig. 37, 38) with 4 to 7 dorsal and 6 to 8 ventral sensory spots. Epipharynx (Fig. 43) with haptomeral process bearing 2 distinct marginal notches, and without plegmatia or proplegmatia. Inner margin of left mandible (Fig. 44) with 3 distinct scissorial teeth; 3rd tooth more vaguely indicated on right mandible (Fig. 45). Ventral mandibular stridulatory area present (Fig. 45). Claws stout, tapered to a point, bearing 2 setae. Raster of abdomen (Fig. 54) bearing a subtriangular patch of about 50 erect hamate setae, but no rows of pali. Lower anal lip bearing a mixture of hamate and long, straight setae. Anal opening a curved, transverse slit.

No detailed description of the larva of this species has been published.

The larva of *L. subtropicus* agrees with the description of *L. gibbosus* (DeGeer) by Ritcher (1944, 1966), except for the absence of frontal setae other than those in anterior angles vs presence of exterior and posterior frontal setae, the terminal antennal segment with several dorsal and ventral sensory spots vs 2 dorsal and 2 ventral spots, the haptomeral process of the

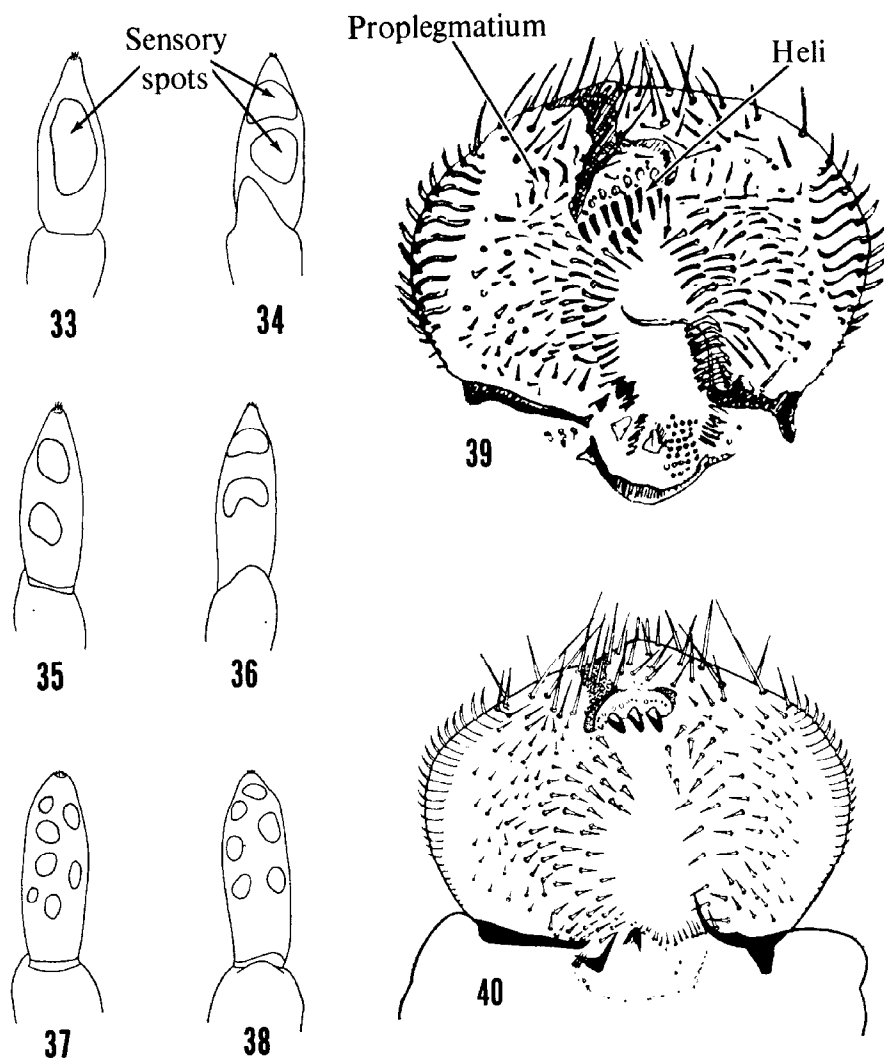


Fig. 33-38. Terminal segments of larval antennae. 33-34. *Anomala marginata*; 33. (dorsal); 34. (ventral); 35-36. *Cyclocephala parallela*; 35. (dorsal); 36. (ventral), showing indented margin of 2nd sensory spot; 37-38. *Ligyrus subtropicus*; 37. (dorsal); 38. (ventral). Fig. 39-40. Epipharynges of larvae. 39. *Phyllophaga latifrons* (from Boving 1942); 40. *Anomala marginata* (from Ritcher 1943).

epipharynx distinctly notched, rather than crenulate, and larger size at maturity, with a maximum head width of 8.5 mm vs 4.8 mm in *L. gibbosus*. Larvae of other Florida species of *Ligyrus* are not available for comparison with those of *L. subtropicus*.

Discussion: Cartwright (1959) reviewed the U.S. species (using the generic name *Bothynus*) and provided a key to adults. Endrodi (1966) reviewed the entire genus but used the generic name *Ligyrus* for most of the U.S. species. Woodruff (1973) listed 4 species from Florida. The large size of

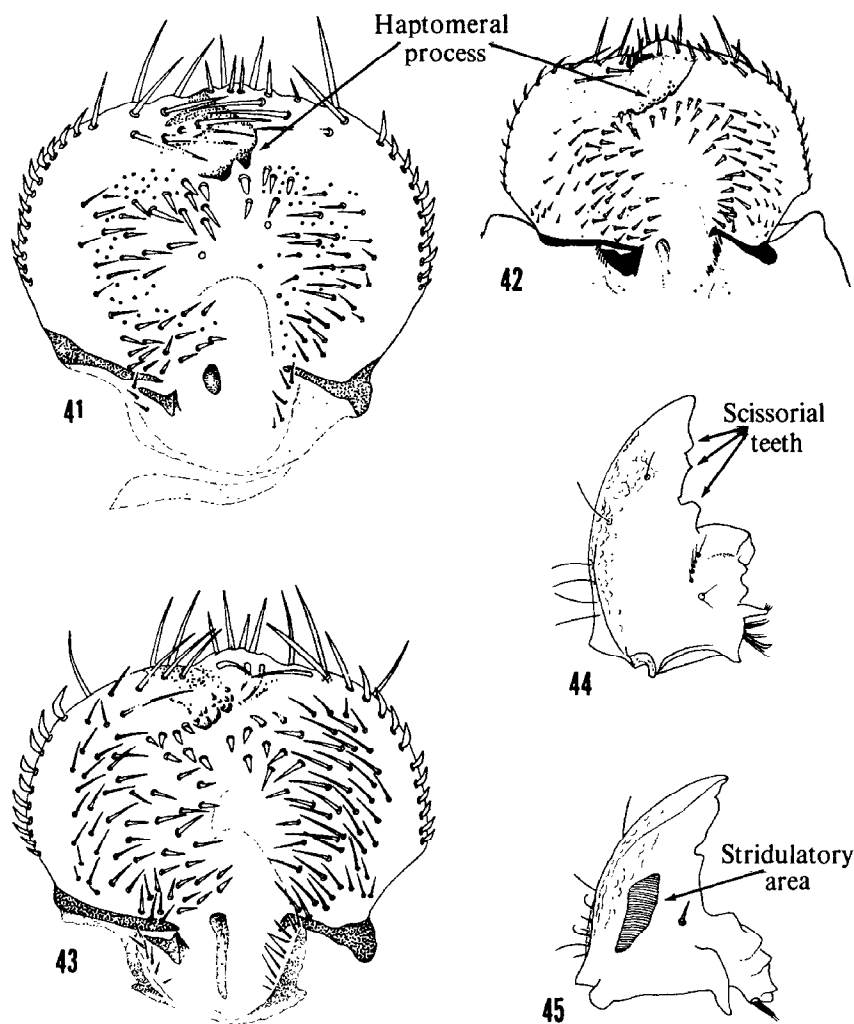


Fig. 41-43. Epipharynxes of larvae. 41. *Cyclocephala parallela*; 42. *Dyscinetus morator* (from Ritcher 1944); 43. *Ligyrus subtropicus*. Fig. 44-45. Larval mandibles of *Ligyrus subtropicus*; 44. Left mandible (dorsal); 45. right mandible (ventral).

L. subtropicus, along with the 2 teeth on the clypeal apex and the other characters listed in the preceding diagnosis of the adult will distinguish it from other Florida Dynastinae. Larvae of *Strategus* spp. are similar in size to *L. subtropicus*, but have 4, rather than 2, setae on each claw, and have no notches on the haptomeral process of the epipharynx.

The larvae of *L. subtropicus* cause significant damage in the cane fields, and *subtropicus* is the species of Scarabaeidae of primary economic importance (pers. comm., Griffin Bell, Jr.). The adult ♀ lays her eggs at the base of the plant. The 1st instar begins to feed on the roots as do the following instars. The roots are finally cut so that the plant falls over from lack of support. The peak of adult emergence is in June, 1st instars are at their

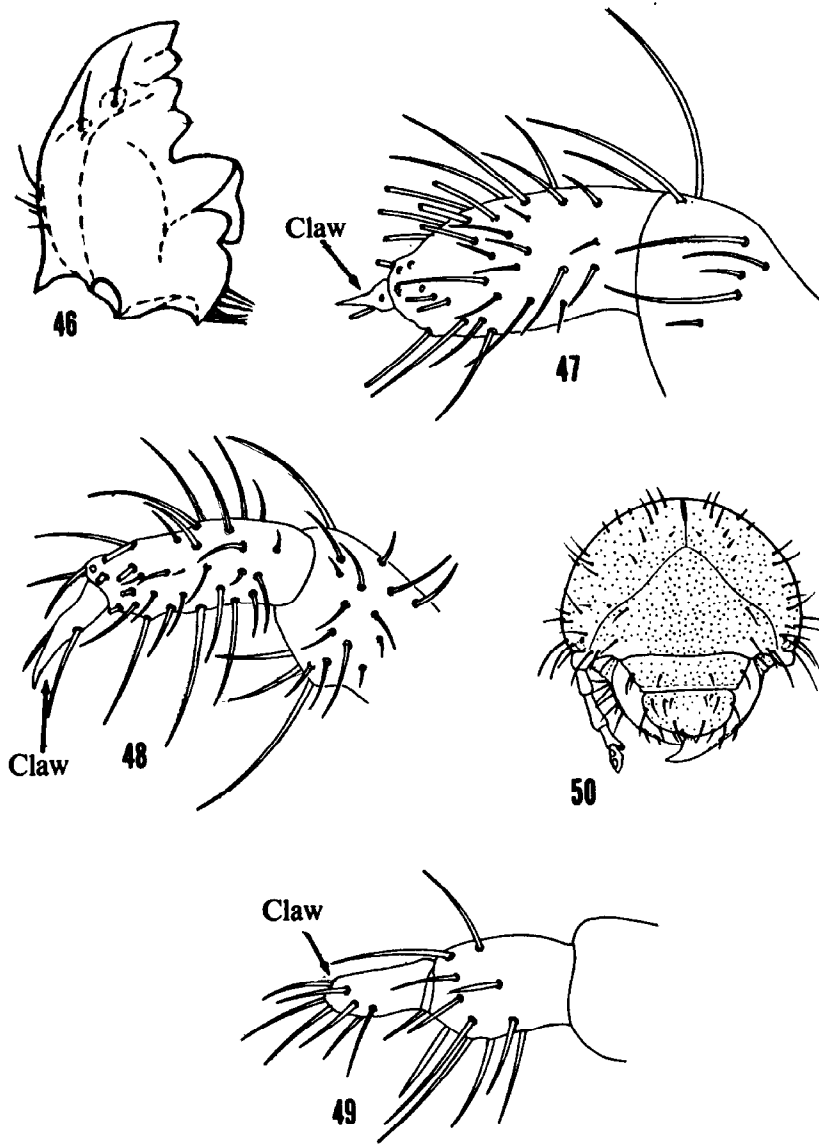


Fig. 46-50. 46. Left mandible (dorsal) of larva of *Euphoria inda* (L.) (from Ritcher 1945), an example of mandibles of this genus. Fig. 47-49. Tibiotarsus of left metathoracic leg, showing claw. 47. *Phyllophaga latifrons*; 48. *Anomala marginata*; 49. *Euphoria sepulchralis*. Fig. 50. Head, front view, larva of *Dyscinetus morator*, showing numerous pits (from Ritcher 1944).

peak in June and July. Second and 3rd instars are prevalent from August through October. In general, pupation begins in November and the pupal state is prevalent through March. The adult emergence begins in April and continues into June. This data was provided by M. Griffin Bell, Jr. (pers. comm.).

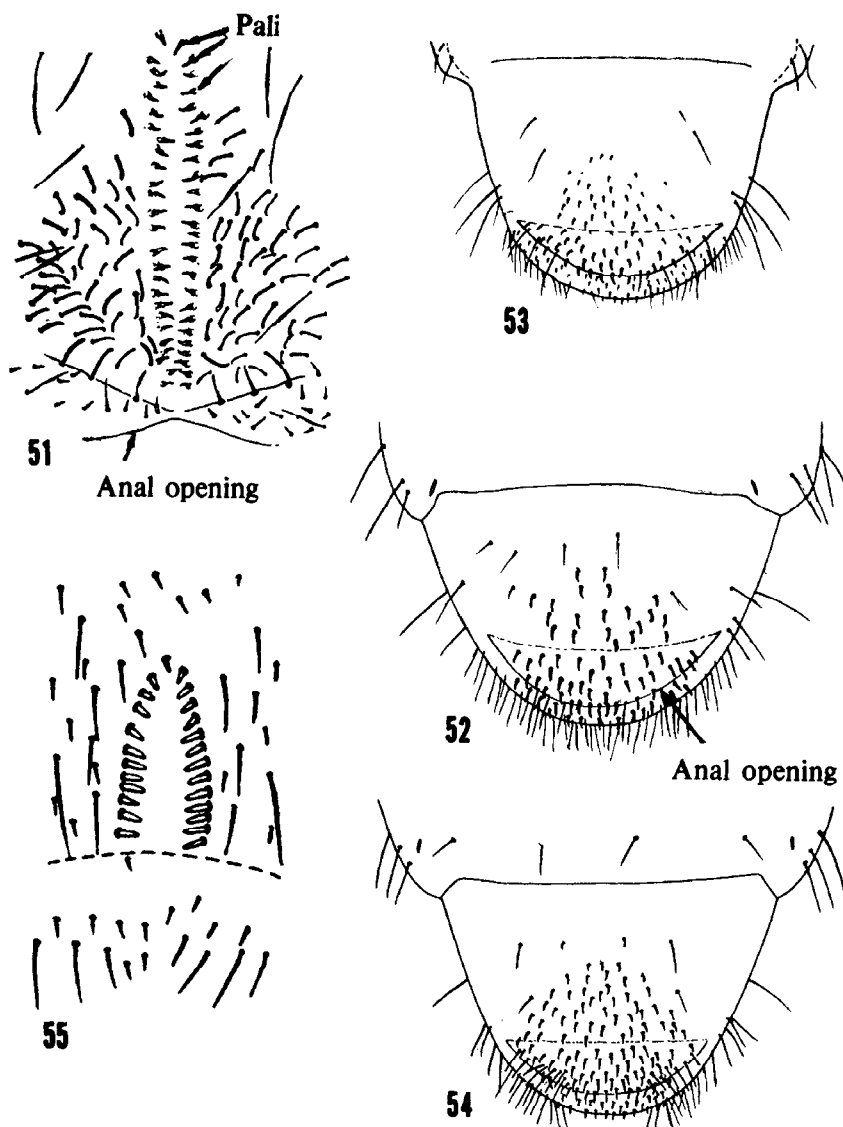


Fig. 51-55. 51. Raster and part of anal area of *Phyllophaga latifrons* (from Boving 1942). Fig. 52-54. Terminal abdominal segment (ventral), showing raster and anal opening. 52. *Cyclocephala parallela*; 53. *Dyscinetus morator* (from Ritcher 1944); 54. *Ligyris subtropicus*. Fig. 55. Raster of *Euphoria sepulchralis* (from Ritcher 1945).

Subfamily Cetoniinae

Genus *Euphoria* Burmeister

Euphoria sepulchralis (F.) 1801: 156.

Adults of this species are diurnal; therefore, they are not collected at

light traps. Larvae were collected, however, and are characterized below. This species is not known to cause significant damage to cane plantings.

LARVA: Mature larva ca. 27 mm long, head 2.8-3.0 mm wide. Head light yellow brown, surface faintly reticulate, ocelli absent. Frons with a shallow median depression, which is forked anteriorly. Terminal antennal segment with 2 dorsal sensory spots and 1 ventral sensory spot. Left mandible (Fig. 46) with 4 distinct scissorial teeth. Ventral stridulatory areas present on both mandibles. Claws cylindrical, rounded apically, each bearing 6 to 9 setae (Fig. 49). Raster of abdomen (Fig. 55) bearing a pair of longitudinal pallidia, each with 12 to 16 stout pali, joined to form a blunt point anteriorly, and diverging posteriorly. Anal opening a single transverse slit.

The larva of this species has been described in greater detail by Ritcher (1945, 1966).

LITERATURE CITED

- BLATCHLEY, W. S. 1922. Some new and rare Coleoptera from southwestern Florida. *Can. Ent.* 54: 27-33.
- BÖVING, A. G. 1942. A classification of larvae and adults of the genus *Phyllophaga* (Coleoptera: Scarabaeidae). *Mem. Ent. Soc. Wash.* 2: 1-95.
- CARTWRIGHT, O. L. 1959. Scarab beetles of the genus *Bothynus* in the United States (Coleoptera: Scarabaeidae). *Proc. U. S. Nat. Mus.* 108: 515-41.
- CASEY, T. L. 1915. A review of the American species of Rutelinae, Dynastinae and Cetoniinae. *Mem. Col.* 6: 1-394.
- ENDRODI, S. 1966. Monographie der Dynastinae (Coleoptera: Lamellicornia) I. Teil. *Entomol. Abhand. Dresden* 33: 1-453.
- FABRICIUS, J. C. 1792. *Entomologia systematica* I. Hafniae. 538 p.
- . 1978. *Supplementum entomologiae systematicae*. Hafniae. 572 p.
- . 1891. *Systema eleutheratorum* I. Kiliae. 506 p.
- HARRIS, E. D., JR. 1959. Observations on the occurrence of a milky disease among larvae of the northern masked chafer, *Cyclocephala borealis* Arrow. *Fla. Ent.* 42: 81-3.
- HOWDEN, H. F., AND S. ENDRODI. 1966. Five new species of *Cyclocephala* Latreille from North and Central America (Coleoptera: Scarabaeidae). *Can. Ent.* 98: 295-302.
- LECONTE, J. L. 1856. Synopsis of the Melolonthidae of the United States. *J. Philadelphia Acad. Nat. Sci. (Ser. 2)* 3: 225-88.
- LUGINBILL, P., AND H. R. PAINTER. 1953. May beetles of the United States and Canada. *USDA Tech. Bull.* 1060: 1-102.
- POTTS, R. W. L. 1974. Revision of the Scarabaeidae: Anomalinae 1. The genera occurring in the United States and Canada (Coleoptera). *Pan-Pacific Ent.* 50: 148-54.
- . 1977a. Revision of the Scarabaeidae: Anomalinae 2. An annotated check list of *Anomala* for the United States and Canada (Coleoptera). *Pan-Pacific Ent.* 52: 34-42.
- . 1977b. Revision of the Scarabaeidae: Anomalinae 3. A key to the species of *Anomala* of America north of Mexico (Coleoptera). *Pan-Pacific Ent.* 53: 129-34.
- RITCHER, P. O. 1943. The Anomalini of eastern North America with descriptions of the larvae and keys to species. (Coleoptera: Scarabaeidae). *Kentucky Agr. Expt. Sta. Bull.* 442: 1-27.
- . 1944. Dynastinae of North America with descriptions of the larvae and keys to genera and species (Coleoptera: Scarabaeidae). *Kentucky Agr. Expt. Sta. Bull.* 476: 1-39.

- . 1966. White grubs and their allies, a study of North American scarabaeoid larvae. Studies in Entomology, No. 4. Oregon State University Press, Corvallis. 219 p.
- SAYLOR, L. W. 1945. Synoptic revision of the United States scarab beetles of the subfamily Dynastinae, No. 1: Tribe Cyclocephalini. J. Washington Acad. Sci. 35: 378-86.
- WOODRUFF, R. E. 1970. The "rice beetle," *Dyscinetus morator* (Fab.) (Coleoptera: Scarabaeidae). Fla. Dept. Agr. Div. Plant Ind., Ent. Circ. 103: 1-2.
- . 1973. The scarab beetles of Florida (Coleoptera: Scarabaeidae) Part 1. The Laparosticti (Subfamilies: Scarabaeinae, Aphodiinae, Hybosorinae, Ochodaeinae, Geotropinae, Acanthocerinae). Arthropods of Florida and Neighboring Land Areas 8: 1-220.

MYRMEDONIINI
(COLEOPTERA, STAPHYLINIDAE, ALEOCHARINAE)
ASSOCIATED WITH ARMY ANTS
(HYMENOPTERA, FORMICIDAE, ECITONINAE)
IN FLORIDA¹

J. H. FRANK² AND M. C. THOMAS³

ABSTRACT

Three species of ecitophilous myrmedoniine beetles (*Microdonia nitidiventris* (Brues), *M. occipitalis* Casey, and *Ecitoxenidia alabamae* Seevers) are reported from Florida (U.S.A.) for the first time. A new genus and species, *Ecitocala rugosa* Frank, with affinities to the Central American genus *Ecitosius* Seevers, is described. A habitus illustration is provided for adults of *M. occipitalis*, *E. alabamae* and *E. rugosa*, while diagnostic structures of *E. rugosa* are illustrated.

Army ants of the subfamily Ecitoninae are believed to be of Neotropical origin and are largely of Neotropical distribution with a minority occurring in the Nearctic region (Smith 1942, Seevers 1965). Associated with these army ants are many species of inquillines belonging to the family Staphylinidae (Coleoptera), most of which are also Neotropical in distribution.

Three species of the army ant genus *Neivamyrmex* Borgmeier are recorded from Florida (Smith 1942), but only a single species of ecitophilous Staphylinidae, *Dinocoryna bisinuata* Casey, is recorded from Florida (Casey 1893, Seevers 1959, 1965; Moore and Legner 1975).

One of us (M.C.T.) operated an ultra-violet light trap while living at Ocala in 1977, collected specimens of some ecitophilous Staphylinidae and also made the habitus illustrations of this article. The other (J.H.F.) ex-

¹Contribution 471, Bureau of Entomology, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, P. O. Box 1269, Gainesville, FL 32602 USA.

²Research Associate, Florida State Collection of Arthropods, P. O. Box 520, Vero Beach, FL 32960 USA.

³Research Associate, Florida State Collection of Arthropods, 4327 NW 30th Terrace, Gainesville, FL 32605 USA.

