

The Cybocephalidae (Coleoptera) of the West Indies and Trinidad

TREVOR RANDALL SMITH¹ AND RONALD D. CAVE²

Ann. Entomol. Soc. Am. 100(2): 164–172 (2007)

ABSTRACT The six species of Cybocephalidae occurring in the West Indies and Trinidad are revised. Included are a new combination of *Pycnocephalus deyrollei* (Reitter) and descriptions of four new species: *Cybocephalus antilleus*, *Cybocephalus caribaeus*, *Cybocephalus iviei*, and *Cybocephalus geoffreysmithi*. A key to species, illustrations of morphological features including detailed drawings of male genitalia, and distribution data are provided.

KEY WORDS *Cybocephalus*, *Pycnocephalus*, revision, taxonomy

Sixteen species of Cybocephalidae have been described from the New World, all belonging to the genera *Cybocephalus* Erichson and *Pycnocephalus* Sharp (Reitter 1874, 1875; Waterhouse 1877, Sharp 1891, Champion 1913, Bréthes 1922, Smith and Cave 2006a). This is in stark contrast to the >150 species belonging to six genera in the Old World. Smith and Cave (2006a) recently revised the five species known to occur in America north of Mexico, but the Neotropical species have never been treated taxonomically.

Cybocephalids are known to feed on a variety of hosts (Smith and Cave 2006a); however, their most common food source is scale insects. In North America, *Cybocephalus nipponicus* Endrödy-Younga is frequently a predator of *Aulacaspis yasumatsui* Takagi (Smith and Cave 2006b), *Fiorinia externa* Ferris (Spichiger 2004), and *Unaspis euonymi* (Comstock) (Drea and Carlson 1988; Alvarez and van Driesche 1998a,b). In the western United States, *Cybocephalus californicus* Horn is a common natural predator of *Ehrhornia cypressi* (Ehrhorn) (Flanders 1934, Clausen 1940, Kartman 1946), *Lecanium corni* Bouché (Heintz 2001), and *Diaspidiotus perniciosus* (Comstock) (Heintz 2001). In the eastern United States, *Chionaspis pinifoliae* (Fitch) (Riley 1882), *Fiorinia theae* Green (Flanders 1934), *Pseudaulacaspis cockerelli* (Cooley) (Smith and Cave 2006a), and *Pseudaulacaspis pentagona* (Targioni-Tozzetti) (Collins and Whitcomb 1975) are prey species of *Cybocephalus nigrutilus* LeConte. *Pycnocephalus argentinus* Bréthes is a predator of *Ceroplastes* sp. (Bréthes 1922, Parker 1951) in South America.

To date, no cybocephalid species have been described from the West Indies. Due to the collecting techniques required to obtain the adults and to their

very small size, these beetles are often overlooked and are rarely found in collections. Cybocephalids do not come to light traps and are usually collected by beating vegetation, extracted from leaf litter samples, or from flight intercept traps. With collectors using collecting techniques such as sifting sand and leaf litter as well as the increased use of flight intercept traps in the West Indies, more of these beetles will be collected and subsequently described. Almost all newly described species from this region are described from a single island or island group; however with so few specimens collected it is unclear whether this is a case of widespread endemism or simply too few specimens to determine the true geographic distribution of each species.

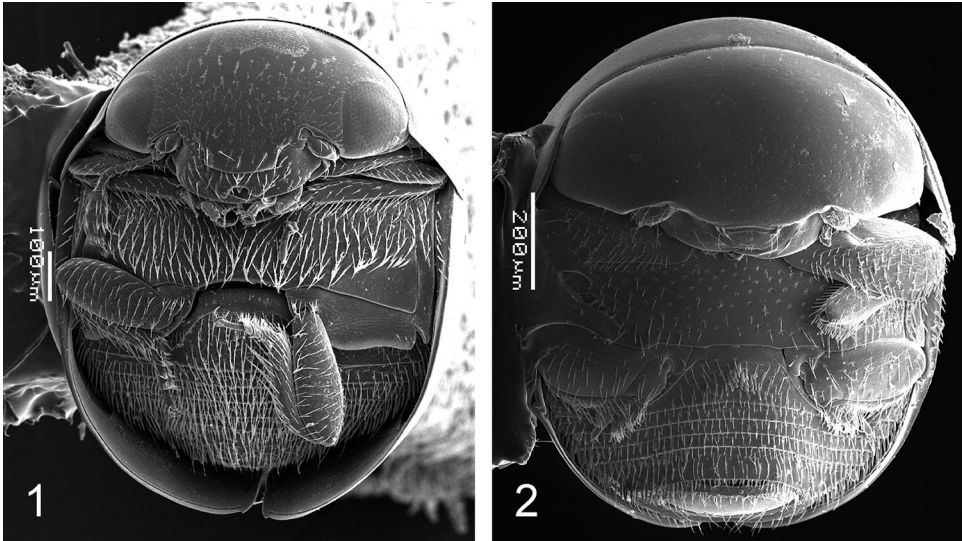
The objectives of this study are to 1) present a key for the identification of the cybocephalids of the West Indies and Trinidad, 2) describe new West Indian species, and 3) record the distribution of each species in the Caribbean Basin.

Materials and Methods

For this study, 222 specimens belonging to the genus *Cybocephalus* and 31 specimens belonging to the genus *Pycnocephalus* were examined. One female specimen from the Dominican Republic is at hand, but without associated males its identification cannot be ascertained. Specimens were borrowed from the following institutions and private collections (name of the curator or owner in parentheses): AAIC Albert Allen Insect Collection, Boise, ID (Albert Allen); BMNH Natural History Museum, London [formerly British Museum (Natural History)], UK (Maxwell Barclay); CNCI Canadian National Collection of Insects, Ottawa, Ontario, CANADA (Serge Laplante and Pat Bouchard); FMNH Field Museum of Natural History, Chicago, IL (James H. Boone); FSCA Florida State Collection of Arthropods, Gainesville, FL (Paul Skelley and Michael Thomas); SEMC Snow Entomological Museum, University of Kansas, Lawrence, KS

¹ Corresponding author: Department of Entomology and Nematology, University of Florida, P.O. Box 110620, Gainesville, FL 32611 (e-mail: smitht2@doacs.state.fl.us).

² Indian River Research and Education Center, University of Florida, 2199 S. Rock Rd., Ft. Pierce, FL 34945-3138.



Figs. 1-2. Ventral habitus of *C. nipponicus* (1) and *P. deyrollei* (2).

(Zack H. Falin); TAMU Texas A&M University, Department of Entomology, College Station, TX (Ed G. Riley); USNM United States National Museum, Smithsonian Institution, WA D.C. (Gary Hevel); and WIBF West Indian Beetle Fauna Project Collection, Montana State University, Bozeman, MT (Michael Ivie).

Genitalia were removed and disarticulation was carried out using the methods described in Smith and Cave (2006a).

Definitions

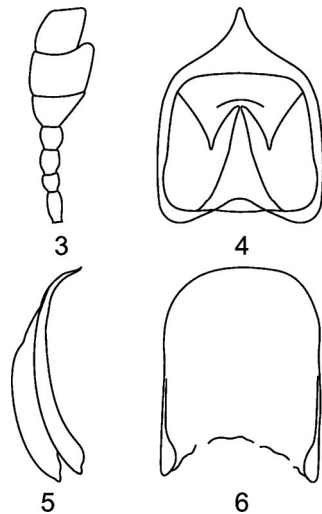
Median lobe: Also referred to as penis (Endrödy-Younga 1968, 1971a,b; Kirejtshuk et al. 1997; Lupi 2003; Yu 1995a,b).

Basal plate: This is a reference to the basal plate of the tegmen (Endrödy-Younga 1968, 1971a,b; Lupi 2003; Yu 1995a,b).

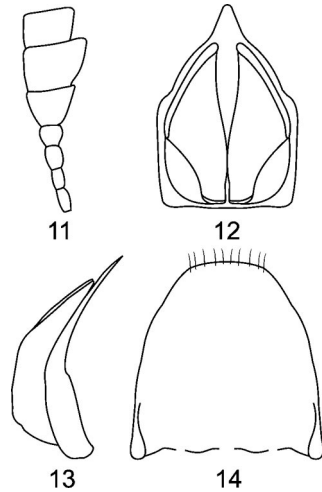
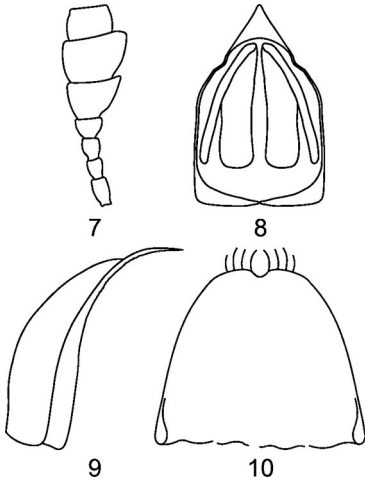
Key to the Cybocephalidae of the West Indies and Trinidad

- 1. Head very short with extremely short, slightly concave clypeus (Fig. 2); femora and tibiae of the posterior two pairs of legs extremely dilated and laminiform (Fig. 27); male with blue-green metallic sheen on head and apical half of pronotum.
 *Pycnocephalus deyrollei* (Reitter) **new combination**
- 1'. Head not short, clypeus of normal size and not concave at the apex (Fig. 1); only hind femora dilated, middle femora and tibiae of the posterior two pairs of legs not or only slightly dilated; male without metallic sheen 2

- 2(1'). Antennal club without a serrated margin, terminal antennomere rounded (Fig. 15); scutellum with concave margins
 . (Fig. 19) *Cybocephalus iviei* new species
- 2'. Antennal club with at least two antennomeres forming a serrated margin, terminal segment truncate (Fig. 3); scutellum with straight or slightly convex margins (Fig. 20) 3
- 3(2'). Margin smooth between club antennomeres one and two but terminal club antennomere clearly much narrower than club antennomere two (Fig. 3); basal plate



Figs. 3-6. *C. antilleus*. (3) Antenna. (4) Median lobe, dorsal view. (5) Median lobe, lateral view. (6) Basal plate, ventral view.



Figs. 7-10. *C. caribaeus*. (7) Antenna. (8) Median lobe, dorsal view. (9) Median lobe, lateral view. (10) Basal plate, ventral view.

Figs. 11-14. *C. geoffreysmithi*. (11) Antenna. (12) Median lobe, dorsal view. (13) Median lobe, lateral view. (14) Basal plate, ventral view.

- rounded (Fig. 6); median lobe as in Figs. 4 and 5 *Cybocephalus antilleus* new species
- 3'. Antennal club with a clearly serrated margin (Fig. 7) 4
- 4(3'). Male bicolored with head, prothorax, mesosternum and legs yellow or tan, rest of body black; basal plate coming to a rounded point (Fig. 25); median lobe as in Figs. 23 and 24. *Cybocephalus nipponicus* Endrödy-Younga
- 4'. Male not bicolored 5
- 5'. Male basal plate rounded with a slight concavity at the apex (Fig. 10); median lobe as in Figs. 8 and 9. *Cybocephalus caribaeus* new species
- 5(4'). Male basal plate evenly rounded and without concavity (Fig. 14); median lobe as in Figs. 12 and 13. *Cybocephalus geoffreysmithi* new species

Cybocephalus Erichson 1844

Cybocephalus Erichson 1844: 441-442.

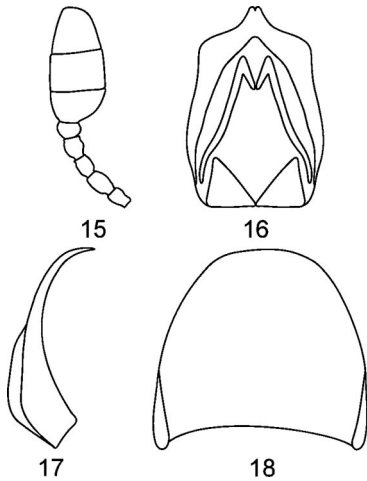
For a description of the genus, see Smith and Cave (2006a) (Fig. 1).

Cybocephalus antilleus T. R. Smith, new species (Figs. 3-6)

Diagnosis. Male and female are black but with a matte-like appearance. The antennal club has a distinctive shape (Fig. 3) unlike any other species in the West Indies. In males, the basal plate (Fig. 6) and median lobe (Fig. 4) are easily distinguished from those of all other species.

Etymology. This species is named after the chain of islands (the Antilles) in which it occurs.

Description. Male. Form: Elongate round, contractile; strongly convex dorsally. Length: 1.3 mm (measured from apex of the clypeus to apex of elytra); breadth: 0.7 mm (measured across elytral humeri). **Color:** Black, shiny but with a matte-like appearance. Head, thorax, and elytra black or dark brown, underside dark brown to black; legs and antennae dark brown. **Head:** Broad and convex, clypeus moderately produced and wide. Eyes large, round, facets distinct. Surface distinctly alutaceous and minutely but uniformly punctate. Clypeus wide and short. Genae not visible from above, slightly explanate when viewed laterally. Dorsal surface alutaceous and finely punctured. Antenna with 11 antennomeres including a three-segmented club. Club large, only slightly smaller than height of the eye, flat and distinctly separated from funicle. First and second club antennomeres wider than long, terminal club antennomere about as long as wide. Margin smooth between club antennomeres 1 and 2, but terminal club antennomere clearly much narrower than club antennomere 2 (Fig. 3). Antennomere 3 shorter than 4 and 5 combined. **Pronotum:** Alutaceous and punctate. Strongly convex, lateral margins curved; anterior angles more narrowly arcuate than posterior angles. **Scutellum:** Very small, alutaceous. **Elytra:** Uniform width narrowing at the apical one fifth. Strongly convex, sides slightly sinuous and apices round, length shorter than combined width (30:39). Punctuation ending just before apices. Median margin and apices of elytra bordered. **Underside:** Metasternum alutaceous, roughly punctured, and clothed in long coarse hairs. Abdominal sternites alutaceous and punctate with long coarse hairs thinly covering the surface. **Legs:** All tibiae slightly but distinctly curved and dilated toward the apex. Protibiae with short hairs along the outer margin. Meso- and metatibiae with long, stiff hairs along the



Figs. 15–18. *C. iviei*. (15) Antenna. (16) Median lobe, dorsal view. (17) Median lobe, lateral view. (18) Basal plate, ventral view.

outer margin. All femora shiny, wide, flattened and sparsely covered with short hairs. Pro- and mesofemora about the same width throughout their length. Metafemora expanded in the middle. Four tarsomeres, claw tarsomere as long or almost as long as two preceding tarsomeres. *Median lobe*: Sides parallel until converging sharply toward an acute, extended point at the apex (Fig. 4). In profile, slightly curved ventrally at tip (Fig. 5). Median plate only slightly elevated (Fig. 5). *Basal plate*: Sides parallel at base, with a uniformly rounded tip (Fig. 6).

Female. Similar to male except for genitalic structures.

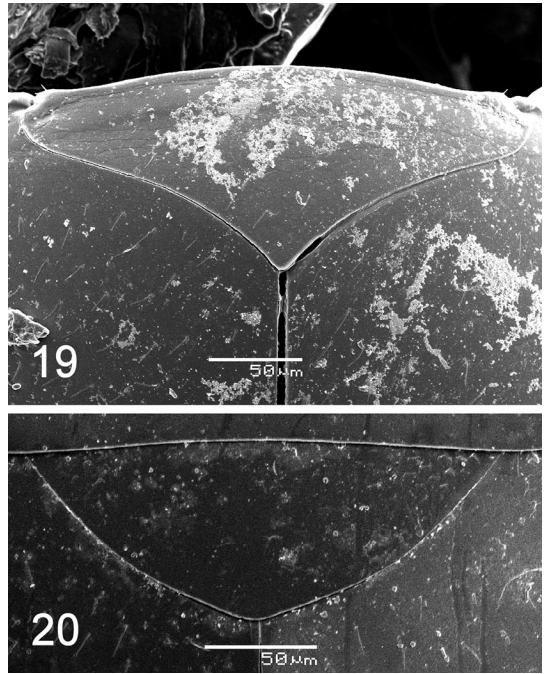
Distribution. Dominica.

Material Examined. The holotype, deposited in the TAMU insect collection, is a partly disarticulated male specimen glued to a point with the following labels: DOMINICA: St. Paul Par. Springfield Estate V-27-VI-12–1994 J. B. Woolley, 94/020 malaise trap (printed) [white rectangular label]/HOLOTYPE *Cybocephalus antilleus* T. R. Smith Det: Trevor Smith (printed) [red rectangular label]. The allotype, deposited in the TAMU insect collection, is a female specimen glued to a point with the following labels: DOMINICA: St. Paul Par. Springfield Estate V-27-VI-12–1994 J. B. Woolley, 94/020 malaise trap (printed) [white rectangular label]/ALLOTYPE *Cybocephalus antilleus* T. R. Smith Det: Trevor Smith (printed) [blue rectangular label]. Paratype: Dominica: St. Paul Par., Pont Cassé, 19-VI-2004, coll. R. Turnbow (1♂, FSCA).

Remarks. These beetles were collected in heavily forested habitat. Nothing is known about the prey of these beetles.

Cybocephalus caribaeus T. R. Smith, new species
(Figs. 7–10)

Diagnosis. Male and female are black or dark brown. Each antennomere of the antennal club is distinctly



Figs. 19–20. Scutellum of *C. iviei*. (19) and *C. nipponicus* (20).

separated to form a serrated edge and the terminal antennomere is truncate (Fig. 7). In males, the basal plate (Fig. 10) and median lobe (Fig. 8) are easily distinguished from all other species.

Etymology. This species is named after the general region (the Caribbean Sea) in which it occurs.

Description. Male. *Form*: Round, contractile; strongly convex dorsally. Length: 1.35 mm (measured from apex of clypeus to apex elytra); breadth: 1.0 mm (measured across elytral humeri). *Color*: Head, thorax, elytra black or dark brown, underside dark brown to black; front legs light brown, middle and hind legs and antennae dark brown. *Head*: Broad and convex, clypeus moderately produced and relatively narrow. Eyes large, tear-shaped, facets distinct. Dorsal surface distinctly alutaceous and minutely but uniformly punctate. Genae not visible from above and slightly explanate when viewed laterally. Antenna with 11 antennomeres including a three-segmented club about one half the height of the eye. Club flat and distinctly separated from funicle. All club antennomeres wider than long; terminal club antennomere short and truncate (Fig. 7). Antennal club margin serrated. Antennomere 3 shorter than 4 and 5 combined. *Pronotum*: Strongly convex, lateral margins curved; anterior angles more narrowly arcuate than posterior angles. Alutaceous and punctate. *Scutellum*: Triangular, alutaceous, and with margins slightly convex. *Elytra*: Uniform width narrowing at the apical one fifth. Strongly convex, sides slightly sinuous and apices rounded, length shorter than combined width (33:43). Punctuation ending just before apices. Median margin and apices of elytra bordered. *Underside*: Abdominal

sternites alutaceous and punctate with long coarse hairs thinly covering the surface. Metasternum alutaceous, roughly punctured, and clothed in long coarse hairs. *Legs*: All tibiae slightly but distinctly curved and dilated toward the apex. Protibiae with short hairs along the outer margin. Meso- and metatibiae with long, stiff hairs along the outer margin. All femora shiny, wide, flattened and sparsely covered with short hairs. Metafemora expanded in the middle. Pro- and mesofemora only very slightly dilated in the middle. Four tarsomeres, claw tarsomere as long or almost as long as two preceding tarsomeres. *Median lobe*: Sides extending parallel to one another, turning in toward the apex to form a sharp point, with a slight notch on either side of lobe three fourths of the way up toward the apex (Fig. 8). In profile, strongly curved from the middle (Fig. 9). Median plate very elevated (Fig. 9). *Basal plate*: Sides parabolic narrowing slightly toward apex, emarginate at the apical end (Fig. 10).

Female. Similar to male except for genitalic structures.

Distribution. Curaçao.

Material Examined. The holotype, deposited in the USNM, is a disarticulated male specimen glued to a point with the following labels: CURAÇAO, Coral Specht 3 km. E. Willemstad 9-15-II-1987 W. E. Steiner & J. M. Swearingen (printed) [white rectangular label]/Flight-intercept yellow pan trap in mesquite-acacia desert scrub near coast (printed) [white rectangular label]/HOLOTYPE *Cybocephalus caribaeus* T. R. Smith Det: Trevor Smith (printed) [red rectangular label]. The allotype, deposited in the USNM, is a female specimen glued to a point with the following labels: CURAÇAO, Coral Specht 3 km. E. Willemstad 9-15-II-1987 W. E. Steiner & J. M. Swearingen (printed) [white rectangular label]/flight-intercept yellow pan trap in mesquite-acacia desert scrub near coast (printed) [white rectangular label]/ALLOTYPE *Cybocephalus caribaeus* T. R. Smith Det: Trevor Smith (printed) [blue rectangular label].

Remarks. This species was collected in desert habitat. Nothing is known about the diet or plant associations of this beetle.

Cybocephalus geoffreysmithi T. R. Smith,
new species
(Figs. 11-14)

Diagnosis. Male and female are black or dark brown. Each antennomere of the antennal club is distinctly separated to form a serrated edge and the terminal antennomere is truncate (Fig. 11). Scutellum with convex margins. In males, the basal plate (Fig. 14) and median lobe (Figs. 12 and 13) are easily distinguished from all other species.

Etymology. This species is named in honor of Geoffrey Edwards Smith, paternal grandfather of the species name's author.

Description. Male. *Form*: Elongate oval; contractile; strongly convex dorsally. Length: 1.1 mm (measured from apex of clypeus to apex of elytra); breadth: 0.9

mm (measured across elytral humeri). *Color*: Head, thorax, elytra, and underside dark brown, a narrow band along the lateral margin of pronotum and posterior margin of elytra yellowish and translucent; front legs and antennae amber or light brown, middle and hind legs dark brown. *Head*: Broad and convex, clypeus moderately produced and narrow. Eyes large, oblong, with internal margins distinct. Genae not visible from above. Dorsal surface distinctly alutaceous and finely punctate. Antennae 11-segmented including a club with three antennomeres, club length about one-half-two-thirds size of the eye. Club flat and distinctly separated from funicle and with a distinctly serrated margin. First club antennomere slightly wider than long, second club antennomere larger than either first or third club antennomere and wider than long. Terminal club antennomere truncate (Fig. 11), setose and wider than long. Antennomere 3 about as long as antennomeres 4 and 5 combined. *Pronotum*: Strongly convex, lateral margins curved; anterior angle more narrowly arcuate than posterior. Surface distinctly alutaceous with fine punctation. *Scutellum*: Very large, alutaceous and triangular with convex margins. *Elytra*: Uniform width narrowing at apical end fifth. Strongly convex, sides slightly sinuous and apices rounded. Length slightly shorter than combined width (28:36). Uniformly punctate along dorsal surface, smooth at sides and base with a narrow impunctate area at apices of elytra. Seeming alutaceous under high magnification. Median margin and apices of elytra bordered. Apices with distinct striations. *Underside*: Metasternum alutaceous, roughly punctured, and clothed in long coarse hairs. Abdominal sternites alutaceous and punctate with long, coarse hairs thinly covering the surface. *Legs*: Femora glossy, broad, flattened and sparsely covered with short hairs. Pro- and mesofemora about the same width throughout length. All tibiae slightly but distinctly curved and dilated toward apex. Protibiae with short hairs along outer margin. Meso- and metatibiae with long stiff hairs along outer margin. Four tarsomeres, claw tarsomere as long or almost as long as two tarsomeres preceding it. *Median lobe*: Sides parallel or slightly divergent curving into a point (Fig. 12). In profile, strongly curved from middle (Fig. 13). Median plate on surface elevated. *Basal plate*: Sides slightly convergent, evenly rounded at apex (Fig. 14).

Female. Nearly identical to male.

Distribution. Jamaica and Trinidad.

Type Material Examined. The holotype, deposited in the BMNH, is a male specimen glued to a card with the following labels: Jamaica: Hope River. 26-V-1908. Dr. M. Cameron. B.M. 1936-555 (printed) [white rectangular label with a yellow line running horizontally the length of the label]/British Mus. (printed) [white rectangular label]/HOLOTYPE *Cybocephalus geoffreysmithi* T. R. Smith Det: Trevor Smith (printed) [red rectangular label]. The allotype, deposited in the BMNH, is a female specimen glued to a card with the following labels: Jamaica: Constant Spring. 29-VII-1908. Dr. M. Cameron. B.M. 1936-555 (printed) [white rectangular label with a yellow line running horizon-

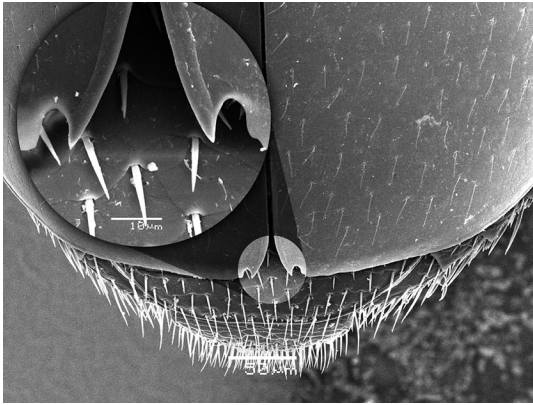


Fig. 21. Invaginations at the elytral apices of *C. iviei*.

tally the length of the label]/British Mus. (printed) [white rectangular label]/ALLOTYPE *Cybocephalus geoffreysmithi* T. R. Smith Det: Trevor Smith (printed) [blue rectangular label]. Paratypes: Jamaica: Rocky Spring, 8-III-1908, coll. M. Cameron (1♂, BMNH); Constant Spring, IV-1908, coll. M. Cameron (2♂, BMNH); Hope River, 26-V-1908, coll. M. Cameron (2♀, BMNH); Kingston, 16-II-1908, coll. M. Cameron (2♂, BMNH); Kingston, Palisadoes, 25-VIII-1966, coll. Howden & Becker (1♀, CNCI); Trinidad: St. Augustine, VI-1955, coll. F. D. Bennett, on *Stachytarpheta* sp. (2♂, 2♀, BMNH).

Remarks. *C. geoffreysmithi* has been collected on *Stachytarpheta* (Verbenaceae); therefore, it stands to reason that its prey is a scale found on this plant. Species of *Stachytarpheta* occur in both Jamaica and Trinidad. Unlike all other species examined from this region, *C. geoffreysmithi* was found on widely separate islands.

Cybocephalus iviei T. R. Smith, new species
(Figs. 15–18, 19, 21)

Diagnosis. Male and female are black. Size is extremely small (<1 mm). The antennal club has a smooth margin (Fig. 15) without a serrated edge and the terminal segment is somewhat rounded. The scutellum has concave margins (Fig. 19), distinguishing this species from all others in the West Indies. The apices of the elytra have a distinct invagination (Fig. 21), a character also unique to this species.

Etymology. This species is named in honor of Dr. Michael Ivie, a thorough collector of microcoleoptera and the first to collect this species.

Description. **Male.** *Form:* Ovate; contractile; strongly convex dorsally. Length: 0.80 mm (measured from apex of the clypeus to apex of elytra); breadth: 0.38 mm (measured across the elytral humeri). *Color:* Head, thorax, elytra black or dark brown, underside brown to dark brown; legs and antennae brown. *Head:* Broad and convex, clypeus moderately produced and wide. Eyes large, oblong with internal margins distinct. Genae extended laterally and easily visible from

above and slightly explanate when viewed laterally. Dorsal surface alutaceous and finely punctured. Antenna with 11 antennomeres, including a three-segmented club only slightly smaller than height of eye. Club flat and distinctly separated from funicle. First club antennomere wider than long. Second club antennomere larger than either first or third club antennomere and not as long as wide. Terminal club antennomere rounded and roughly trapezoidal and about as long as wide (Fig. 15). Antennomere 3 slightly shorter than 4 and 5 combined. *Pronotum:* Strongly convex, lateral margins curved; anterior angles more narrowly arcuate than posterior angles. Surface distinctly punctured. *Scutellum:* Very wide with very concave margins (Fig. 19); alutaceous and very sparsely punctured. *Elytra:* Uniform width narrowing at the apical one fifth. Strongly convex dorsally, sides slightly sinuous and apices with a distinct invagination (Fig. 21). Length about one-half of combined width (17:30). Very alutaceous, distinctly punctured. Median margin and apices of elytra bordered. *Underside:* Abdominal sternites alutaceous and punctate with long coarse hairs thinly covering the surface. Metasternum alutaceous, roughly punctured, and clothed in long coarse hairs. *Legs:* All tibiae slightly but distinctly curved and dilated toward the apex. Protibiae with short hairs along the outer margin. Meso- and metatibiae with long, stiff hairs along the outer margin. All femora shiny, wide, flattened and sparsely covered with short hairs. Pro- and mesofemora about the same width from end to end. Metafemora expanded in the middle. Four tarsomeres, claw tarsomere as long or almost as long as two preceding tarsomeres. *Median lobe:* Sides extending parallel to one another, turning in sharply toward the apex and coming to a blunt point (Fig. 16). In profile, strongly curved from middle (Fig. 17). Median plate only slightly elevated (Fig. 17). *Basal plate:* Sides parallel at base, rounding to a slightly flat top (Fig. 18).

Female. Similar to male except for genitalic structures.

Distribution. U.S. Virgin Islands: Buck Island (St. Croix), St. John, St. Thomas.

Type Material Examined. The holotype, deposited in the USNM, is a male specimen glued to a point with the following labels: Virgin Is: St. John Est. Concordia 12-V-1984, litter under cactus and agave, W. Muchmore (printed) [white rectangular label]/HOLOTYPE *Cybocephalus iviei* T. R. Smith Det: Trevor Smith (printed) [red rectangular label]/WIBF 014005 (printed with a barcode, upside down) [white rectangular label]. The allotype, deposited in the USNM, is a female specimen glued to a point with the following labels: Virgin Is: St. John Est. Concordia 12-V-1984, litter under cactus and agave, W. Muchmore (printed) [white rectangular label]/ALLOTYPE *Cybocephalus iviei* T. R. Smith Det: Trevor Smith (printed) [blue rectangular label]/WIBF 013987 (printed with a barcode, upside down). Paratypes: UNITED STATES VIRGIN ISLANDS: BUCK ISLAND: Buck Island Reef National Monument, 140 feet, V-VI-1993, coll. Z. Hillis, flight intercept trap #14 (1♂, WIBF); Buck Island

Reef National Monument, 340 feet, VII-VIII-1993, coll. Z. Hillis, flight intercept trap #15 (1♀, WIBF); Buck Island Reef National Monument, 340 feet, 30-III-29-VI-1995, coll. Z. Hillis and M. Hillis, flight intercept trap #15 (1♂, 1♀, WIBF); Buck Island Reef National Monument, 9-V-1996, coll. Z. Hillis, M. Hillis and B. Phillips, flight intercept trap (1♂, 2♀, WIBF); ST. JOHN: Maho Bay, 12-III-1984, coll. W. B. Muchmore, under trees nr. road (1♀, WIBF); Est. Concordia, 12-V-1984, coll. W. B. Muchmore, litter under cactus and dung (3♂, 11♀, WIBF; 2♂, TRSC, 2♀, USNM); Est. Concordia, 12-V-1984, coll. W. B. Muchmore, litter under cactus and agave (5♂, 10♀, WIBF; 1♂, 1♀, MCZC; 1♂, 3♀, FSCA); ST. THOMAS: Red Hook, 27-VII-1980, coll. M. A. Ivie, ex. Dead Stump (3♀, WIBF); Est. Nazareth, 40 feet, 26-VII-19-X-1994, coll. M. A. and L. L. Ivie, flight intercept #9 (2♂, 2♀, WIBF).

Remarks. Although much smaller, this species has characteristics similar to *C. kathrynae* T. R. Smith, which is found in southern Florida. Both species have similarly shaped antennal clubs and scutella. *C. iviei* has almost always been collected in flight intercept traps or in leaf litter. It was often collected in litter at the base of cacti and agave; therefore, there is a good chance that one of their hosts is a scale insect found on one of these plants.

***Cybocephalus nipponicus* Endrödy-Younga**

(Figs. 1, 20, 22-25)

Cybocephalus nipponicus Endrödy-Younga 1971a: 244-245.

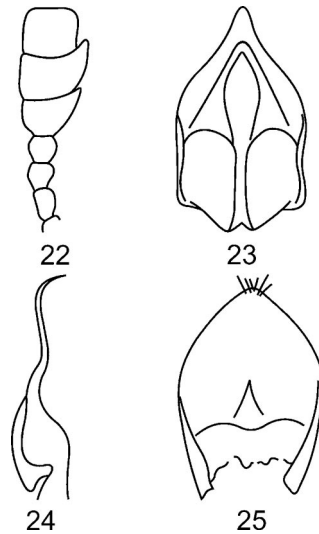
Diagnosis. The male is bicolored with a yellow or tan head, pro- and mesosternum, antennae, and legs but the remainder of the body is black; thus, distinguishing this species from all other *Cybocephalus* in the West Indies. The female is almost completely black with yellow front legs and antennae, with the remaining legs either light brown or brown. The antennal club is smaller than the eye, truncate, and each segment is distinctly separated to form a serrated edge (Fig. 22). The male basal plate (Fig. 25) and median lobe (Figs. 23 and 24) are distinctly different from those of the other species.

Description. For descriptions of both sexes, see Smith and Cave (2006a).

Distribution. West Indies: Cayman Islands, St. Kitts/Nevis, Barbados; World: Asia, southern Europe, Micronesia, eastern North America, and South Africa.

Hosts. This predator has been reported feeding on at least 14 species of armored scale around the world (Smith and Cave (2006a), and references therein). According to label data, this beetle has only been recorded feeding on *A. yasumatsui* and *Aspidiotus destructor* Signoret in the West Indies.

Material Examined. British West Indies: Cayman Islands: Grand Cayman, 15-VI-2001, coll. S. Frederick, feeding on cycad scale on *Cycas revoluta* (8♂, 6♀, FSCA); West Indies: St. Kitts/Nevis: St. Kitts, 14-II-1997, coll. R. D. Gautan, feeding on *Aspidiotus de-*



Figs. 22-25. *C. nipponicus*. (22) Antenna. (23) Median lobe, dorsal view. (24) Median lobe, lateral view. (25) Basal plate, ventral view.

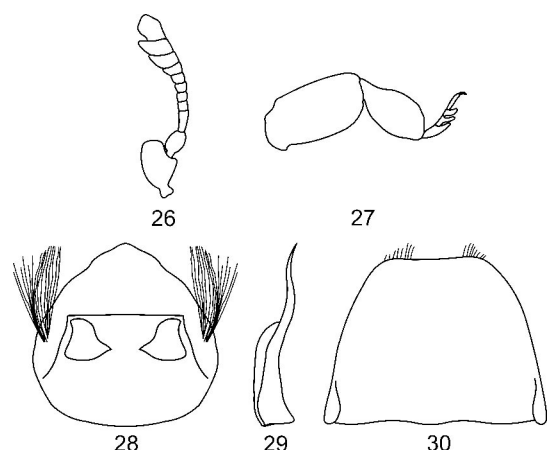
structor (6♂, 3♀, BMNH); Nevis, nr. Charlestown, 9-XI-1995, coll. G. Watson, on coconut palm infested with whitefly (1♂, 2♀, BMNH); Four Seasons Resort, 9-XI-1995, colls. G. Watson, M. Cock & E. Clarke, on coconut palm infested with *Aspidiotus destructor* and whiteflies (43♂, 34♀, BMNH); Nisbet Plantation, 10-XI-1995, coll. G. Watson, on coconut palm (20♂, 14♀ BMNH); Nisbet Estate, 20-II-1997, coll. R. G. Booth, on coconut palm (3♂, 2♀ BMNH); Potwork, 10-XI-1995, coll. E. Clarke & G. Watson, on coconut palm infested with scale and whitefly (2♀, BMNH).

Remarks. *C. nipponicus* was recently introduced, from Florida, to Barbados where it quickly became established and contributes to the biological control of *A. yasumatsui* on ornamental king sagoes, *Cycas revoluta* Thunberg (I. Gibbs, personal communication). This introduction was part of a continuing effort to control the cycad aulacaspis scale in the Caribbean region.

***Pycnocephalus* Sharp 1891**

Pycnocephalus Sharp 1891: 373.

Description. *Form:* Ovate and very convex; body contractile. *Head:* Very broad and short; deflexed (Fig. 2). Epistoma slightly prolonged at middle. Mandibles in repose resting against the metasternum, acute at tip with a small tooth posteriorly. Maxillae with one lobe. Antennae shorter or as long as width of head, antennal club flat with three antennomeres, antennal grooves small and convergent. Scape greatly enlarged and of a particular shape (Fig. 26). *Thorax:* Pronotum margined at base, covering the base of elytra, sides very short. Prosternum acutely carinate in front, not prolonged behind the procoxae, procoxal cavities open behind. Mesosternum broad, oblique. Metasternum



Figs. 26–30. *P. deyrollei*. (26) Antenna. (27) Hind leg. (28) Median lobe, dorsal view. (29) Median lobe, lateral view. (30) Basal plate, ventral view.

not or only slightly protuberant and with very short and sparse hairs. Both the meso- and metasternum are deeply impressed for reception of middle and hind legs. *Scutellum*: Small and broad, triangular. *Elytra*: Covering or nearly covering tip of abdomen, apices curved. *Abdomen*: Five visible ventral plates (omitting the small male anal plate), and five abdominal spiracles. *Legs*: Femora and tibiae of the posterior two pairs of legs dilated and laminiiform. Tibiae simple. Tarsi four-segmented, each tarsomere slightly dilated ventrally, second and third segments bilobed, claws simple. *Median lobe*: Heavily sclerotized and dorso-ventrally compressed. *Tegmen*: Fused.

Pycnocephalus deyrollei (Reitter) new combination
(Figs. 2, 26–30)

Cybocephalus deyrollei Reitter 1875: 55–56.

Diagnosis. The male is black with a blue-green metallic sheen on the head, anterior portion of the pronotum, and scape. The female is black and without the metallic sheen. Length 2.5 mm. The extremely large and dilated middle and hind tibiae as well as the extremely short, broad head (Fig. 2) distinguish this species from all other cybocephalids in the West Indies.

Description. Male. *Form*: Elongate, ovate; contractile; strongly convex dorsally. Length: 2.4–2.5 mm (measured from apex of clypeus to apex of elytra); breadth: 1.75–1.85 mm (measured across elytral humeri). *Color*: Head and apical portion of pronotum dark but with a blue or green metallic sheen, posterior portion of pronotum, elytra, and underside black, front legs light brown or amber, middle and hind legs brown or dark brown, scape dark with a blue-green metallic sheen, remaining 10 antennomeres brown or amber. *Head*: Broad, convex and very short, clypeus extremely short and broad, with a slightly concave apical margin. Eyes very large, fairly round and oblong with internal margins distinct. Genae not visible from

above. Dorsal surface alutaceous and finely punctate. Antenna with 11 antennomeres including a three-segmented club approximately one third–one half the height of the eye. Club flat, distinctly separated from funicle, and with a distinctly serrated margin. First and second club antennomeres wider than long, terminal club antennomere longer than wide, apically rounded and setose (Fig. 26). Third antennomere subequal to antennomeres 4 and 5 combined. *Pronotum*: Strongly convex, lateral margins curved; anterior angle more narrowly arcuate than posterior angles. Surface finely punctate. *Scutellum*: Triangular with margins slightly convex and sinuous; alutaceous and very sparsely punctured. *Elytra*: Uniform width narrowing at the apical one fifth. Strongly convex, sides almost parallel and apices rounded, length shorter than combined width (50:72). Distinctly alutaceous and punctate, punctuation extending to lateral edges and almost to apices. Median and lateral margins of elytra bordered. *Underside*: Metasternum alutaceous and roughly punctured, with short coarse hairs uniformly distributed. Abdominal sternites alutaceous and punctate with long, coarse hairs thinly covering the surface. *Legs*: Protibiae expanded toward the distal end and setose, profemora narrowing slightly at the distal end. Meso- and metatibiae with long, stiff hairs along the outer margin. Meso- and metafemora and tibiae very alutaceous, laminiiform and greatly dilated (Fig. 27). Four tarsomeres, claw tarsomere as long or almost as long as two preceding tarsomeres combined. *Median lobe*: Sides rounded and curving to a rounded tip (Fig. 28). A patch of long hairs on either side of lobe about halfway between base and apex (Fig. 28). In profile, sinuous and slightly curved at tip (Fig. 29). Median plate not elevated. *Basal plate*: Sides angling in before forming a flat top (Fig. 30).

Female. Similar to male but head, pronotum, and first antennal segment black and without blue-green metallic sheen.

Distribution. Trinidad and Tobago, Venezuela, and Brazil.

Material Examined. West Indies: Trinidad and Tobago: Trinidad, St. George Co., Anma Asa Wright Nature Centre, 7-VII-1994, coll. C. Chaboo, beating vegetation (1♂, SEMC); Port-of-Spain, St. Clair, Savanna, 24-X-1918, coll. Harold Morrison (1♂, USNM); Arouca V, 1953, coll. NLH Krauss (1♀, USNM); 26-II-1956, coll. V. F. Hayes, on coffee berries (1♂, USNM); Talparo, 24-V-7-VI-1990, coll. H. L. Dozier (4♂, FSCA; 1♂, 1♀, TRSC); Talparo, 25 July-VII-1991, coll. H. L. Dozier (1♀, FSCA); Arima Valley, Simla, W. Beebe tropical research station, 12-VII-1989, coll. H. L. Dozier (1♂, 4♀, FSCA); St. Augustine, Mt. St. Benedict Abby, 7-VII-1996, coll. B. K. Dozier (2♂, 1♀, FSCA); Arima Valley, road at mountain crest, 2-VII-1990, coll. H. L. Dozier (1♂, FSCA); N. range, Arima-Blanchisseuse Rd., mile 10, 11-V-1985, coll. C. W. & L. B. O'Brien (1♀, FSCA); St. Augustine, IX-1962, coll. F. D. Bennett, on croton (1♂, BMNH); 1905, coll. C. E. Bryant (5♂, 1♀, BMNH); St. George Co., Arima Valley, Asa Wright Nature Centre, 7-VII-1994, coll. C. Chaboo, ex. beating vegetation (1♂, SEMC); Morne

Bleu, 2700', 25-VIII-1969, colls. H. & A. Howden (1♂, FMNH); Balandra Bay, 23-III-1922 (1♂, FMNH).

Remarks. When Reitter described *Cybocephalus deyrollei* in 1875 there was only one described genus in the family Cybocephalidae. It was not until 1891 that Sharp described a second genus, *Pycnocephalus*. Sharp recognized that the size and shape of the head as well as the dilated middle and hind tibiae justified the creation of a new genus. *Cybocephalus deyrollei* clearly exhibits the features described by Sharp; therefore we place it in *Pycnocephalus*. The type specimens of *Pycnocephalus metallicus* Sharp, the genotype, also were examined and compared with *C. deyrollei*. The identification of *C. deyrollei* specimens was based on the published description because type specimens were not available for examination.

Acknowledgments

We extend our gratitude to the curators of collections for loans of specimens as well as Michael Thomas, J. Howard Frank, and Bill Overholt for reviews of the manuscript. We also thank Jane Medley and Patricia Hope for assistance with figures and photographs. This research was supported in part by the Florida Agricultural Experiment Station and Florida Department of Agriculture and Consumer Services Grant DACS 7276186-12 and approved for publication as IRREC journal series number R-030604.

References Cited

- Alvarez, J. M., and R. van Driesche. 1998a. Biology of *Cybocephalus* sp. nr. *nipponicus* (Coleoptera: Cybocephalidae), a natural enemy of euonymus scale (Homoptera: Diaspididae). *Environ. Entomol.* 27: 130–136.
- Alvarez, J. M., and R. van Driesche. 1998b. Effect of prey, sex, density, and age on oviposition of *Cybocephalus* sp. nr. *nipponicus* (Coleoptera: Cybocephalidae), a natural enemy of euonymus scale (Homoptera: Diaspididae). *Fla. Entomol.* 81: 429–436.
- Bréthes, J. 1922. Descripción de varios coleópteros de Buenos Aires. *Anal. Soc. Cient. Argent.* 94: 263–305.
- Champion, C. 1913. Notes on various Central American Coleoptera, with descriptions of new genera and species. *Trans. Entomol. Soc. Lond.* 58–169.
- Clausen, C. P. 1940. *Entomophagous insects*. McGraw-Hill, Inc., New York.
- Collins, F. A., and W. H. Whitcomb. 1975. Natural enemies of the white peach scale, *Pseudaulacaspis pentagona* (Homoptera: Coccidae), in Florida. *Fla. Entomol.* 58: 15–21.
- Drea, J. J., and R. M. Carlson. 1988. Establishment of *Cybocephalus* sp. (Coleoptera: Nitidulidae) from Korea on *Unaspis euonymi* (Homoptera: Diaspididae) in the eastern United States. *Proc. Entomol. Soc. Wash.* 90: 307–309.
- Endrödy-Younga, S. 1968. Monographie der paläarktischen Arten der Familie Cybocephalidae (Coleoptera: Clavicornia). *Acta Zool. Acad. Sci. Hung.* 14: 27–115.
- Endrödy-Younga, S. 1971a. Neue Ergebnisse bei der Bearbeitung der paläarktischen und orientalischen Cybocephalidae (Coleoptera: Clavicornia). *Acta Zool. Acad. Sci. Hung.* 17: 243–249.
- Endrödy-Younga, S. 1971b. Cybocephalidae, Coleoptera. *Insects of Micronesia*. 16: 281–285.
- Flanders, S. E. 1934. The life histories of three newly imported predators of the red scale. *J. Econ. Entomol.* 27: 723–724.
- Heintz, C. 2001. Update of the pest management evaluation for the almond industry. Almond Board of California. California Department of Pesticide Regulation, Modesto, CA.
- Kartman, L. 1946. A new host for *Cybocephalus* sp., a predator of diaspine Coccidae. *J. Econ. Entomol.* 39: 814.
- Kirejtshuk, A. G., D. G. James, and R. Heffer. 1997. Description and biology of a new species of *Cybocephalus* Erichson (Coleoptera: Nitidulidae), a predator of Australian citrus whitefly. *Aust. J. Entomol.* 36: 81–86.
- Lupi, D. 2003. Contribution to the knowledge of cybocephalid beetles. Biology and ethology of *Cybocephalus freyi* Endrödy-Younga. *Bull. Zool. Agr. Bachic. Ser. II*. 35: 45–54.
- Parker, H. L. 1951. Notes on *Pycnocephalus argentinus* Brèthes, parasitic on *Ceroplastes* sp. in Uruguay. *Proc. Entomol. Soc. Wash.* 53: 35–41.
- Reitter, E. 1874. Diagnosen der bekannten *Cybocephalus*-Arten. *Verh. Naturf. Ver. Brünn* 12: 1–10.
- Reitter, E. 1875. Diagnosen neuer Cybocephalus-Arten als Nachtrag zu der gleichnamigen Abhandlung in den Verhandlungen des Naturhistorischen Vereins in Brünn 1873, pgs. 55–56. *In* E. v. Harold [ed.], *Coleopterologische Hefte*: Herausgegeben unter Mitwirkung mehrerer Fachgenossen, 13.
- Riley, C. V. 1882. General note. *Am. Nat.* 16: 514.
- Sharp, D. 1891. Fam. Nitidulidae. *Biologia Centrali-Americana. Insecta. Coleoptera*. 2(1): 265–387.
- Smith, T. R., and R. D. Cave. 2006a. The Cybocephalidae (Coleoptera) of America north of Mexico. *Ann. Entomol. Soc. Am.* 99: 776–792.
- Smith, T. R., and R. D. Cave. 2006b. The life history of *Cybocephalus nipponicus* a predator of the cycad aulacaspis scale, *Aulacaspis yasumatsui* (Homoptera: Diaspididae). *Proc. Entomol. Soc. Wash.* 108: 905–916.
- Spichiger, S.-E. 2004. The Pennsylvania Department of Conservation and Natural Resources. Forestry. 2004. *For. Pest Manage. News*. 22 (1).
- Yu, G. 1995a. Two new species of Cybocephalidae (Coleoptera) from Guangdong, China. *Entomotaxonomia* 17: 31–34.
- Yu, G. 1995b. Two new species of Cybocephalidae (Coleoptera) from China. *Entomotaxonomia* 17: 277–280.
- Waterhouse, C. O. 1877. Account of the zoological collection made during the visit of H.M.S. 'Peterel' to the Galapagos Islands. *Günther Proc. Zool. Soc. Lond.* 77–82.

Received 24 April 2006; accepted 20 November 2006.