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Lady beetles of Puerto Rico (Coleoptera: Coccinellidae)[1,2]

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ABSTRACT

This work presents accounts and illustrations of the lady beetle species reported from Puerto Rico. Fifty-three species are discussed, including rare and uncommon lady beetles occurring on the Puerto Rican archipelago. The work also includes keys for subfamilies and species, the description of a new species (*Zilus barbosi* sp. nov.), and a redescription of *Diomus ochroderus* (Mulsant). Brief accounts of the history of coccinellid collections and collectors, and of classical bio-control efforts in Puerto Rico are given, including an annotated list of 24 historical biological control introductions.

Key words: Coccinellidae, lady beetles, Puerto Rico, *Zilus barbosi* sp. nov., *Diomus ochroderus*, biological control

RESUMEN

Las mariquitas de Puerto Rico (Coleoptera: Coccinellidae)

Este trabajo de investigación presenta datos e ilustraciones de las mariquitas reportadas de Puerto Rico. Reseñamos cincuenta y tres especies,

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incluyendo las especies raras y poco comunes de mariquitas presentes en el archipiélago puertorriqueño. Este trabajo incluye claves para las subfamilias y especies, la descripción de una nueva especie (*Zilus barbosi* sp. nov.) y la redescripción de *Diomus ochroderus* (Mulsant). Se presentan breves relatos de la historia de las colecciones de coccinélidos y sus colectores más importantes, así como de los esfuerzos de control biológico clásico en Puerto Rico, incluyendo una lista histórica de 24 introducciones registradas.

Palabras clave: Coccinellidae, mariquitas, Puerto Rico, *Zilus barbosi* sp. nov., *Diomus ochroderus*, control biológico

INTRODUCTION

Lady beetles (Coleoptera: Coccinellidae) are an economically and even a culturally important group of insects. The group's economical significance derives from the fact that most of its nearly 6,000 species prey on insects and other arthropods. It is not by chance that many of these species have been used successfully in biological control programs, particularly against pests such as aphids and scale insects. In fact, one of the earliest examples of successful classical biological control was the use of the Australian Vedalia beetle *Rodolia cardinalis* (Mulsant) in 1888 to control cottony cushion scales in California. Not all coccinellids are carnivores. Some coccinellids in the subfamily Epilachninae are herbivorous and important agricultural pests, and a few in subfamily Coccinellinae are fungus feeders (e.g., tribe Haliziini).

Skirvin et al. (1997a, b) proposes that the cultural-religious importance of lady beetles can be traced back to the Neolithic during the dawn of agriculture. Early humans apparently observed their colorful beauty, but also perhaps their appetite for pests attacking their crops. Even their common names in many Western countries evoke religious or magical significance. In English the name "Lady beetles" most likely alludes to the Virgin Mary. Similarly, in many Spanish-speaking countries these insects are called "*mariquitas*", which according to Zabala et al. (2003) derive from the phrase 'María quita' referring to the healing powers associated with the Virgin Mary within Catholicism. Apparently, the iconic red, white, and black colors of many common species reminded Europeans in the middle ages of paintings and portraits of the Virgin wearing similarly colored tunics. In Portuguese these insects are called "catarinas" referring to St. Catherine (i.e., Santa Catarina). In French they are called "coccinelles". In fact, the scientific name, Coccinellidae, comes from the Latin "coccineus" meaning reddish. Despite its relative importance and popularity, in Puerto Rico the group has received little attention.

Taxonomy

Coccinellid beetles belong to the Cerylonid series, section Clavocornia, of the superfamily Cucujoidea. Its closest relatives are believed to be beetles in the families Corylophidae and Endomychidae (Skelley and Leschen, 2002). Currently, most authors recognize Sasaji's (1968) classification, which supports six coccinellid subfamilies: Sticholotidinae, Scymninae, Chilocorinae, Coccidulinae, Coccinellinae, and Epilachninae. We adopt this classification scheme in the present work. Vandenberg (2002a) has pointed out major reservations in the current classification of Coccinellidae, emphasizing the lack of morphological support for most of the recognized subfamilies. A recent proposal by Slipinski (2007) has taken a more conservative approach, recognizing only two subfamilies: Microweiseinae (=Sticholotidinae) and Coccinellinae. Thus, it seems that higher classification within the family is still being examined, and an accurate definition of the principal coccinellid lineages remains to be established (Giorgi and Vandenberg, 2009).

Biota and diversity

Perhaps because of their cultural charisma, or because of their economic importance as beneficial insects, Coccinellidae are better known worldwide than many other insect groups. Puerto Rico's coccinellid fauna includes members of all coccinellid subfamilies, except Epilachninae, which are mostly herbivorous. Of the 53 species reported here, the largest number, 28 (eight appear endemic) belong to the subfamily Scymninae; eight species (five appear endemic) to the Stilocholotidinae; nine species (one endemic) to the Coccinellinae; four species (all introduced for biological control programs) to the Chilocorinae; and four species (one endemic) to the Coccidulinae. Almost one third of the species inhabiting the archipelago of Puerto Rico (Puerto Rico, Vieques, Culebra, Mona Island, Caja de Muertos Island) are endemic (15 species or approximately 30%). Rate of endemism appears highest in the Sticholotidinae. In fact, in his landmark work on Latin American and Caribbean biogeography, Morrone (2001) lists the sticholotidines *Lenasa jayuyai* Gordon*, Neaptera doyeni* Gordon*,* and *N. viridissima* Gordon as key beetle taxa for Puerto Rico (cocciduline *Psorolyma maxillosa* Sicard also listed in this group). Most endemic sticholotidines appear to be rare species, usually inhabiting upland subtropical rain forest habitats.

Epilachninae is the only subfamily currently absent from Puerto Rico, and no members of this group have been reported from the Caribbean. Wolcott (1948) alluded to the possibility that a species called *Epilachna patricia* Mulsant was reported from the Caribbean, but

this species was probably never found here. A curious error in the description record of this species by Mulsant (1850: 717) listed this herbivore from "*L'ile de Santa-Cruz, dans le grand Océan équinoxial (Museum de Paris, voyage de M. d'Orbigny)*". However, Jadwiszcak and Węgrzynowicz (2003) have established that this species was first collected from Santa Cruz de la Sierra in Bolivia, and it is a native only to El Chaco Region in Argentina, Bolivia, and Peru.

Species, collectors and collections

From the perspective of entomological work in Puerto Rico, only six authors have provided lists of known species occurring in Puerto Rico. Chronologically, the first report of lady beetle species was published by French explorer André Ledru (1810) who writes, in the last sentence of his section on the Coleoptera, about two unidentified lady beetles: *"Coccinelle (deux espèces indéterm.)"*. Weise (1885) listed 10 species for the island: *Coleomegilla* (=Megilla) *innotata* (Mulsant), *Psyllobora nana* Mulsant, *P. lineola* (F.), *Procula* (=Neda) *ferruginea* (Olivier), *Cycloneda* (=Neda) *sanguinea* (L.), *Hyperaspis connectens* (Thunberg), *H. festiva* Mulsant, *Diomus* (=Scymnus) *ochroderus* (Mulsant), *Scymnus floralis* (F.), and *S. phloeus* Mulsant. Gundlach (1893) repeated this same list with annotations. Leng and Mutchler's lists (1914, 1917) included the newly introduced *Hippodamia convergens* Guérin-Méneville, and added *Cryptolaemus montrouzieri* Mulsant, and two Scymninae: *Diomus roseicollis* (Mulsant) and *Scymnus loewii* Mulsant. Later, Wolcott (1948) determined that the latter was a misidentification of *Scymnus floralis* (F.). Blackwelder (1945) published an enhanced list of 28 species, followed by Wolcott (1948) who listed 43 species. Wolcott's list included lady beetle species introduced between 1912 and 1940 as biological control agents (whether their establishment was confirmed or not). Our work lists 53 species, including: 16 species recorded or described since 1948, and six species that have presumably entered Puerto Rico since Wolcott's 1948 monograph.

The first known expedition to collect insects in Puerto Rico took place in 1797 and was conducted by French naturalist André-Pierre Ledru (Ledru, 1810: 234). Later, between 1857 and 1876, Karl Wilhem Leopold Krug, a German consul, avid naturalist, and arts benefactor who lived in Mayagüez, collected extensively in western Puerto Rico. In fact, Krug financed two expeditions (1873 and 1875) by a young German naturalist and ornithologist, Johannes Gundlach, then living in Cuba. In 1885, Krug's specimens were sent to Europe, and used by German entomologist Julius Weise to publish his 1885 work on the coccinellids of Puerto Rico. Later, Gundlach (1893) pub-

lished his fauna of Puerto Rico, where he provides a brief annotated list of these same lady beetle species, offering some comparisons with Cuba's entomological fauna.

Unfortunately, the record of collections during the first half of the 20th century can only be gleaned either from museum specimen labels or from the somewhat limited accounts presented by Wolcott (1948). Following a loose chronology, the earliest records of lady beetle collections during that period came just after the end of the Spanish-American War of 1898, when Danish-born entomologist and explorer August Busck, then working for the old U.S. Department of Agriculture (USDA) Bureau of Entomology, collected in Puerto Rico and Vieques, and also on several other Caribbean islands. Like many explorers after him, Busck went on to travel throughout the West Indies and South America collecting and describing many new species for science.

More regular collections began in earnest in 1912 following the hiring of entomologist Thomas H. Jones by the Puerto Rico Sugar Growers Association's Agricultural Experiment Station. Through his extensive collection, Jones contributed to the knowledge of Puerto Rican Coccinellidae, collecting what would become paratypes of *Delphastus nebulosus* Chapin, an important and likely endemic predator of whiteflies. After Jones' departure in 1917, the newly created Insular Agricultural Experiment Station (AES) hired R.T. Cotton, who collected extensively in eastern Puerto Rico. Among his collections is an important source of smaller scymnine genera, like *Scymnus* and *Diomus*. Cotton joined the USDA and become a specialist in stored grain insects and their control. That same year a young USDA entomologist, Harold Morrison, travelled extensively in western Puerto Rico, collecting among scymnines the holotype for *Zilus gilvifrons* (Chapin) in Maricao. Morrison later became a prominent coccidologist at the U.S. National Museum (USNM).

The period between 1920 and 1950 saw important collectors, arguably the most important being G.N. Wolcott (AES), who collected the types for *Zilus variipennis* (Sicard); Francisco Seín (AES), who collected the type for *Decadiomus pictus* Chapin; followed by L.F. Martorell (AES) and J.A. Ramos, University of Puerto Rico (UPR), who separately organized entomological expeditions to Mona Island; H.L. Dozier, USDA entomologist who collected the type for *Decadiomus tricuspis* Chapin, as well as paratypes for *Lenasa jayuyai* Gordon; and H.L. Plank, also a USDA entomologist who became the first to collect the rare and endemic *Neaptera viridissima* Gordon. Of all resident entomologists, R.G. Oakley is considered by Wolcott (1948) as "*…the most prolific and enthusiastic collector of Coleoptera*". Oakley, who worked for the USDA Bureau of Entomology, travelled extensively throughout

the island's interior, and collected the type for *Nephaspis magnopunctata* Gordon (a rare endemic species), as well as many chrysomelid and mordellid types. This remarkable collector moved on to Guam, where he worked on fruit flies at the time of his retirement.

After 1950, several AES entomologists, among them S. Medina-Gaud, a former curator of 'Museo de Entomología y Biodiversidad Tropical' (MEBT), N.E. Virkki, F. Gallardo-Covas and A. Armstrong-Ramírez, have contributed with collections and unpublished observations of coccinellids of agricultural importance. Finally, some visiting entomologists have also contributed to the knowledge of Puerto Rico's coccinellid fauna. Among them are: F. Bennett (University of Florida [UFl] and Caribbean Agricultural Research and Development Institute [CARDI]), V.L. Blackburn (USDA-APHIS), O. Flint (USNM), H. Howden (Canadian Museum of Nature), G.B. Marshall (Florida A&M), L. O'Brien (Florida A&M), J. Santiago-Blay (USNM), R. Pluke (UFl), A. Escribano (UFl) and P. Spangler (USNM). Special mention is due retired USDA entomologist R.D. Gordon for describing 10 of the rarest coccinellid species in Puerto Rico during his tenure at the USNM.

Introduced species and classical biological control

Perhaps, few examples illustrate how direct human intervention affects the composition of an insect fauna better than the one offered by recent changes to the lady beetle fauna in Puerto Rico. During the last 80 years, a sizable 40% of the species appear to be recent acquisitions. Between 1912 and 1940, up to 24 coccinellid species were deliberately introduced as part of classical biological control programs (Table 1). In addition, since Wolcott's (1948) work, 10 additional species, presumably adventive from North America and the Caribbean, have been reported as occurring here. This number of 34 introduced species is almost equal to the number of native/endemic species in Puerto Rico's coccinellid fauna.

The records of deliberate coccinellid introductions in Puerto Rico are abundant. Of the 24 species for which introduction records exist, about a dozen have become established. Most of these originated from Australia, Hawaii, South America or other Caribbean islands. Largely, introductions were intended to control key agricultural pests of sugarcane, coconut, citrus or bamboo. While some of these species remain quite rare, several are among the most common lady beetles in Puerto Rico, such as the twice-stabbed lady beetle (*Chilocorus cacti* L.), the mealybug destroyer (*Cryptolaemus montrouzieri* Mulsant) and the Australian lady beetle (*Coelophora inaequalis* F.) (Table 1). The latter is the most abundant and commonly collected lady beetle in Puerto Rico.

We can establish that most of these introductions occurred between 1935 and 1940 and were made by a group of entomologists working for the USDA Bureau of Entomology and Plant Quarantine, stationed at the Federal Agricultural Experiment Station in Mayagüez. Wolcott (1953) narrates how station director H. Atherton Lee recognized early in his tenure the potential benefits of introducing "beneficial" organisms for pest control, especially against bamboo scales (*Bambusaspis bambusae* Boisduval). As a phytopathologist, he had served with the Bureau of Plant Industry in the Philippines and worked primarily with citrus and also with bamboo, a plant that he considered of great economic potential for the tropics.

In 1935, Atherton Lee obtained funding to hire several new research scientists for the USDA station under the Agricultural Adjustment Act of 1933, one of the pillars of U.S. President F.D. Roosevelt's "New Deal". Among them, Kenneth A. Bartlett was hired to head the biological control unit, which included entomologists S.M. Dohanian, H.L. Dozier, L.C. Fife, H.K. Plank, L.B. Scott, M.R. Smith and S.R. Vandenburg. This extraordinary entourage of young and promising entomologists was charged with exploration, importation and release of beneficial insects into Puerto Rico from abroad. The project, which began in 1935, was intended to "*… introduce into Puerto Rico, and colonize, species of beneficial insects to aid in the control of major insect pests of the island, and through their establishment to build up a reservoir from which introductions of needed species can be made to the continent*" (USDA, 1938). Between 1935 and 1940, Bartlett and his group introduced approximately 75 species of biological control agents, 21 of which were lady beetles. After that period, no record exists of deliberate introductions of lady beetles in Puerto Rico.

Unfortunately, as often occurs in classical biological control, impact evaluation is usually limited to scoring successes or failures based on the organism's establishment, and then, only assessed shortly after its introduction. Less frequently, longer-term evaluations are made to determine whether introductions resulted in reducing the pest status of their intended target(s), and even more infrequent are non-target effect assessments. Wolcott (1960) evaluated past lady beetle introductions into Puerto Rico, concluding that most successes (i.e., assessed by their ability to control intended targets) occurred from introductions against scale insects and exposed mealybugs. Less successful were those introductions against aphids, such as the green peach aphid [*Myzus persicae* (Sulzer)] or the yellow sugarcane aphid [*Sipha flava* (Forbes)]. Wolcott's prescient writings implied that one unintended consequence of these introductions was that "*. . . native lady beetles became scarce or tended to disappear.*" His key example was the apparent disappear-

ance of the endemic lady beetle *Decadiomus pictus* Chapin, which followed the introduction of *Rodolia cardinalis* (Mulsant) in 1932. As a note, this endemic beetle is uncommon, but it still can be found at a few locations (See discussion below).

Lastly, to date no long-term assessment exists about the impact of lady beetle introductions on the native fauna in Puerto Rico. Probably, the impact on non-target organisms has been significant, but the pitfalls inherent in conducting a sound scientific evaluation using poor biological and ecological records may prove insurmountable. Recent reviews have addressed the issue of non-target impacts of biological control (Howarth, 1991; Simberloff and Stiling, 1996; Hoddle, 2002). Negative impacts of introduced exotics include competitive suppression or displacement of native natural enemies, and suppression or extinction of non-target prey species, some of which may be beneficial (Elliott et al., 1996). Recently Koch (2003) reviewed the non-target effects of the establishment of coccinellid *Harmonia axyridis* Pallas in North America. Perhaps future research may explore possible intraguild competition between introduced and native Puerto Rican coccinellid species.

SPECIES OCCURRING IN PUERTO RICO

In this work, species are organized by subfamily, and in some cases, by tribe. Keys for each major group are given. Each taxon is discussed through a short account of its taxonomy, description, geographical distribution, records for Puerto Rico and remarks. References include author, year and page of original description, as well as other treatments of the species with emphasis on works from Puerto Rico and the Caribbean region. For most species, genitalia descriptions are based on original descriptions, or those found in other taxonomic treatments of the species, thus not redrawn or presented here. Morphological terminology follows Gordon (1999) for the Diomini. Morphological structures were studied using an Olympus SZX-12[6] stereomicroscope, and an Olympus BX41 phase contrast compound microscope (magnification 50-400x). Genitalia were dissected after maceration of abdomens in KOH and placed on glass slides with glycerin for examination. Prosternum pictures were produced with a JEOL 5410LV scanning electron microscope. Collections mentioned include: Museum of Entomology and Tropical

[6]Company or trade names in this publication are used only to provide specific information. Mention of a company or trade name does not constitute an endorsement by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

Biodiversity (MEBT) at the University of Puerto Rico Agricultural Experiment Station in Río Piedras, the Invertebrate Collection of the University of Puerto Rico-Mayagüez (INV-COL), the José A. Ramos collection (JAR) and the senior author's private collection. All locality information is given exactly as it appears on the label, correcting for obvious misspellings. Most of these descriptions were corroborated by dissection of specimens, except in several cases where only a few or valuable specimens were available for dissections (e.g., Sticholotidines). Genitalia illustrations are provided as part of the description for new species.

Key to Coccinellid subfamilies (after Vandenberg, 2002a)

1. Eye deeply divided by transverse projection or canthus from inner ventral margin; canthus broad, band-like, expanded to cover basal antennomeres in frontal view; clypeus short and not projecting to mandibles with semicircular emargination medially; antenna with ten or fewer antennomeres and with spindle-shaped flagellum; mandible scythe-like and single-toothed . . . . . *Chilocorinae.*

— Eye weakly emarginate or with short finger-like canthus. If canthus deeply divides eye, then it is narrow and clypeus is not as above . . . . . 2.

2. Mandible with multi-denticulate apex, with three or more irregular teeth, not comb-like; all tibia with one or two apical spurs present; antenna with 11 segments, inner margin of club weakly serrated, and base inserted dorsally between eyes . . . . . *Epilachninae.***

— Mandible with bifid or single apex, some with weak sub-apical tooth (some Sticholotidinae), but body size minute i.e., <2 mm). If additional apical, teeth then regular and comb-like (Halyzinii (=Psylloborini)); tibia lacking apical spurs . . . . . 3.

3. Dorsal surface glabrous; distal maxillary palpomere broadly securiform (hatchet-shapes) with side strongly divergent apically, base narrowly articulated with preceding palpomere; antenna long, equal to or longer than 2/3 head width; femur not strongly flattened; tibia simple without angulations. . . . . *Coccinellinae.*

— Dorsal surface pubescent, some glabrous; distal maxillary palpomere barrel-shaped, oblong, oval or conical (i.e., tapered to-

wards apex). If securiform, then base broadly articulated with previous palpomere; antennae less than 2/3 head width . . . . . 4.

4. Distal maxillary palpomere elongate, either conical or parallel-sided with an acute apex; mouthparts may be hidden from view by prosternal projection (see *Delphastus*); mentum usually narrowly articulated with submentum; small insects with body less than 3 mm . . . . . *Sticholotidinae*.

— Distal maxillary palpomere short and/or broad (although somewhat elongate in the Scymnillini), barrel-shaped, securiform or with apex weakly convergent; mentum widely articulated with submentum; body size variable . . . . . 5.

5. Dorsum mostly pubescent. When hairs are present, they are sparse and small (e.g., *Brachiacantha*, *Hyperaspis,* and *Zilus*); antenna short, 2/3 head width or less and inserted laterally or ventrally; flagellum and club merging gradually, not well differentiated. Mid-coxal cavities widely separated. Maxillary palpus from parallel-sided (Scymnilini) to barrel-shaped (Scymnini), short and weakly convergent apically (Stethorini), or more or less securiform and apically expanded (Hyperaspidini, Brachiacanthini, and Diomini) . . . . . *Scymninae*.

— Coccinellidae with dorsum convex and pubescent (except *Psorolyma* glabrous); antenna with 8-11 antennomers with weak spindle shaped club; body size variable; eye densely pubescent; tarsi trimerous (except cryptotetramerous in *Psorolyma*); some species with anterolateral margin thickened (e.g., *Pseudoazya*). Species are identified by color patterns; subfamily is difficult to characterize . . . . . *Coccidulinae*.

(** Currently not occurring on Puerto Rican archipelago).

Subfamily Sticholotidinae

The sticholotidines are among the minutest of coccinellids. These usually range from very small to small-sized (<1 to 4 mm), and their name is derived by the way in which their mentum and submentum are narrowly joined, resembling a narrow stitch. Some members are apterous, such as the genus *Neaptera*. Head with apical segment of maxillary palpi more or less tapered in most species. Antenna usually inserted dorsally, with seven to 11 segments, club with one to five segments. Abdomen with five or six visible sterna. Tarsus

trimerous or cryptotetramerous. Female genital plate elongate, triangular. The subfamily is characterized by the form of the terminal segment of the maxillary palpus, which is not securiform nor distinctly broadened apically, as is typical of the rest of the Coccinellidae [see Vandenberg (2002a) for discussion]. Members of this subfamily are found throughout the tropical regions of the world, with some genera and species also occurring in temperate regions. Three tribes are represented in Puerto Rico: Microweisini, Serangiini, and Sticholotidini. These are represented here by eight species in five genera: *Coccidophilus* (1 sp.), *Delphastus* (2), *Lenasa* (1), *Neaptera* (2) and *Semiviride* (2).

Key to Puerto Rican Sticholotidinae

1. Prosternum greatly expanded to conceal mouthparts; antennal club composed of a single oblong or elongate oval antennomere; femur broad, fitting into depressions on ventral surface (Serangiini: *Delphastus*) . . . . . 2.

— Prosternum not expanded, antenna or femur not as described 3.

2. Prosternal scoop convex; color light reddish brown, with darker spot around humeral callus on base of elytra . . . . . *Delphastus nebulosus* Gordon.

— Prosternal scoop flat medially with apical margin truncate; color dark reddish brown with no spots . . . . *Delphastus chapini* Gordon.

3. Abdomen with 6 visible segments; postcoxal line divided; minute size around 1 mm; color dark brown with yellowish-red border just inside the lateral margin of elytro . . . . . (Microweisini) *Coccidophilus cariba* Gordon.

— Abdomen with 5 visible segments; prosternum often modified, abruptly raised medially or defined by sharp lateral carinae (Sticholotidini). . . . . 4.

4. Eyes large, finely facetted, body rounded; prosternal process oblong, apically rounded; terminal segment of maxillary palpus short, slightly tapered apex; body black, polished and smooth, with metallic sheen . . . . . *Lenasa jayuyai* Gordon.

— Eyes small, coarsely facetted . . . . . 5.

5. Body surface smooth, lacking membranous wing; body oval elongate and strongly convex . . . . . 6.

— Body rounded, surface wrinkled; greenish metallic tint. . . . . 7.

6. Elytron dark reddish brown . . . . . .*Neaptera doyeni* Gordon.

— Elytron metallic green . . . . . .*Neaptera viridissima* Gordon.

7. Pronotum strongly wrinkled. . .*Semiviride loisobrienae* Gordon.

— Pronotum not wrinkled. . . . . *Semiviride portoricensis* Gordon.

Tribe Microweisini

Coccidophilus is the only known member of this tribe in the West Indies. This tribe is also characterized by the minute size of their members (around 1 mm) and are generally glabrous on dorsal surfaces. Pronotum with an anterolateral line; abdomen with six visible sterna; basal sternum with divided postcoxal line. Male genitalia asymmetrical, phallobase with unpaired parameres. Female spermathecal capsule bulbous. This tribe is represented by eight genera that occur from southern Canada to Chile and Argentina, and is apparently restricted to the Western Hemisphere. *Coccidophilus* Brèthes (1905: 76) is the only representative listed and can be distinguished from other members by its two-segmented antennal club (Gordon, 1985).

Coccidophilus cariba Gordon [Plate III, Fig. C]

Coccidophilus cariba Gordon, 1978: 206; Peck, 2006: 187.

Description: Form oval and convex, small. Length 0.85 to 1.1 mm. Body dark brown, except pronotum, head, and mouthparts that are paler reddish brown. Elytron is smooth and shiny. Pronotum with anterolateral line widely separated from anterolateral angle. Postcoxal line divided, outer portion very short and strongly curved; inner line complete to hind margin of first sternum and then to lateral margin. This species can be distinguished from other members of the genus by a distinct yellowish-red border just inside the lateral margin of the elytron (Gordon, 1978).

Type locality: Antigua. Holotype and allotype from the island of Antigua, March 1976, USNM. (Type was seen at USNM).

Distribution: The species was only known to the Eastern Caribbean, until collected by the senior author in 2008. It has been reported from the West Indian islands of Antigua, Curaçao, Dominica, Montserrat, St. Kitts, Nevis, and Puerto Rico.

Remarks: MEBT specimens were collected at the Juana Díaz Agricultural Experiment Station in December 2008, associated with *Crypticerya genistae* Hempel (Hemiptera: Monophlebidae) attacking pigeon pea [*Cajanus cajan* (L.) Millsp.]. This is the first record for this species in Puerto Rico. These are small, rapidly moving lady beetles, superficially resembling *Zilus* spp. when first seen walking on the plant. Upon further observation, they appear slightly more elongate than *Zilus*. As the generic name implies, most members are predators of Coccoidea (Hemiptera: Sternorrhyncha), especially diaspidids and coccids.

Tribe Serangiini

The Serangiini are a closely-knit group of genera of small and compact beetles (0.9 to 1.6 mm). Their heads are slightly prolonged before antennal insertion. Apical segment of maxillary palpus is elongate and conical. Antennae are eight- or nine-segmented, clubs composed of a single segment. One of the characters to best identify this group is the shape of the prosternum, which is strongly extended anteriorly forming a scoop that conceals the mouthparts. Epipleuron with cavity (fovea) for reception of leg. Tarsi are cryptotetramerous or trimerous. Abdomen with five visible sterna. Postcoxal line complete. Male genitalia asymmetrical, with parameres reduced. In this genus, male head is almost always much paler than the female's. Six genera are currently recognized in this tribe, five of which are native to the Old World (Gordon, 1985). *Delphastus* Casey (1899: 111) appears to be the only native representative of the Western Hemisphere. *Delphastus* spp. occur from Canada to Argentina and have been used extensively for the biological control of whiteflies (Hemiptera: Aleyrodidae) in glasshouses. In fact, these little lady beetles are sometimes referred to as "whitefly destroyers." In Puerto Rico, two species have been reported.

Delphastus chapini Gordon

Delphastus chapini Gordon, 1970: 363.

Description: Form rounded. Length 1.1 to 1.2 mm. Color mostly dark reddish brown. Head, prosternum and legs, yellow. Meso- and meta- sternum, and abdomen pale reddish brown. Elytral pubescence sparse and short, and 5th abdominal sternum also sparsely pubescent. Prosternal scoop nearly flat medially with apical margin truncate. Male genitalia with basal lobe moderately long; paramere 1/8 length of basal lobe. Sipho sinuate before apex, apex acuminate. *Delphastus chapini* is unique in the

genus because female genitalia have a long, robust and heavily sclerotized infundibulum. Spermatheca ovoid.

Type locality: Trinidad, Maracas Valley.

Distribution: Trinidad, Puerto Rico (specimen from Mayagüez at USNM), and a single specimen from Venezuela (Gordon, 1994a).

Remarks: There are no specimens of this species in Puerto Rican collections (i.e., MEBT, INV-COL or JAR collections). Gordon (1994a) suggests that this species is native to Trinidad, and that Puerto Rican records are the likely result of introduction, either accidental by commerce or deliberate via biological control release. Introduction records by Bartlett's 1935 USDA biological control group suggest the possibility that the Mayagüez specimen reported by Gordon may have resulted from a 1938 introduction from Trinidad. Unfortunately, we could not see the specimen in question at USNM to verify label data.

Delphastus nebulosus Chapin [Plate VIII, Fig. C]
Delphastus nebulosus Chapin, 1940: 264. Peck, 2009: 28.
Delphastus barti, synonymy by Gordon, 1994a.

Description: Form round or oval, and small. Length 1.0 to 1.4 mm; elytron with eight short yellowish white hairs, four arranged in row along basal margin between suture and callus, one outside humeral callus on anterior angle, one hair on lateral margin behind humeral callus, and two hairs near suture posterior to scutellum. Fifth abdominal sternum is entirely pubescent, with a patch of dense pubescence on each side of middle. Elytra with color variable, but generally pale yellowish brown with a diagnostic light brown spot inside the humeral callus, expanded to cover callus, and sometimes to occupy most of the basal half of elytron. Prosternal scoop convex, apex feebly arcuate. Meso- and meta-tibia with one blunt tooth. Male genitalia with basal lobe short, straight in lateral view and without a paramere. Sparse short setae present where one should be. Sipho short and sinuate before apex. Apex acute not curved. Female infundibulum is slightly elongate and slightly sclerotized.

Type locality: Villalba, Puerto Rico.

Distribution: Puerto Rico, Barbados, St. Croix, Guadeloupe, and likely more widely distributed in the Eastern Caribbean than current records may suggest (Peck, 2009).

Remarks: This little lady beetle is very common in Puerto Rico and the Lesser Antilles. Puerto Rico collections have been made from a variety of elevation ranges, from coastal plains to the mountains of the Central Cordillera at over 1,000 m. As with other members of its genus, this species seems to be a specialist in whiteflies (Hemiptera: Sternorrhyncha: Aleyrodidae). Wolcott (1948) reports this beetle feeding on white scale on papaya, but this is probably a mistaken prey association. The likely prey was probably the papaya white fly, *Trialeurodes variabilis* (Quaintance), which we have seen frequently attacked by larvae and adults of this lady beetle. Other whitefly prey we have recorded include: *Bemisia* spp., *Singhiella simplex* (Singh), *S. citrifolii* (Morgan), *Dialeurodes citri* (Ashmead), and *Aleurodicus* spp. Peck (2009) also reports this lady beetle feeding on *Orthezia insignis* Browne (Hemiptera: Orthezidae) in Barbados.

Tribe Sticholotidini

The Sticholotidini are of worldwide tropical distribution, and eight genera appear to be distributed solely in the West Indies. These are small and compact lady beetles (0.9 to 1.8 mm), with compactly articulated antennae and a well-developed spindle-shaped club, bearing a concentration of short sensory setae on the mesal surface of the last antennomere. Meso-and meta-tibial spurs are absent. Male genitalia with parameres, narrow and even. Prosternum often highly modified, abruptly raised medially or defined by a sharp lateral carina (Vandenberg and Pérez-Gelabert, 2007). In Puerto Rico, all members of this tribe appear to be rare, seeming to inhabit primarily dense mountain forest habitats. Little is known of the biology or life history of these coccinellids, especially in the West Indian species whose classification scarcely dates back to the latter part of the 20th century (Gordon, 1977, 1991).

Lenasa jayuyai Gordon [Plate III, Fig. B]
Lenasa jayuyai Gordon, 1994d: 234.

Description: Form round to slightly oval and small. Length 1.4 to 1.6 mm. Body color is black with a strong metallic green sheen on dorsal surface, without pubescence. Antenna, tibial apex and tarsus light brown or luteous yellow. Mouthparts, legs and ventral surface are dark reddish brown. Eyes finely faceted. Antenna 10-segmented, club three segmented elongate. Prosternum without anterior projections or carinae. Elytron is smooth,

polished and shiny. Abdomen with five visible sterna. First sternum with postcoxal line incomplete, not reaching hind margin of sternum, and extending along this margin nearly to lateral margin slightly curved in apical third. Leg with femur robust, tibia slender, shorter than femur; tarsi cryptotetramerous with small acute basal tooth.

Type locality: Holotype: Male from Jayuya, Puerto Rico, July 22, 1969. H. and A. Howden (USNM). Allotype from same locality and collectors, but date is July 23, 1969. Specimen tag indicates location as "5 mi N.E. Jayuya". Likely endemic.

Distribution: Puerto Rico. A female was first collected from El Yunque, February 25, 1925 by H.L. Dozier. Holotype, allotype and paratypes from Jayuya.

Remarks: At first sight, this lady beetle resembles *Zilus gilvifrons* (Sicard) in color and shape. Under the microscope large differences become evident (e.g., shape of maxillary palps, the greater size of *Zilus* first abdominal sternum). Gordon (1994d) writes about an earlier collection of a female from El Yunque by H.L. Dozier on February 17, 1925. This female had a coppery sheen and a different punctation pattern than either the holotype or the paratypes. Its head is illustrated in a scanning electron photograph by Gordon (1994d). We have collected this species only once, from Las Marías (762 m) on *Inga vera* Willd.

Neaptera doyeni Gordon

Neaptera doyeni Gordon, 1994d: 237.

Description: Form strongly convex, oval shaped. Length 1.3 mm. Color dark reddish brown, surface without metallic sheen or pubescence except for a row of long setae on clypeal apex. Antennae 10 segmented, with broad three-segmented club. Mouthparts, antennae, and legs yellow. Five visible abdominal sterna. Prosternum with coxa separated by a protuberant, rectangular carinal process. Carina not joined at apex. Legs with robust femur, tibia slender and shorter than femur; tarsi cryptotetramerous with simple claw, and lacking tooth. Generic name is given because the membranous wing is lacking in these lady beetles, and thus, all its known members are flightless.

Type locality: Holotype, Puerto Rico "Sierra de Luquillo, Caribbean Nat. For. Rd. 191, km. 12 S Palmer 2,500 ft."; December 22, 1986, J. Doyen and J. Santiago collectors, ex. Dead palm fronds". Type

at University of California at Berkeley (UCB). One paratype with same collection data at USNM, but on loan to Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) at the time of this publication.

Distribution: Puerto Rico. Likely endemic.

Remarks: This is also a very rare species. *Neaptera doyeni* can be distinguished from *N. viridissima* Gordon by the lack of metallic sheen, phallobase with parameres that are longer than basal lobe, and an acute basal lobe.

Neaptera viridissima Gordon
Neaptera viridissima Gordon, 1991: 313.

Description: Form convex, oval shaped and small. Length 1.3 to 1.4 mm. Color light yellowish brown; head and pronotum lighter in color and polished. Mouthparts, antenna, and legs, pale yellow. Elytron with metallic green sheen. Male genitalia: Basal lobe slender and lanceolate and acute; parameres slender and slightly longer than basal lobe. Sipho long and sigmoid (see Gordon, 1991 for illustration).

Type locality: Holotype, Puerto Rico. "nr. Fajardo, Rd. 194 km 46.7, August 20, 1961, Flint and Spangler" (USNM). Allotype: "Mayagüez, Puerto Rico 10.9. '37 2035, H.K. Plank" USNM (loaned to CSIRO, Australia).

Distribution: Puerto Rico. Likely endemic.

Remarks: This species also appears to be very rare. By studying collection sites, we could infer that it may be found on coastal plains. According to Gordon (1991), this species resembles *N. purpurea* Gordon, a species only known from the Virgin Islands. Nothing is known about the habits of either species. Gordon (1991) observed that most label information for *Neaptera* species indicates an association with leaf litter and closeness to the ground that, given their flightless condition, may explain why they are infrequently collected.

Semiviride loisobrienae Gordon [Plate III, Fig. A]
Semiviride loisobrienae Gordon, 1991: 308.

Description: Form rounded, slightly oval, not strongly convex. Length 1.7 to 1.8 mm which makes this species the largest representative of the tribe in Puerto Rico. Body glabrous, except for long straight hairs on clypeal apex, and on lateral margin of head

near the eyes. Dorsal surface black, heavily sculptured and leathery (alutaceous), with a faint green metallic sheen. Pronotal surface strongly wrinkled. Antennae 10 segmented and yellow, with the four-segmented club strikingly pale straw colored. Terminal segment of maxillary palpus is elongate, slender and distinctly narrowed apically. Labrum and clypeus pale yellow. Other mouthparts, distal apex of femur, tibia and tarsus brownish yellow; coxa, trochanter, and basal 4/5 of femur dark brown. Tarsi cryptotetramerous, simple and lacking tooth. Prosternum with coxae narrowly separated by a protuberant triangular process. Abdomen with five visible sterna. First sternum with postcoxal line incomplete, parallel to hind margin.

Type locality: Holotype, Puerto Rico, "Carib. N.F. El Yunque Hwy 191, km. 11.2, July 19, 1979, G.B. Marshall" (USNM on loan to CSIRO). Allotype: Same data except km 10.9, Lois O'Brien (USNM). Seven paratypes, all from El Yunque Caribbean National Forest, collected on same date.

Distribution: Puerto Rico. Likely endemic.

Remarks: This is another rare species, with very limited distribution, apparently living solely in ancestral, pristine mountain forests. This species was chosen by Gordon (1991) to be the type species for the genus *Semiviride*. The name *Semiviride* is a combination of Latin *semi*, meaning half, and *viride,* Latin meaning green for the semigreen dorsal surface of the known species. The species is named for entomologist Lois O'Brien, collector of the allotype and spouse of the late C. O'Brien, an expert in the Curculionidae. We have collected this species only at the type locality.

Semiviride portoricensis Gordon

Semiviride portoricensis Gordon, 1991: 309

Description: Body color black; dorsal surface with blue green sheen. Size 1.75 mm. Antennae yellow, except last four-segment club, paler. Mouthparts, trochanter, tibia and tarsus are brownish yellow. Femur and ventral surface are dark brown. Head and pronotum surface not wrinkled or alutaceous. Male genitalia: very similar to that of *S. loisobrienae,* but the trabes seems to be slender with unmodified apex. Basal capsule of sipho is reduced and feebly developed. No allotype exists.

Type locality: Holotype; Puerto Rico, "Carib. N.F., El Yunque Hwy., (191) km 12.7, July 29, 1979, L.B. O'Brien" (USNM on loan to CSIRO) (likely endemic).

Distribution: Puerto Rico. Likely endemic.

Remarks: This species is distinguished from *S. loisobrienae* by the absence of deep wrinkling in the pronotum, and by the slender unmodified trabes in male genitalia. It is perhaps one of the rarest lady beetles of Puerto Rico.

Subfamily Scymninae

The scymnines are a diverse group of small to medium-sized Coccinellidae. The name Scymninae probably derives from the Greek geographer and explorer Scymnus of Chios. In the Scymninae, antennae are relatively short, usually two-thirds head width or less. Middle coxal cavities are broadly separated. Most species are 3 mm or less (except *Crytolaemus*). Mentum and submentum broadly articulated. According to Vandenberg (2002a) this subfamily is difficult to characterize, and is also probably polyphyletic. Antennae are of at least two different types: the first exemplified by *Scymnus* (i.e., first two segments enlarged and somewhat inflated, and terminal segments forming an expanding club); and the second exemplified by *Hyperaspis* and its allies (i.e., first segment not enlarged, with no obvious club and apical segments with sensillae). Similarly, terminal maxillary palpomeres differ among tribes: parallel-sided (Scymnillini); barrel-shaped (Scymnini); short and weakly convergent apically (Stethorini); and more or less securiform (hatchet-shaped) in Hyperaspidini, Brachiacanthini, and Diomini. Members of this subfamily generally prey on mites and various soft-bodied Hemiptera. Seven tribes, as defined by Vandenberg (2002a), occur in the Puerto Rican archipelago: Pentiliini, Scymnillini, Stethorini, Scymnini, Diomini, Hyperaspidini, and Brachiacanthini. These are represented in Puerto Rico by 28 species in 13 genera.

Key to the Puerto Rican Scymninae

1. Size greater than 3.0 mm . . . . . 2.

— Size less than 3.0 mm . . . . . 4.

2. Hairy elytra; pronotum reddish yellow; prosternal intercoxal process with carina; distal maxillary palpomeres diverging towards apex. Introduced from Australia for mealybug control . . . . . *Cryptolaemus montrouzieri* Mulsant.

— Elytra glabrous . . . . . 3.

3. Elytra shiny black, body rounded. Pronotum dark with prominent anterolateral flaps yellow. Epistermun foveate; femur grooved . . . . . .*Pentilia egena* Mulsant.

— Elytra black, with five sizable orange circular spots; anterior tibia with external tooth or spine; eye emarginated . . . . . *Brachiacantha bistripustulata* Fabricius.

4. Abdomen with 5 visible sterna; prosternal intercoxal process broad and flat, no carinae. Eye canthus extending about halfway across eye; head partially concealed by pronotum; small body, metallic sheen, 2 mm or less, mostly glabrous (Scymnillini . . . 5.

— Abdomen with 6 or 7 visible sterna; . . . . . 7.

5. Elytra dark violaceous to light brown, not metallic, pronotum translucent; size 1.0-1.2 mm. . . . . *Zilus variipennis* (Sicard).

— Metallic colored elytra . . . . . 6.

6. Elytra dark violaceous or bluish, metallic; head metallic purple with front of head, and anterior angles of pronotum with brilliant golden pubescence, especially in males; length 1.35-1.5 mm common in higher elevations . . . . . .*Zilus gilvifrons* Chapin.

— Elytra dark greenish, metallic; head metallic purple with front of head, and anterior angles of pronotum with sparse pubescence; length 1.3-1.5 mm; common in higher elevations. . . . . *Zilus barbosi* n. sp.

7. Elytrum shiny black with reddish stigma; prosternum broadly rounded anteriorly, at least partly concealing mouthparts and antennae. Clypeus with interior margin upturned; head light brown with black eyes; size 2.5 mm. . .*Pentilia discors* Gorham.

— Body black, hairy, not metallic; maxillary palpi long terminal segment sub-securiform; associated with mites, body less than 2.0 mm . . . . . 8.

8. Body black, except antenna and mouthparts usually yellow, leg usually yellow; elytra oval not strongly convex, pubescent; small (≤1.0 mm); head with moderately coarsely faceted eyes; prosternum without carina, produced anteriorly to partly conceal mouthparts . . . . . 9.

— Not with previous combination; color variable; size ≥1.3 mm . . . . 11.

9. Post coxal line incomplete; body with short pubescence; basal lobe of tegmen almost as wide apically as basal piece . . . . . *Parastethorus histrio* (Chazeau).

— Post coxal line complete . . . . . 10.

10. Clypeus and frons yellow; femur yellow; postcoxal line abruptly angulate . . . . . *Stethorus caribus* Gordon and Chapin.

— Clypeus and frons black; femora partly black or brown . . . . . *Stethorus tridens* Gordon.

11. Dorsal surface glabrous . . . . . 12.

-— Dorsal surface pubescent — . . . . . 15.

12. Epipleuron not excavated for reception of mid- and hind- femoral apices tarsal claw toothed; head black; elytral disc yellowish white with black marking resembling an upright trident . . . . . *Hyperaspidius* sp.

— Epipleuron excavated with fovea; tibia and femur slender, elytrum usually black with or without maculation; size about 2.5 mm. . . . . 13.

13. Pronotum mostly creamy white with dark brown markings resembling two back-to-back letters "C" medially; elytral disc color as pronotum with a large central black spot and two smaller spots towards edge . . . . . *Hyperaspis onerata* Mulsant.

— Pronotum mostly black with orange markings . . . . . 14.

14. Head black; elytra with two large orange spots on black elytra connected to form a "C" and suture black . . . . . *Hyperaspis connectens* Thunberg.

— Head black with frons and clypeus orange; black in elytra not reaching disc border . . . . . *Hyperaspis festiva* (Mulsant).

15. Head with mouthparts directed postero-ventrad in repose, concealing a cup-like prosternum; basal two antennomers greatly enlarged relative to rest . . . . . 16.

— Mouthparts and first antennomers not as above . . . . . 17.

16 Elytra pale yellowish white with a large black spot near apex margin, and small brown spot on humeral callus; pronotum with small black markings at base on each side of middle; size 1.3-1.6 mm . . . . . *Nephaspis magnopunctata* Gordon.

— Body brown; head, pronotum, mouthparts, legs and apical 2 abdominal sterna pale yellow; size 1.4-1.5 mm . . . . . *Nephaspis acuta* Gonzalez.

17. Postcoxal line of abdomen reaching and joining posterior margin of ventrite; apex not recurved; distal maxillary palpomere securiform strongly expanded apically . . . . . 18.

— Postcoxal line of abdomen not reaching posterior margin of ventrite; line continuing parallel to margin or apex recurved; distal maxillary palpomere roughly parallel-sided or barrel-shaped . . 25.

18. Antennae with 11 antennomers (*Diomus* sp . . . . . 19.

— Antennae with 10 antennomers (*Decadiomus* sp . . . . . 20.

19. Elytral suture black from base to apex, with posterior yellowish areas covering distal 1/5 of abdomen and not joining at suture. . . . . *Diomus roseicollis* (Mulsant).

— Body with heavy yellowish pubescence; pronotum reddish; posterior yellowish areas joining at suture and covering 1/6 of apex. . . . . *Diomus ochroderus* (Mulsant).

20. Elytra mostly straw white or reddish pink, with darker spots . . .21.

— Elytra not as above, brown or black with or without yellowish spots . . . . . 22.

21. Elytra straw white with pale but darker basal triangular area; spots 1/3 from apex; length 0.9-1.0 mm; smallest Diomini from Puerto Rico . . . . . *Decadiomus tricuspis* Chapin.

— Elytra pale reddish pink with bluish black spots 1/3 from apex; humeral callus prominent and strongly shining; length 1.6-1.8 mm . . . . . *Decadiomus pictus* Chapin.

22. Prosternal carina long, slender . . . . . 23.

— Prosternal carina not as above, either wide, trapezoid, or strongly triangular . . . . . 24.

23. Elytra completely dark, no spots; legs dark brown; length 1.3-1.6 mm . . . . . *Decadiomus austrinus* (Gordon).

— Elytra dark, with last 1/8 of apex yellowish; and reddish brown areas extending ¼ from apex and not reaching apex; length 1.5-2.1 mm . . . . . *Decadiomus ramosi* Segarra.

24. Prosternal carina broad and trapezoid-shaped; head, legs pale yellow; elytra dark with 2 pale spots; apex yellowish; length 1.4-1.8 mm . . . . . *Decadiomus hayuyai* Otero.

— Prosternal carina strongly triangular, produced anteriorly; elytra completely dark; length 1.3-1.7 mm . . . . . *Decadiomus martorelli* Segarra.

25. Prosternum without carina; postcoxal line incomplete, not reaching base nor margin of ventrite, and apex recurved; elytra dark brown with prominent yellowish spots on apical 1/3 . . . . . .*Scymnobious bilucernarius* (Mulsant).

— Prosternum with distinct carina on intercoxal process; carina often reaching anterior margin of prosternum . . . . . 26.

26. Head and elytra completely black. . . .*Scymnus phloeus* (Mulsant).

— Elytra reddish brown with prominent black sutural line extending from base to 1/3 from apex . . . . . *Scymnus floralis* (Fabricius).

Tribe Scymnillini

This group of small-sized lady beetles has been poorly studied in the West Indies. Most species discussed below are likely endemic to Puerto Rico. Vandenberg (2002a) considers that this tribe is probably misplaced within the Scymninae, as individuals have many affinities with the Sticholotidinae. Scymnillines are easily recognized by their broad and flat prosternal intercoxal process, and by their parallel-sided maxillary palpi. Two genera represent this tribe: *Zagloba* and *Zilus,* but only the latter is reported from Puerto Rico. *Zilus* species are glabrous, often with strong metallic sheen, while *Zagloba* species are pubescent with no metallic sheen. According to Dohanian (1937), seventeen *Zagloba* (=*Scymnus*) *aeneipennis* (Sicard) adults were shipped to Puerto Rico from Trinidad in 1936 to control coconut scales. Apparently, this introduction was unsuccessful, as no specimens have been collected since (Wolcott, 1948). Little is known about the biology of local *Zilus* species that have been associated with predators of scale insects (Hemiptera: Coccidea) and whiteflies (Hemiptera: Aleyrodidae). Finally, the genus has not been revised and changes are likely.

Zilus cyanescens (Sicard)

Scymnillodes cyanescens var. *violaceus* Sicard, 1922: 358.
Scymnillodes caseyi Chapin (1930: 492).
Zilus cyanescens var. *violaceus* (Sicard) Blackwelder, 1945: 445; Wolcott, 1948: 308.

Description: According to Sicard (1922), the form *violaceus* of *Zilus cyanescens* collected from Puerto Rico differs from Jamaican individuals in that their elytra are metallic violet instead of metallic blue. *Zilus. c. violaceus* specimens described by Sicard were collected from Río Piedras on October 18, 1921 by G.N. Wolcott. No specimens of this series remain at MEBT for examination. The holotype has not been seen by the author and is presumably housed at the Paris Natural History Museum with other Sicard types. The original species' description for *Zilus cyanescens* Sicard (1922:357) is: Form oval-rounded, convex and shiny steel blue color. Length 1.5 mm. Head clear metallic green, finely punctuate, and covered with grey pubescence. Maxillary palps reddish; antennae pale yellow. Pronotum densely and finely punctuate, metallic blue with anterior angles pale reddish and with short straight grayish hairs. Elytra metallic blue, convex with punctation deeper than pronotum. Undersides dark brown with reddish legs. Last abdominal segment slightly inflated and longer than two preceding segments (3rd and 4th).

Type locality: Jamaica. Collected from citrus trees infested with the citrus blackfly, *Aleurocanthus woglumi* Ashby. According to Sicard (1922), *Z. cyanescens violaceus* specimen was collected by G.N. Wolcott from Río Piedras, feeding on coconut scale *Aspidiotus destructor* Signoret.

Distribution: Jamaica; two specimens collected July 2, 1917 by Harold Morrison from Maricao, in Casey's collection at the USNM with original label marked A-289 (Chapin, 1930).

Remarks: This is likely a Jamaican species, not occurring in Puerto Rico. Some confusion exists as to the nomenclature of *Z. c. violaceus*. As best as can be deduced, Chapin (1930: 492) examined specimens of *Delphastus cyanescens* Casey (1924: 170) in Casey's collection, and these were collected from Puerto Rico by Morrison. Chapin deemed that these beetles were specimens of *D. cyanescens* and concluded that these were similar to Sicard's description of *Z. c. violaceus*. As a result, Chapin placed this subspecies as a junior synonym of *Z. (=Symnillodes) caseyi* Chapin from Puerto Rico. Blackwelder (1945) did not recognize

Chapin's synonymy, restricting *Z. caseyi*'s distribution to Cuba. Interestingly, Sicard's description of *Z. c. violaceus* is very similar to that of *Z. gilvifrons* (Chapin 1930: 493). One very likely possibility is that Morrison's specimens were in fact *Z. gilvifrons,* and that *Z. cynescens* is restricted to Jamaica. Without access to Sicard's types it is difficult to determine whether this subspecies is valid, whether it is present in Puerto Rico, or whether it belongs to another taxa.

Zilus gilvifrons (Chapin) [Plate IX, Figs. A to D]

Scymnillodes gilvifrons Chapin, 1930: 493.

Zilus gilvifrons (Chapin), Blackwelder, 1945: 446; Wolcott, 1948: 308.

Description: Form oval, convex (Plate IX, Figs. A and B). Length 1.4 to 1.5 mm. Head with purplish or bluish metallic sheen; pronotum and elytra violaceous, or cyaneous blue. Front of head and anterior angles of pronotum covered densely with bright yellow pubescence, denser in males. Underparts black. Legs, pale yellow to reddish testaceous. Head with dense coarse punctation. Mandibles castaneous, darker than palpi, labrum or antennae. Pronotum with complete marginal bead, strong at base and sides, and fine across front; punctation less dense but as coarse as in head. Elytra with coarse and sparse punctation, irregularly distributed. Fine punctures absent. Fine marginal bead, present only at lateral margins. Epipleura not foveate. Prosternum with few very coarse punctures covering most of surface. Meso- and metasternum more sparsely punctured, the latter punctured only at sides and along the median line. Abdominal sternites strongly alutaceous at sides, with sparse fine punctation. Male genitalia, phallobase with distinct alae at base (Plate IX, Fig. C), parameres 7/8 of base. Sipho as in Plate IX, Figure D with outer arm of capsule long and inner arm long and bifurcate.

Type locality: Maricao, Puerto Rico (USNM) "collected July 2, 1917. H. Morrison collector, original number A-289."

Distribution: Puerto Rico. Likely endemic.

Remarks: This species is probably what Sicard (1922) called the *violaceus* form of *Zilus cyanescens* from Puerto Rico, because in contrast to the Jamaican species, their elytra were metallic violet instead of metallic blue. Specimens are more common at higher elevation but can be collected at all elevations. Upon genitalic

examination, we found that the completely violaceous-colored specimens were indistinguishable from the blue-colored individuals. Specimens described by Sicard (1922: 357) were violaceous in color and were collected in Río Piedras on October 18, 1921 by G.N. Wolcott. Unfortunately, no specimens of this series remain at MEBT for examination. This species is commonly associated with scale insects, especially black parlatoria scales [*Parlatoria ziziphi* (Lucas)] attacking citrus.

Zilus barbosi Segarra, sp. nov. [Plate X, Figs. A to E]

Description: *Male.* Form oval, convex. Length 1.4 mm. Head with greenish metallic sheen; pronotum violaceous and elytra metallic green. Front of head and anterior angles of pronotum covered densely with yellowish pubescence, denser in males. Underparts black. Legs, pale yellow to reddish testaceous. Head with dense coarse punctation. Mandibles castaneous, darker than palpi, labrum or antennae. Pronotum with complete marginal bead, strong at base and sides, and fine across front. Punctation less dense but as coarse as in head. Elytra with coarse and sparse punctation, irregularly distributed. Fine punctures absent. Marginal bead fine, present only at lateral margins. Epipleura not foveate. Prosternum with few very coarse punctures, covering most of surface. Meso- and metasternum more sparsely punctured, the latter punctured only at sides and along the median line. Abdominal sternites strongly alutaceous at sides, with sparse fine punctation. Genitalia as illustrated in Plate X, Figures C to E. Sipho long with acute apex and conspicuously bent in apical 1/8 bend; capsule with outer arm short, inner arm short, stocky with no clear bifurcation. Phalobase with no alae, parameres 7/8 shorter than base. The species epithet is given in honor of Puerto Rican entomologist and eminent insect ecologist Pedro Barbosa of University of Maryland.

Variation: Females similar to males, but pronotal pubescence sparser. Length 1.4 to 1.6 mm.

Diagnosis. The species can be easily distinguished by the distinctive green metallic sheen of their elytra. The species is similar in size to *Z. gilvifrons,* but differs: (1) in the shape of male genitalia with phallobase *alae* absent, and acute apex of sipho; (2) elytral color greenish sheen, and for having elytra with coarse and sparse punctation, irregularly distributed and with fine punctures absent. This species is also easily recognized from

Z. variipennis by the metallic green coloration of elytra and the size and shape of male genitalia.

Type material: *Holotype* male: *Label "Puerto Rico, Guánica. 17°58.79'N 66°52.86W. 27.vi.2008. Sweeping. Coll. A. Segarra"; Allotype: Label "Puerto Rico, Guánica. 17°57.32'N 66°50.95W. 26.vi.2008. Sweeping. Coll. A. Segarra". Both deposited at MEBT, Acc. No. 03-2010. Paratypes: 6. 2, Label: "Guánica, PR. 17.960N 66.862W. Ex. Hypogeococcus pungens on Pilosocereus royenii cactus". 2, Label "17.995°N 67.059°W. Lajas, PR 4.iii.2008. Ex. P. royenii/H. pungens Coll. A. Segarra-Carmona" (deposited at UPRM-IC). 2, Label "18 01.59N 66 31.76W. Juana Díaz EEA. 28.11.2008. On guava. Coll. A. Segarra-Carmona".*

Distribution: Puerto Rico.

Remarks: The species resembles *Z. gilvifrons* but differs in elytral punctuation patterns, in body color, with green metallic sheen in elytra, and in the shape of male genitalia. All collection locations for this species are coastal. The species is also associated with the presence of scale insects and mealybugs (Hemiptera: Sternorrhyncha).

Zilus variipennis (Sicard). New description. [Plate XI, Figs. A to D].

Scymnillus variipennis Sicard, 1922: 354; Blackwelder 1945: 445; Wolcott 1948: 308.

Scymnillus nunenmacheri Sicard, 1922: 355. Junior synonym. Blackwelder 1945: 445; Wolcott 1948: 308.

Zilus variipennis (Sicard) (New generic synonym. Gordon, 1985: 75).

Description: Small, oval, and convex. Length 0.95 to 1.2 mm. Body from piceous black (Plate XI, Figure A) to pale reddish brown (Plate XI, Figure B); in pale form, head pale yellow with short sparse hairs in frons and clypeus, and with no punctation. Antennae, palpi and legs pale yellow; disc of pronotum well developed lateral bead, and with anterior edges translucent. Punctation fine and dense, spaced about one diameter. Elytra with few erect long hairs near base and along suture, and short erect hairs close to anterior portion of lateral bead. Humeral callus prominent. Elytral punctation deeper with spacing >2 diameters. Epipleura thin and extending posteriorly almost the length of elytra. Prosternun with deep punctation 2-3x diameter, especially towards the middle. Abdominal sterna reddish brown to yellowish. First abdominal sternum deeply punctated 2-3x di-

ameter, others with fewer punctures mostly located laterally. Last sterna paler and with short decumbent hairs and devoid of punctation. Male genitalia as presented in Plate XI, Figures C and D. Phallobase long and narrow, with parameres longer than base. Sipho with outer arm very short and rounded.

Type locality: Puerto Rico. Río Piedras. October 18, 1921. Ex. *Aspidiotus destructor*. Collected by G.N. Wolcott.

Distribution: Puerto Rico.

Remarks: In 1922, Sicard described *Zilus variipennis* and *Z. nunenmacheri* from Puerto Rico based on a single batch of specimens collected by Wolcott in Río Piedras on October 18, 1921 from citrus. Sicard's descriptions designate all light brown forms as *Z. variipennis,* and all black forms as *Z. nunenmacheri*. An examination of USNM material led to finding a determination note, presumably by R.D. Gordon, with the word "Homotypes" placed between both sets of specimens. Our subsequent examination of locally collected material has led us to conclude that these species are one and the same. Based on a thorough examination of body characters and male genitalia from both forms, we cannot distinguish *Z. variipennis* from *Z. nunenmacheri* (Sicard:1922: 355) except by color. Further, intermediate individuals between dark and light forms are common, and all forms are often collected together. We are therefore placing *Z. nunenmacheri* as junior synonym to *Z. variipennis* (Sicard) by priority rule, as the latter was described before the former in the same publication.

These tiny lady beetles seem to abound on coconut fronds infested with the scale *Aspidiotus destructor* Signoret, and on citrus infested with *Parlatoria ziziphi* (Lucas). Most specimens in local collections come from coastal areas, but the species is also found at higher elevations, usually on citrus. As with other members of the genus, this lady beetle may be an important mortality factor for scale insects.

Tribe Stethorini

These are tiny Scymninae, 1.0 to 1.3 mm; body generally black, and pubescent dorsally. Pubescence long and generally sparse rather than dense. Antennae eleven-segmented and inserted between eye and clypeus; clypeus not emarginated around base of antennae like in other scymnines (i.e., *Zilus*). Maxillary palpi with terminal segment convergent apically, in a shape unusual for scymnines. Prosternum

lobed anteriorly, partially concealing mouthparts; intercoxal process without carinae. Tarsi cryptotetramerous or trimerous. Abdomen with six visible sterna. This tribe contains a single genus, *Stethorus*, which has usually been placed in the tribe Scymnini. Stethorini are easily separated from all other tribes of Scymninae because the clypeus is not emarginate around the antennal bases, and because the prosternum is arcuately produced in front, but only partly concealing the mouthparts. According to Gordon and Chapin (1983), the tribe is represented in the Western Hemisphere by two subgenera: *Parastethorus* Pang and Mao and *Stethorus* Weise. These differ in the length of postcoxal line, which is complete in the latter, and incomplete in the former. The Stethorini are probably unique among the Coccinellidae in preying on mites (i.e., spider mites Acarina: Tetranychidae).

Stethorus caribus Gordon and Chapin. [Plate VIII, Fig. D].

Stethorus caribus Gordon and Chapin, 1983: 245; Blackwelder, 1945: 444, and Wolcott, 1948: 303 (as *S. punctum* in synonymy).

Description: Small black oval species. Length 0.95 to 1.1 mm. Dorsal pubescence long, semi-erect and yellowish white. Antennae, mouthparts, legs pale yellow. Clypeus and triangular area on frons, yellow. Body punctation as follows: head finely punctured separated by a diameter; pronotum with sparse coarser punctation, separated by 2-4x diameter; elytron with punctation coarser than pronotum separated by 1-3x diameter. Punctures in 1st abdominal sternum sparser than other segments. Postcoxal line arc extending ¾ length of first abdominal sternum, strongly angulate. Apex 6th abdominal segment in males, notched. Male genitalia: basal lobe spatulate and slightly longer than parameres, alae reduced, base apex bent apically on lateral view. Sipho sinuate. Trabes y-shaped proximal to phallobase (Gordon and Chapin, 1983).

Type locality: Dominican Republic, L. Vani (*sic* Baní?), October 7, 1956, D.C. Hamilton collector (USNM). Allotype: same data.

Distribution: Antigua, Cuba, Grenada, Hispaniola, Nevis, Puerto Rico, St. Lucia, St. Eustatius. Puerto Rico (USNM) specimen label "*San Juan, Sept 8, 1981. R.M. Burkhart "Ex on morning glory.*"

Remarks: This little black lady beetle is a common mite predator, usually found in agricultural habitats, but also in mite infested wild plants. The species has been reported feeding on the sugar cane mite *Oligonychus sacchari* McGregor in Loiza. The yellow trian-

gle on the frons and clypeus are diagnostic. Wolcott (1948) originally wrote about this species as *Stethorus punctum* Le Conte based on identifications by E.A. Schwarz. We have collected this species from Mona Island, feeding on the red palm mite, *Raoiella indica* Hirst, and feeding on papaya mites (*Eutetranychus* sp.) in Yauco and Isabela.

Stethorus tridens Gordon

Stethorus tridens Gordon, 1982a: 122; Wolcott 1948: 304 (as *S. punctum*); Gordon and Chapin, 1983: 254.

Description: Form oval, elongate, noticeably tapered to apex in apical ½ of abdomen. Length 1.0 to 1.1 mm. Color black; antennae, mouthparts, and legs yellow, except basal 5/6 femora brown. Dorsal pubescence short, decumbent, and yellowish white. Body punctation as follows: head finely punctured separated by two times diameter; pronotum with coarse shallow punctation, separated by a diameter or slightly more. Punctures dense laterally; elytral punctures coarse, dense and larger than punctures on pronotal disc and separated by a diameter or less. Arc of postcoxal line extending slightly more than ½ length of first abdominal sternum. Male genitalia quite unique in genus, with processes between phallobase and parameres that make the base appear trident-like.

Type locality: Honduras, La Ceiba.

Distribution: Brazil, Honduras, Mexico, Peru and Puerto Rico. It is known from Puerto Rico by a single specimen (including a genitalia vial) housed at USNM and collected by L.F. Martorell in August 1939 from *Ricinus communis* L. on Mona Island. This specimen was determined by R. Gordon.

Remarks: This lady beetle is widely distributed in Central and South America. Martorell's collection represents the only record of this species in the Caribbean. Specimens of this species are absent from local collections examined. The species easily told by the absence of the triangular yellowish area in the frons and clypeus, and internally, by the striking trident-like male genitalia.

Parastethorus histrio (Chazeau)

Stethorus histrio Chazeau et al., 1974: 269;

Stethorus (Parastethorus) histrio Gordon and Chapin, 1983: 272.

Parastethorus histrio Slipinski, 2007: 116.

Description: Form oval, elongate, not strongly convex. Length 1.0 to 1.3 mm. Color black; antennae, mouthparts, and legs dark brown to yellowish brown. Dorsal pubescence short, decumbent, and yellowish white. Body punctation as follows: head finely punctured separated by 2-3x diameter; pronotum with coarse shallow punctation, separated by a diameter or slightly more. Elytral punctures coarse, dense, and larger than punctures on pronotal disc, and separated by five diameters or less. Arc of postcoxal line incomplete. Male genitalia, quite unique in tribe, has basal lobe as wide or wider than basal piece, and parameres with stout, short lateral setae. Females with no spermathecal capsule.

Type locality: Cilaos, La Reunion Island, Mascarene Islands.

Distribution: Puerto Rico, Argentina, Brazil, Chile, Mexico, Paraguay, Peru, Australia, Asia.

Remarks: This lady beetle is easily distinguished from *Stethorus* by its incomplete postcoxal lines, its oval body and shorter dorsal setae. According to Gordon and Chapin (1983) the known distribution of this species is unusual. The first known specimens collected in Puerto Rico are those collected in January 12, 2011 from Cabo Rojo (Boquerón) feeding on spider mites on *Plumeria rubra*. Widely distributed in Central and South America. Specimens are deposited at MEBT with accession numbers 034201 to 034206. This species is now widely used in augmentation biological control of spider mites worldwide.

Tribe Scymnini

According to Gordon (1985), the Scymnini are lady beetles of small size, usually less than 3.0 mm; form oval, rounded, or oblong; dorsal surface and eye pubescent, usually strongly so. Antennae eight to eleven segmented, terminal segments forming distinct club. Maxillary palpus with apical segment cylindrical or securiform. Leg free, simple, not expanded or enlarged; tarsus trimerous or cryptotetramerous, tarsal claw simple or with basal tooth. Abdomen with six visible sterna, sterna usually not fused medially, apex of 6^{th} abdominal sternum of male modified. Male genitalia vary from symmetrical to asymmetrical, form simple or complex. Female genitalia with sclerotized infundibulum; genital plate long and narrow, or short, nearly round. There are four genera reported from Puerto Rico: *Cryptolaemus* (introduced), *Scymnus, Nephaspis*, and *Scymnobius* (=Nephus).

Cryptolaemus montrouzieri Mulsant [Plate VIII, Fig. A]

Cryptolaemus montrouzieri Mulsant, 1853: 268; Crotch, 1874:204; Leng and Mutchler 1914:411; Blackwelder, 1945: 445; Wolcott, 1948: 307; Gordon, 1985: 105; Pluke et al., 2005: 123.

Description: Form oval, convex. Length 3.0 to 3.5 mm. Antenna with seven segments with club three-segmented. Maxillary palpus with apical segment securiform. Prosternum produced and rounded anteriorly covering mouthparts and antenna; Prosternal carina weak, parallel, extending less than halfway to anterior margin. Tarsi trimerous; claw with broad basal tooth equal to half the length of claw. Abdomen with postcoxal line complete, as in *Scymnus*. Male genitalia with basal lobe symmetrical. Female genitalia with strong spermathecal capsule; sperm duct short; infundibulum reduced to a small sclerite at head of bursa; genital plates long, triangular.

Type locality: Australia.

Distribution: Worldwide, thanks to its introduction as a successful biological control agent against mealybugs (Hemiptera: Stenorrhyncha: Pseudococcidae).

Remarks: This is one of the largest Scymninae found in Puerto Rico, the other being *Pentilia egena* Mulsant. This species is also known as the "mealybug destroyer" for its ability to effectively regulate mealybug populations. *Cryptolaemus montrouzieri* was introduced into Puerto Rico in 1911 from California. This species has become an important mealybug predator, and it is commonly collected from citrus and guava. Larvae resemble mealybugs; farmers and others not trained in entomology often confuse them as pests.

Scymnus* (Pullus) *floralis (Fabricius) [Plate VI, Fig. D]

Nitidula floralis Fabricius, 1792: 260.

Coccinella floralis (F.) Fabricius, 1801: 377.

Scymnus floralis (F.) Mulsant, 1850: 981

Scymnus (Pullus) *floralis* Mulsant. Mulsant, 1853: 331; Gundlach, 1893: 344; Leng and Mutchler, 1914: 411; Blackwelder, 1945: 444; Ramos, 1946: 36; Wolcott, 1948: 304; Hillburn and Gordon, 1990: 273.

Scymnus (Pullus) *phloeus* Mulsant, 1850: 983 [Weise 1885: 168, Gundlach, 1893: 344; Leng and Mutchler, 1914: 411; Blackwelder, 1945: 444; Wolcott 1948: 305].

Description: Form oval, and somewhat elongate and pubescent. Length 1.6 to 2.0 mm; width 1.2 to 1.4 mm. Dorsal color reddish brown or testaceous, except mostly black pronotum. Elytron with basal and sutural margins black. Postcoxal line extending to hind margin of sternum and apex slightly curved forward. Male genitalia with broad and symmetrical base, basal lobe broad at base, lanceolate and slightly longer than parameres. Parameres elongate and rounded at apex. Sipho long and medially engrossed, with pointed apex. Capsule with inner arm slender and long; outer arm short and broad.

Type locality: Caribbean islands. "*Les Antilles*".

Distribution: Antigua, Bermuda, Montserrat, and Puerto Rico. Perhaps widespread in other Caribbean islands.

Remarks: This species has been associated with aphid predation (Gordon and Hillburn, 1990). The author found this small lady beetle in great numbers at the Juana Díaz Agricultural Experiment Station, feeding on immature stages of the dasheen whitefly *Aleuroglandulus subtilis* Bondar (=*A. malangae* Russell) (Hemiptera: Aleyrodidae) and on dasheen (*Xanthosoma* sp.). Based on examination of material studied by Wolcott (1948: 305) and available at MEBT, we conclude that he misidentified this species as *S. phloeus* Mulsant. The original Fabricius description of *S. floralis* as "*N. nigra elytris testaceis: Sutura nigra*" is concordant with all specimens examined by Wolcott. No specimens of *S. phloeus* were found in Puerto Rican collections examined by us. Examination of older material from MEBT and JAR collections leaves no doubt that specimens are routinely misidentified as *Scymnus phloeus* as first determined by Weise 1885: 168, and reiterated by Gundlach, 1893: 344; Leng and Mutchler, 1914: 411; Blackwelder, 1945: 444; Wolcott 1948: 305. Wolcott, however, correctly remarked that this species is likely to be mistaken with the North American *S. loewii* Mulsant, to which it bears great external resemblance, and can only be reliably distinguished through comparison of male genitalia.

Scymnus* (Pullus) *creperus Mulsant [Plate VI, Fig. C]

Scymnus (*Pullus*) *creperus* Mulsant, 1850: 985; Mulsant, 1853: 153; Crotch 1874: 265; Gordon, 1976: 260; Gordon 1985: 276; Hillburn and Gordon, 1989: 680; Gordon and Hillburn, 1990: 277.

Description: Form oval, somewhat elongate, pubescent. Length 2.0 to 2.3 mm; width 1.4 to 1.5 mm. Head reddish brown; pronotum also reddish brown with black triangular spot that extends from base towards middle of pronotum with apex between eyes. Elytra black, shiny, with yellowish white pubescence, and apex narrowly reddish brown. Post coxal line not reaching hind margin of first sternum and curving upwards almost reaching anterior margin. Fifth sternum of male broadly emarginated. Male genitalia with basal lobe broad and longer than ventral ala, apex elliptic. Parameres short, 1/3 size of basal lobe. Sipho stout, slightly bent apically, with two pairs of symmetrical apical processes, and membranous area in distal half.

Type locality: Louisiana ("*la Nouvelle Orleans*").

Distribution: Southeastern United States; Bermuda, Puerto Rico.

Remarks: This is the larger and the most common of the *Scymnus* species in Puerto Rico. The original description by Mulsant (1850) describes this lady beetle as: prothorax reddish to testaceous, with a black central spot from the base to the middle, black elytra with apex bordered in orange. Externally *S. phloeus* are easily told from *S. creperus*, as the former lacks the black spot in the prothorax. *Scymnus creperus* is often associated with aphids, on which both larvae and adults feed. They are commonly found as predators of the oleander aphid, *Aphis nerii* Boyer de Fonscolombe feeding on the giant milkweed *Calotropis procera* (Ait). All 74 specimens in MEBT were collected from coastal locations, especially in the more arid habitats of the southern coast.

Nephaspis magnopunctata Gordon. [Plate VI, Fig. F]
Nephaspis magnopunctata Gordon, 1990: 25.

Description: Body rounded to oval, broadest posterior to base of elytra. Length 1.2 to 1.3 mm; width 0.9 to 1.0 mm. Color pale yellowish white, except pronotum with small brown spot at base on each side of center (baso-medial). Elytron with small brown spot at humeral callus, and a larger black spot at base on suture at apical declivity. Elytral punctures coarse, darker medially. Apical half of epimeron usually black. Head dull, almost imperceptibly punctured. Pronotum shiny, imperceptibly punctured. Elytron deeply and coarsely punctured only on large scutellar spot, and in irregular, wide band diagonally from humerus to suture. Male genitalia with basal lobe 1/3 longer than parameres, widest at base and tapered to apex with small dorsal keel.

Parameres slender and tapered base to apex. Sipho elongate, slender, sinuate in apical half, straight before apex, apex acute and unmodified. Basal capsule with inner arm short, slender; outer arm shorter and acute. Females have similar appearance.

According to Casey (1899), members of the genus *Nephaspis* are remarkable among the Scymninae, and perhaps in the entire family, due to the structure of their prosternum. This structure is obliquely bi-concave, with the apical end bearing setae, elevated and cup-like. In this regard, this group's prosternum is slightly reminiscent of that in *Delphastus* spp., which are also whitefly predators. A recent revision of the genus is available in Gordon (1996). Kairo et al. (2001) recognize members of the genus from the control of a coconut whitefly, *Aleurodicus pulvinatus* (Maskell), on Nevis Island. Gordon (1972a, 1982b) also associates the species as common predators of the spiraling whitefly, *Aleurodicus dispersus* (Russell).

Type locality: San Juan, Puerto Rico. Holotype at USNM.

Distribution: Puerto Rico: Adjuntas, Isabela, Ponce, San Juan. Virgin Islands: St. Thomas.

Remarks: This endemic species was originally collected from Adjuntas, and from Ponce in March 1933 by USDA Bureau of Entomology collector R.G. Oakley, and it was labeled as collected from *Diphysa robinioides* Benth (Leguminosae). Label information from specimens collected by Bennett on May 1990 note feeding on papaya whitefly, *Trialeurodes variabilis* Quaintance. A couple of specimens of this uncommon species are available at MEBT, both collected by Bennett during his 1990 visit to Isabela. *N. magnopunctata*'s pale white color is distinctive of the species. Only the much smaller *Decadiomus tricuspis* has a similar color pattern. We have not been able to collect this species in 10 years, and thus deem it to be rare.

Nephaspis* near *acuta Gonzalez, 2009: 101. [Plate VI, Fig. E]
Nephaspis acuta Gonzalez (2009: 101).

Description: Color brownish yellow. Length 1.3 mm; width 0.9 mm. Body oval, convex, with maximum broadness between humeri and mid-elytra, tapering slowly towards apex. Male with head pale yellow darkening slightly towards vertex; females with brown head. Antennae, mouthparts except mandibles, prothorax, legs also pale yellow. Elytra uniformly castaneous all the way to apex, darker at basal border, punctations, and suture.

Head with almost imperceptible punctation, distance variable 1-5 diameters, some in pairs; hairs short, fine, dense, decumbent. Antennae with 11 antennomers, first two large, rounded, clearly dilated; last five forming a club. Pronotum with vestiture and punctation like in head, shiny. Elytra with very coarse punctation, separated by one diameter or less; hairs long, sparser, slightly decumbent about as long or longer than scutellum. Prosternum with long wineglass-like intercoxal process, apically setose. The process has long decumbent setae, and covers sub-mentum, reaching the coxal cavity. Meso- and meta-sternum shiny, with coarse punctation separated by less than one diameter. Tarsi cryptotetramerous. Abdominal ventrites with long decumbent setae, somewhat sparser than in elytra, and slightly shorter. First ventrite with large punctation separated by 1-2x diameter. Post coxal line is a continuous arc not reaching bottom of ventrite, turning upwards at slightly over mid arc and stopping well short of elytral border and midway width of ventrite. Punctation size decreases towards the latter ventrites, separated by 1-3 diameters, and more abundant towards the center and the elytral borders. Apex of sixth ventrite semicircular, almost imperceptivity truncated

Male genitalia with basal lobe slightly longer than parameres in lateral view; apex pointed, triangular, short. Lobe widest in apical 1/3 tapering and somewhat widening at base. Sipho long, basal half strongly curved, then slightly curved towards a sharpened pointy apex. Capsule with short, thick and triangular inner arm; outer arm long slightly notched near apex.

Type locality: Tumbes, Los Cedros, Peru.

Distribution: Ecuador, Peru, and Puerto Rico.

Remarks: The first record for this lady beetle in Puerto Rico is from March 2009 at El Faro in Cabo Rojo, where it was found in great abundance feeding on *Metaleurodicus* sp. on button mangrove, *Conocarpus erectus* L. We have designated these specimens as *N. acuta* based on the description by González (2009). This species is unique within the genus by the unusual shape of the basal lobe, the shape of the siphonal capsule, and the acute and pointy siphonal apex. Some important characteristics are different between our specimens and those from South America, such as smaller and closer-packed pronotal and elytral punctation, a larger, broader, and rounder spermathecal ramus, and the fact that all our specimens appear to have 11 instead of 10 anten-

nomers. *Nephaspis* species have been associated with important predators of whiteflies (Hemiptera: Aleyrodidae).

Scymnobius bilucernarius (Mulsant). [Plate VIII, Fig. B]

Scymnus bilucernarius Mulsant, 1850: 997.
Scymnus pictus Gorham, 1897: 231.
Scymnobius bilucernarius (Mulsant) Gordon and Gonzalez, 2002: 63. Syn: *Nephus bilucernarius* (Mulsant).

Description: Form elongate, oval. Length 1.6 to 1.8 mm; width 1.2 to 1.5 mm; Color black somewhat shiny. Dorsal surface is alutaceous with grayish white pubescence. Head, lateral angles of pronotum, mouthparts, antennae, legs, and last two abdominal sterna, reddish brown. Head black in females. Elytron with transverse large pale-yellow spot on the apical declivity not reaching apex. Head and pronotum punctures coarse, spaced less than 2x diameter. Elytral punctures coarser, and separated by no more than a diameter. Postcoxal line on 1st abdominal sternum almost reaching posterior sternal margin, curved in basal half, and straight in apical half and almost reaching lateral sternal margin. Apex of 6th sternum emarginated in males and rounded in females. Male genitalia with basal lobe longer than parameres. Parameres long and slender, widened to rounded apex in apical fourth. Sipho strongly curved in basal half, straight in apical half with trifurcate apex. Inner arm of capsule straight; outer arm basally rounded. Female, with spermathecal capsule bent anterior to ramus, slender.

Type locality: Yucatan Peninsula, Mexico.

Distribution: Mexico, Bermuda, Lesser Antilles, and Central America. Only reported from Puerto Rico in the Greater Antilles.

Remarks: According to Gordon and González (2002) this is the most widespread and frequently collected member of the genus. We strongly suspect that Wolcott (1948:304) was probably referring to this species in his account as *Scymnus flavifrons* Melsheimer. Gordon and González (2002) consider this species as similar to *S. bilucernarius* in body shape, in color, and in male genitalic characters. Wolcott refers to this species as having been intercepted accompanying plant material infested with nigra scale, *Parasaissetia nigra* (Neitner). No records or collections were available of this species until 2007, when we found it associated with the Harrisia cactus mealybug, *Hypogeococcus pungens* Granara de Willink, attacking Royen's cac-

tus (*Pilosocereus royenii* [L.] Byles and G. Rowley) in Lajas. We also found this species associated with the coconut mealybug *Nipaecoccus nipae* (Maskell) feeding on guava and coconut at Juana Díaz. These findings suggest that *S. bilucernarius* is probably common attacking mealybugs in the drier areas of southern Puerto Rico.

Tribe Diomini

Scymninae with length less than 4.0 mm (most < 2 mm in Puerto Rico). Body form ovate and convex, somewhat dorsoventrally flattened. Antenna short, with 10 or 11 segments. Apical segment of maxillary palpus, securiform. Postcoxal line in 1st abdominal segment reaching hind margin of sternum (except *Magnodiomus* and *Erratodiomus* which are not present in Puerto Rico). Prosternal process carinate. Tarsus trimerous or cryptotetramerous. First visible abdominal segment fused with the second. Male genitalia with basal lobe asymmetrical. Female genitalia with short, transverse genital plate. According to Gordon (1999) this short, somewhat transverse female genital plate is the most important apomorphy for the tribe, as opposed to the long triangular plate of the Scymnini.

The Diomini are distributed worldwide, especially in tropical regions, although some members occur in temperate regions. The tribe contains five genera, two of which occur in Puerto Rico: *Diomus* and *Decadiomus*. *Diomus* is a large pan tropical genus with close to 280 described species. However, unlike *Diomus,* which has been well monographed (Gordon, 1976 and 1999), the genus *Decadiomus* is a small and poorly studied group of less than 10 species. This genus is recognized from other Diomini by their 10-segmented antennae. Some species are whitish or reddish colored, and all are small beetles. Thus far all *Decadiomus* species seem to be confined to the Caribbean from Florida to the Lesser Antillean arch.

Host data are limited, but many records associate members of the Diomini with members of Hemiptera: Sternorrhyncha (e.g., mealybugs, aphids, whiteflies, soft scales, armored scales).

Diomus ochroderus (Mulsant) [Plate VI, Fig. A; Plate XII, Figs. A to E]

Scymnus ochroderus Mulsant, 1850: 951.

Scymnus (Diomus) ochroderus Mulsant, 1853: 329; Weise, 1885: 168; Leng and Mutchler, 1914: 411; Blackwelder, 1945: 445; Wolcott, 1948: 305; Peck, 2009: 29.

Diomus ochroderus (Mulsant), after Korschefsky, 1931.

Syn.: Scymnus thoracicus Fabricius, synonymy by Gundlach, 1893: 343.

Description: Initial description by Mulsant (1850) is supplemented here. Form oval, convex, slightly flattened, dark brown to piceous. Length 1.45 to 1.7 mm; width 1.0 to 1.2 mm. Head stramineus, punctures coarse, shallow, 1-2x diameter; eyes black, inter-ocular distance 2x eye diameter, canthus small; clypeus not explanate. Mouthparts, antennae yellowish brown. Pronotum yellow, slightly covering eyes; pronotum brighter yellow in males. Hairs long, decumbent, pale yellow, abundant. Punctures deep, 1-2x diameter; prosternum with carina, rounded at base and extending close through anterior margin. Elytra black, except apical 1/6 yellow; hairs long, erect to decumbent, pale brown, abundant. Punctures deep, 1-3x diameter. Legs yellow, tarsi trimerous; underparts black. Epipleuron short, not foveate, only reaching base of metacoxa. Abdomen with six visible segments, two to six yellowish brown. The 5th segment arcuate in males. Genitalia: male, phallobase with broad basal piece about 1.2x length of lobe. Basal lobe asymmetrical; less than 0.5x length of parameres. Parameres broadening apically, with long hairs starting on basal 1/3 extending apically (Plate XII, Figures B and C). Sipho with long apical flagellum, and inner arm long and slender, outer arm nearly obsolete (Plate XII, Figure D).

Type locality: Island of St. Bartholomew.

Distribution: Barbados, Cuba, Grenada, Guadeloupe, Mustique, Puerto Rico, St. Bartholomew, and St. Vincent.

Remarks: This small oval lady beetle is a very common species in citrus growing districts of central Puerto Rico. The species is mentioned by Wolcott (1948) in a somewhat opaque account, in which he argues against Gundlach's (1893) conclusion that *D. ochroderus* was a junior synonym for *Diomus thoracicus* (Fabricius, 1801: 379). In his account, Wolcott disagrees with Gundlach's opinion of synonymy and implies that no evidence exists of the presence of this South American species in Puerto Rico. In fact, *D. thoracicus* is, according to Mulsant (1850: 951), distinct from *D. ochroderus* in that the former is generally much larger, and has a conspicuous dark baso-medial spot in the pronotum that is lacking in the latter. In addition, male genitalic characters differ significantly between these two species. In *D. ochroderus*, the sipho has a long apical flagellum, while *D. thoracicus*

has a shorter sipho with no flagellum (Gordon, 1999). While *D. ochroderus* was not included in Gordon's (1999) revision of South American Diomini, the lady beetle appears to belong to his "Group F" consisting of species with long apical flagellum and no appendage on basal lobe. Thus, we agree with Wolcott's conclusion that *D. thoracicus* is probably listed by Gundlach (1893) in error.

The senior author has observed larvae and adults feeding on oleander aphid, *Aphis nerii,* and on spirea aphid, *A. spiraecola*, on citrus. According to Peck (2009) this lady beetle is reported predaceous on *Orthezia insignis* (Browne), *Sipha flava* (Forbes)*, Toxoptera aurantii* (Boyer de Fonscolombe), *Aphis* spp., *Aleurothrixus floccosus* (Maskell), *Aleurodicus cocois* (Curtis) and *A. dispersus* Russell, and on *Icerya purchasi* Maskell.

Diomus roseicollis (Mulsant) [Plate VI, Fig. B]

Scymnus (Diomus) roseicollis Mulsant 1853: 270; Crotch, 1874: 270; Leng and Mutchler, 1914: 411; Korschefsky, 1931: 165; Ramos, 1946: 36; and Wolcott, 1948: 304.

Diomus roseicollis (Mulsant) Gordon, 1976: 348; Gordon, 1985: 341; Gordon, 1999: 74; Peck, 2006: 187; Peck, 2009: 29.

Description: Body oval and slightly rounded. Length 1.5 to 1.6 mm; width 1.0 to 1.1 mm. Head, mouthparts, prothorax and legs pale reddish brown to yellow. Elytron dull black, feebly alutaceous, with an apical yellowish spot not reaching suture. Grayish-white pubescence, long, and decumbent. Thorax and first abdominal sterna usually dark brown, rest of abdomen reddish brown. Punctation on head fine. Pronotum with coarser punctation separated by a diameter or less, with punctation finer than pronotum and separated by less than 2x diameter. Apex of 5th abdominal segment feebly emarginated in males, whereas truncate in females. Apex of 6th segment feebly emarginated medially in males, and arcuate in females. Male genitalia with basal lobe short, asymmetric. Parameres long, widening apically, and rounded. Sipho long and abruptly sinuate just before apex. Basal capsule with long, slender, and straight inner arm; outer arm short, nearly obsolete with large accessory piece. Female genitalia with spermathecal short capsule, bent in basal half, ramus beaked, and without infundibulum.

Type locality: Cuba.

Distribution: Antigua, Bahamas, Barbados, Bequia, Cuba, Curaçao, Dominica, Grenada, Guadeloupe, Hispaniola, Jamaica, Martinique, Mona, Montserrat, Mustique, Puerto Rico (Vieques), St. John, St. Lucia, St. Marteen, St. Thomas, St. Vincent, Central America, South America, U.S. (South Florida) (Peck, 2006 and 2009).

Remarks: This species is easily told from *D. ochroderus* by the shape of its apical elytral spots where a dark sutural band prevents them from reaching the suture. Wolcott (1948) considered this to be a very common lady beetle species, and notes its importance in controlling the yellow sugarcane aphid [*Sipha flava* (Forbes)], the cotton aphid [*Aphis gossypii* (Glover)], and other economically important aphids. It appears that the species is no longer as common, being rarely collected. According to Peck (2009) this beetle is reportedly predaceous on a variety of Hemiptera including: *Aleurocanthus woglumi* Ashby, *Coccus viridis* (Green), *Geococcus coffeae* Green, *Lepidosaphes beckii* (Newman), *Aspidiotus destructor* Signoret, *Aleurodicus cocois* (Curtis), *A. dispersus* Russell, *Planococcus* sp., *P. citri* (Risso), *Ferrisia virgata* (Cockerell) and *Phenacoccus gossypii* (Townsend and Cockerell).

Decadiomus pictus Chapin [Plate V, Fig. B]

Decadiomus pictus Chapin, 1933: 97.
Decadiomus pictus Chapin in Wolcott, 1948: 306.

Description: Form oval nearly circular. Length 1.6 to 1.8 mm; width 1.1 to 1.2 mm. Body flesh-pink to reddish. Head, mouthparts, pronotum, and legs pale reddish. Elytron shiny, with dense, short pubescence, and with piceous to black spots. Head and pronotum sparsely and finely punctated. Elytra more strongly punctated; humeral callus prominent and distinctly shiny. Each elytron with two larger dark spots: one at basal third between humeral callus and suture covering scutellum, and extending backwards 1/3 to 1/2 length of elytron. A second rather rounded or elliptical spot starts from mid-elytron, shortly before declivity, sometimes extending to suture but never extending to apex. Basal spot sometimes covering humeral callus. No description of genitalia is available.

Type locality: Dorado, Puerto Rico. Reared and curated by entomologist Francisco Seín, July 11, 1933, feeding on *Icerya purchasi* Maskell, and today housed at USNM (PR. Acc. No. 133-32). Two specimens were sent to USNM by Wolcott, both collected on casuarina (*Casuarina equisetifolia* L.). According to the MEBT accession

card, these beetles were collected at "Miss Livingstone's Place", probably referring to property owner Ms. Sara Livingstone, famous airplane pilot and owner of 688 hectares where today stands Ritz-Carlton Dorado Beach Hotel. No specimens of this series remain at MEBT.

Distribution: Puerto Rico. Likely endemic.

Remarks: This small but beautiful, pink and black lady beetle is found occasionally by sweeping arboreal vegetation, usually in pristine habitats, within forest and wildlife reserves such as Guánica and Maricao forests. The author has also collected it on citrus groves in San Sebastian. The species is also sometimes collected in yellow sticky traps. The invasive hemipteran *Icerya purchasi* Maskell was its only recorded host (Wolcott, 1948), but most likely other Hemiptera serve as hosts. This uncommon species was presumed to have disappeared by Wolcott (1960), who thought that introduced competitors had displaced the species. The larva was described by Böving (1933). This species resembles *D. hubbardi* Chapin from Monserrat, and externally the types differ mostly in size and color, with *pictus* being larger and salmon pink, while *hubbardi* is pale yellow. Apparently, color varies, and may be unreliable as a sole character to distinguish these species. For example, Chapin's description indicates that scutellum is pale; however, all specimens examined in MEBT have dark scutellum. Further, teneral specimens are straw colored. Clearly a revision of this small genus is warranted.

Decadiomus tricuspis Chapin [Plate V, Fig. E]

Decadiomus tricuspis Chapin, 1933: 98.
Decadiomus tricuspis Chapin Wolcott, 1948: 307.

Description: Form oval, small. Length ≤ 1.0 mm; width 0.7 mm. Body pale stramineous, almost white; elytron with dark brown markings. Head pale with no visible punctation, and eyes prominent and black. Mouthparts, legs whitish. Pronotum whitish, with posterior margin with two narrow and dark spots on either side of scutellum, and no visible punctation. Elytron shiny with coarse and sparse punctation, and with two darker spots. A basal spot is present between humeral calli, forming three apexes (tricuspid) as it extends back towards middle of elytral disc. A second paler sub-triangular spot is located between margin and suture on apical half, not reaching either. No description of genitalia is available.

Type locality: Río Piedras, Puerto Rico. Collected by H.L. Dozier on January 21, 1925; associated with whiteflies (*Metaleurodicus* sp.) on *Carica papaya* L.

Distribution: Puerto Rico. Likely endemic.

Remarks: This tiny lady beetle is also uncommonly collected. As with *D. pictus*, they are more likely to be collected in protected areas and forests, sweeping with fine nets on herbaceous vegetation. Even so, their inconspicuous color and small size make them easily overlooked within the collector's net. In addition to Dozier's Río Piedras record, we have collected them in forest habitats of Jayuya and Maricao.

Decadiomus austrinus (Gordon) [Plate V, Fig. D; Plate XIII, Fig. B]
Diomus austrinus Gordon (1976: 341).
Decadiomus seini Segarra and Otero (2014: 556)
Decadiomus austrinus Vandenberg and Hanson (2019: 264)

Description: *Male*. Form oval, convex. Length 1.4 mm, width 1.1 mm. Body color yellowish brown. Head, mouthparts, antenna yellow. Eyes black, frontal inter-ocular space 2x width of eye; punctation fine, shallow, 1-2x diameter; hairs yellowish, sparse, decumbent. Pronotum yellowish; punctation 1x diameter, shallow; hairs decumbent to semi-erect; scutellum black. Prosternal carina elongate narrow; process long with apex 1.5x base. Legs yellowish brown. Elytron dark brown, punctation coarse, deep, 2-3x diameter; hairs yellowish brown, semi-erect. Apex of 5th sternum feebly, emarginated medially; apex of 6th sternum arcuate. Phallobase moderately long; basal lobe half size of parameres, with short dorsal keel without dorsal setae; parameres with internal pubescence, gradually widening from base to apex; apex moderately rounded. Sipho long with long flagellum. Basal capsule elongate, slightly bifid; outer arm very short apically, with small accessory piece; basal margin with long emargination. *Female*. Similar to male except head, mouthparts and pronotum pale brown. Apex of 6th abdominal sternum arcuate. Genitalia with spermatheca bent close to middle; cornu rounded and slightly globose; ramus with small beak. Infundibulum long and usually ring-like.

Type locality: Florida, U.S.

Distribution: South Florida, Mona Island, Puerto Rico .

Remarks: This species appears to be widely distributed in Puerto Rico, where it has been collected mostly from drier southern

coastal areas, but specimens are also available from mountain locations (up to 750 m), and from the island's northern coastal plains. A specimen that appears to be this species was collected from Mona Island by the author on May 29, 2008 on Sardinera beach. Adults and larvae of this species have been repeatedly collected feeding on the Harrisia cactus mealybug, *Hypogeococcus pungens* Granara de Willink, in southwestern dry forest districts.

This species was originally described by Gordon (1976) as *Diomus austrinus*. Examination of the holotype by Vandenberg and Hanson (2019) led to the discovery that this species had ten antennomers instead of eleven, and thus belonged to *Decadiomus* Chapin. In so doing, these authors rightly placed *D. seini* (Segarra-Carmona and Otero) as its junior synonym and thank Dr. Vandenberg for apprising us of the change.

Decadiomus ramosi Segarra [Plate V, Fig. A; Plate XIII, Fig. D]
Decadiomus ramosi Segarra and Otero (2014: 558)

Description: Body black oval, convex, elongate, slightly flattened posteriorly. Length 1.5 to 2.1 mm, width 1.1 to 1.5 mm. *Male*. Head, mouthparts, antenna yellow. Eyes black, frontal inter-ocular space >2x width of eye; punctation double, fine, shallow, about one diameter; hairs short (less 1/3 diameter of eye), yellowish, dense, decumbent. Pronotum yellowish; punctation 1x diameter, shallow double; hairs erect to semi-erect; Scutellum dark brown. Hypomeron, prosternum yellowish; prosternal carina elongate narrow; process long with apex 1.7x base. Legs yellowish brown. Epipleuron, mesepimeron, mesepisternum, metaventrite, dark brown. Elytron dark brown, shiny, with paler, elongate central spot extending apically after basal 1/3 extending but reaching neither base nor suture, and extending 2/3 length. Apical 1/8 yellow. Punctation coarse, deep, 1-2x diameter; hairs yellowish brown, semi-erect. First and second abdominal segments dark brown. Segments 3 to 6 yellowish brown, with apex of 5th sternum feebly emarginated medially; apex of 6th sternum arcuate. Genitalia as in Plate III. Phallobase moderately long; basal lobe asymmetrical, broad, with dorsal setae; parameres slender, 7/8 size of phallobase with no pubescence, apex rounded. Sipho long with long flagellum. Basal capsule elongate, slightly bifid; outer arm short, with small accessory piece, inner arm elongate; basal margin emarginated. *Female*. Similar to male except head, mouthparts and pronotum pale brown. Pale elytral spot small-

er, sometimes altogether absent. Apex of 6th abdominal sterna arcuate. Genitalia with spermatheca bent close to middle; cornu rounded and slightly globose; ramus with small beak. Infundibulum short and vestigial.

Type locality: Maricao, Puerto Rico. 18°09.45N 67°59.93W. 25.vi.2008. Sweeping. Coll. A. Segarra-Carmona. MEBT, Acc. No. 04-2010.

Distribution: Puerto Rico. Likely endemic.

Remarks: This species appears to be widely distributed in more humid areas in western and central Puerto Rico, where it has been collected mostly from higher locations and some northern coastal areas. No specimens have been collected from drier coastal areas on the southern coastal plains. Most collections are associated with citrus, but no Sternorrhyncha has been associated. The species is named in remembrance of José A. Ramos-Alemar (deceased) and his son Stuart Ramos; the first, a renowned Puerto Rican taxonomist of Auchenorrhyncha in the 20th century, collector of dozens of type specimens of Diomini from Colombia during his tenure as visiting professor at Universidad Javeriana in Bogota, and the second, a lepidopterist and mentor to several generations of Puerto Rican entomologists.

Decadiomus hayuyai Otero [Plate II, Figure F; Plate XIII, Fig. C]
Decadiomus hayuyai Segarra and Otero (2014: 559)

Description: Shape oval, convex. Length 1.6 mm; width 1.1 mm. Body color yellowish brown. Head, mouthparts, antenna pale yellow. Eyes black, frontal inter-ocular space 2x width of eye; punctation fine to almost imperceptible, about 1-2x diameter; hairs short (less 1/4 diameter of eye), whitish, sparse, decumbent. Pronotum pale yellow, shiny; punctation 2x diameter, shallow almost imperceptible; hairs pale yellow, dense, decumbent to semi-erect; scutellum light brown. Hypomeron, prosternum pale yellow; prosternal carina broad; process trapezoid with apex 1.5x base. Legs pale yellow. Epipleuron pale brown; mesepimeron, mesepisternum, and metaventrite dark brown. Elytron dark brown, shiny, with two paler, elongate irregular spots. First smaller spot located almost medially, close but not reaching suture. Second spot elongate, on apical third, broadly separated from apex and not reaching suture. Apical 1/8 pale yellow. Punctation coarse, deep, 1-2x diameter; hairs pale yellow, decumbent to semi-erect. Abdominal segments dark brown, with apex of 5th sternum deeply emarginated medially; apex of

6th sternum arcuate. Genitalia as in Plate IV. Phallobase long; basal lobe asymmetrical, broad, with fleshy apical projection and no dorsal setae; parameres slender, widening towards apex, 2/3 size of phallobase with no pubescence, apex rounded. Sipho long with long flagellum. Basal capsule elongate, slightly bifid; outer arm short open, with no accessory piece, inner arm elongate and widening towards apex; basal margin feeble emarginated. *Female*. Similar to male. Legs pale yellow. Mouthparts pale yellow. Apex of 6th abdominal sterna arcuate. Genitalia with spermatheca bent before middle; cornu with elliptical to lanceolate apex and enlarged; ramus with small rounded beak. Infundibulum absent.

Type locality: Jayuya, Puerto Rico, 18°13.72N 66°33.07W. 2.ii.2010. Ex. Sweeping. Coll. A. Segarra-Carmona", deposited at MEBT, Acc. No. 05-2010.

Distribution: Puerto Rico. Likely endemic.

Remarks: This species also appears to be distributed in the more humid and higher areas in western and central Puerto Rico. No specimens have been collected from drier coastal areas on the southern coastal plains. Most collections were done by sweeping trees, and some have been collected from citrus. The species is named after the last Taino Cacique (chief) of the interior highland town of Jayuya, Puerto Rico, hometown of the junior author and discoverer of the species.

Decadiomus martorelli Segarra [Plate V, Fig. C; Plate XIII, Fig. A]
Decadiomus martorelli Segarra and Otero (2014: 560).

Description: *Male*. Dorsal habitus rounded, oval, convex. Length 1.3 mm, width 1.0 mm. Body color black. Head, mouthparts, antenna pale yellow. Eyes black, frontal inter-ocular space <2x width of eye; punctation coarse, deep, about 1x diameter; hairs pale yellow, short (less than 1/3 diameter of eye), sparse, decumbent to semi-erect. Clypeus slightly produced apically, strongly marginate. Cardo, submentum dark. Pronotum black, shiny; anterior angles pale yellow; punctation same as head, coarse; hairs pale yellow, erect to semi-erect; scutellum black. Hypomeron pale yellow anteriorly, darker posteriorly. Prosternum black; prosternal carina narrow anteriorly and produced; process with apex 5x base (Plate VI, Figure A). Legs pale yellow. Epipleuron pale brown; mesepimeron, mesepisternum, and metaventrite black. Elytron black, shiny. Punctation coarse, deep, 1-2x diam-

eter; hairs yellowish brown, erect to semi-erect. Abdominal segments dark brown, with apex of 5th sternum deeply emarginated medially; apex of 6th sternum slightly emarginated. Genitalia as in Plate V. Phallobase long, narrow with parameres shorter than base; basal lobe asymmetrical, broad, with fleshy apical projection and no dorsal setae; parameres with internal pubescence, with almost no gradual widening from base to apex; apex rounded. Sipho long with long flagellum, with noticeable widening at 2/3 length before end of flagellum. Basal capsule elongate; outer arm short apically, with small accessory piece; inner arm elongate, slightly widening towards apex. Basal margin with no noticeable emargination. *Female*. Black. Length 1.5 mm; width 1.1 mm. Legs dark brown. Mouthparts brown. Apex of 6th abdominal sterna arcuate. Genitalia wide, uniform caliber, with spermatheca bent close to middle; cornu with slightly truncate rounded apex and enlarged; ramus with almost unnoticeable beak. Infundibulum absent.

Type locality: Las Marías, P.R., May 27, 2009. Finca Ana Luisa. 18°12.59N 66°59.97W. Coll. A. Segarra-Carmona deposited at MEBT, Acc. No. 07-2010.

Distribution: Puerto Rico. Likely endemic

Remarks: This species is easily distinguished from *D. austrinus* by the males having bright yellow frons, strongly margined clypeus, and for having a produced apex in the prosternal carina. The species appears to be distributed in the more humid and higher areas of western and central Puerto Rico. Most collections were done by sweeping trees, and some have been collected from citrus. The species is named after Luis F. Martorell, first Puerto Rican forest entomologist and avid botanist, who worked at the University of Puerto Rico, Agricultural Experiment Station.

Tribe Hyperaspidini

According to Gordon (1985), these lady beetles are small to medium-sized Scymninae, 1.50 to 5.0 mm in length. Their form ranges from elongate oval and depressed to rounded and convex. Their dorsal surface is glabrous in all species found in Puerto Rico. Antenna short, reportedly 11-segmented; club elongate and fusiform with distal segment small and recessed in preceding segment. Eye large, entire, or weakly notched, finely faceted, without pubescence. Maxillary palpus with apical segment securiform. Scutellum usually large. Epipleuron of elytron narrow, flat, excavated for reception of

femoral apex in *Hyperaspis*, but not in *Hyperaspidius*. Leg short; femur grooved for reception of tibia; tarsus cryptotetramerous. Abdomen with six visible sterna in female, seven sterna visible in male. Male genitalia asymmetrical.

There are two genera in Puerto Rico: *Hyperaspis* (three species) and *Hyperaspidius* (one species, probably undescribed). *Hyperaspis* is a commonly found genera, with over 150 species found in North and South America (Gordon and Canepari, 2008; Vandenberg, 2002a). Little is known about the biology of these lady beetles. Hyperaspidines have been associated with predators of pseudococcids, coccids, diaspidids and aphids (Hemiptera: Stenorrhyncha). Often, adults are found amongst grasses, but finding them on trees is also common.

Hyperaspis onerata (Mulsant) [Plate VII, Figs. A and B]

Cleothera onerata Mulsant, 1850: 552.

Hyperaspis onerata Crotch, 1874: 230; Blackwelder, 1945: 447; Gordon and Canepari, 2008: 336.

Description: Form oval to rounded, slightly flattened. Length 2.7 mm; width 2.1 mm. Head black (males) or reddish yellow (females). Antennae with 11 antennomers. Dorsal surface pale yellow. Pronotum with two black spots near center, not reaching anterior angle, separated medially, and merging on posterior angle of pronotum to form two back-to-back letters "C". Scutellum yellow, with base of elytra narrowly black. Elytra with two lateral black spots: one near humeral callus and one in apical 1/3. A large central discal spot-on sutural margin of each elytron forms a single large round spot. From base to 1/3, suture is narrowly black, reaching large spot, narrowing then briefly expanding towards apex, but always covering suture. Body black. Mouthparts, legs, episternum, and border of abdominal sterna pale brown. Hypomeron yellow. Epipleurum foveate. Two forms are found in Puerto Rican collections: one dark (Plate VII, Fig. A), and one light (Plate VII, Fig. B). Male genitalia with basal lobe shorter than parameres, asymmetrical, with acute angular projection or tooth on one side. Parameres wide, rounded at apex. Sipho slender, apically sinuate, with membranous area. Capsule with inner arm wide, outer arm shorter.

Type locality: Colombia, at Museum of Natural History, Paris (lectotype designated by Gordon and Canepari, 2008).

Distribution: Northern South America, Jamaica, Puerto Rico, St. Thomas, and Trinidad.

Remarks: Label information from USNM specimens associates this species with *Orthenzia* sp. (Hemiptera: Ortheziidae) in Venezuela and *Pulvinaria* sp. (Hemiptera: Coccidae) in Jamaica. Renowned horticulturalist George C. Jackson collected the earliest known specimen in Puerto Rico in 1956 at Juana Díaz. The species appears uncommon, and mainly associated with tree habitats. We have collected this species from *Manilkara zapota* (L.) Royen (níspero trees) at the Tropical Agricultural Research Station at Isabela.

Hyperaspis connectens (Thunberg) [Plate VII, Figs. C and D)]

Coccinella connectens Thunberg, 1808: 157.

Hyperaspis connectens (Thunberg) Mulsant, 1850: 662; Gundlach, 1893: 343; Leng and Mutchler, 1914: 411; Wolcott, 1948: 309; Gordon, 1985: 473; Gordon and Canepari, 2008: 379.

Description: Form elongate, oval, not slightly flattened. Length 2.5 to 3.0 mm; width 1.8 to 2.2 mm. Head orange yellow in males, black in females. Clypeus feebly explanate. Antenna with 10 articles. Pronotum black with broad lateral orange yellow area. Elytron with two yellow spots usually connected on apical declivity, and sometimes discrete. Spots look like back-to-back C-shaped orange marks that do not meet, as suture is black. Lateral elytron broadly black at bead and also apically, except where C-shaped spot occurs. Lower apical portion of spot reaching bead. As in *H. onerata*, two forms are found in Puerto Rican collections: dark (Plate VII, Fig. C) and light (Plate VII, Fig. D). Postcoxal line not reaching hind margin of first abdominal sternum, slightly flattened along margin, area within line coarsely, sparsely punctured. Male genitalia with basal lobe 3/4 as long as parameres, with angular projection on margin. Parameres oval, tapered from basal ¼ to rounded apex. Sipho slender, apex straight with membranous area. Inner and outer arms of basal capsule equally long.

Type locality: Island of St. Eustatius ("*les iles Saint-Eustache*").

Distribution: North America (States of Arizona, California, Louisiana, and Texas) and Mexico, Central America (Honduras, Nicaragua, and Panama), South America (Venezuela), and the Caribbean (Antigua, Hispaniola, Jamaica, Puerto Rico, St. Bartholomew, St. Eustatius, and St. Kitts).

Remarks: Two color forms can be found in this species. The darker form, previously described, is by far the commoner. In a lighter

form, less common than the first, the elytron is entirely orange yellow except for basal, sutural and lateral border in apical ½, black. This form occurs in Puerto Rico, and has also been recorded from Jamaica. This species has been collected mostly from weedy vegetation on coastal plains. The senior author has collected it from calabaza (pumpkin) squash (*Cucurbita pepo*) in association with melon aphid (*Aphis gossypii* Glover).

Hyperaspis festiva Mulsant [Plate VII, Fig. E]

Hyperaspis festiva Mulsant, 1850: 659; Blackwelder, 1945: 447; Wolcott, 1948: 309, as "*H. festiva* Mulsant, aberration *apicalis* Weise"; Gordon and Canepari, 2008: 375; Peck, 2009: 30.

Hyperaspis apicalis Weise, 1885; Gundlach, 1893: 343 as *H. apicalis* var 'festivus'; Leng and Mutchler, 1914: 411; Gordon and Canepari, 2008: 376.

Description: Body oval, elongate and more flattened than either *connectens* or *onerata*. Length 2.3 to 3.0 mm; width 1.7 to 2.1 mm. Head orange yellow in males and black in females. Antenna, mouthparts, and legs testaceous. Antenna with 11 segments. Pronotum with lateral and anterior margins testaceous, with discus medially black between the scutellum and half length. Elytra with exterior border testaceous following beads. Dark brown towards apex. Elytron with pair of orange spots, one central and one apical, close to suture. Apical spot often uniting with lateral spot. Suture black. Legs, body piceous. Epipleura foveate testaceous. Postcoxal line not reaching posterior margin of sternum. Male genitalia with basal lobe almost as long as parameres, asymmetrical with abrupt angular projection. Parameres narrow, apex rounded. Sipho long, robust and apical membranous area. Capsule with inner arm slender, curved and longer than outer.

Type locality: Brazil. According to Gordon and Canepari (2008), two syntypes of "*H. festiva* var. *apicalis*" are available at the Museum für Naturkunde der Humboldt Universität in Berlin (ZMHB), both collected from Puerto Rico.

Distribution: Mexico; Panama; Barbados, Grenada, Hispaniola, and Puerto Rico; Argentina, Bolivia, Brazil, Colombia, Paraguay and Peru.

Remarks: This species appears extremely variable in coloration, causing Mulsant (1850) to describe three variants based on elytral patterns. According to Peck (2009) this species is predaceous on

aphids, such as *Rhopalosiphum maidis* (Fitch). Similar observations have been made by this author on this common lady beetle. Wolcott (1948) considered them a major factor in the control of the yellow sugarcane aphid, *Sipha flava* (Forbes), also of *Aphis gossypii* Glover on cotton. Most collections of this lady beetle have occurred on southern coastal plains.

Other Hyperaspidines

Hyperaspidius sp.: There is one specimen of this genus reportedly collected from Corozal in 2007 by an undergraduate student for her entomology collection. Members of this genus do not have epipleuron excavated for reception of middle and hind femoral apices. The female specimen is 1.8 mm long, 1.1 mm wide. Form oval, slightly flattened. Head black, prothorax shiny black medially and pale yellow laterally. Scutellum black. Elytron black with complete yellow vita on lateral margin connecting with discal vita above humeral angle. Thus, the black markings look like a trident. No other specimens have been collected from that or similar locations since. Curiously, the specimen is externally very similar to a North American species named after the famous Indiana coloepterist Albert Burke Wolcott, *H. wolcotti* (Nunenmacher). The latter species is native to Indiana, Iowa and Kansas.

Tribe Pentiliini

Pentilia egena Mulsant [Plate VIII, Fig. F]

Pentilia egena Mulsant, 1850: 502; Crotch, 1874: 199; Gorham, 1892: 180; Leng and Mutchler, 1914: 411; Blackwelder, 1945: 450; Wolcott, 1948: 310.

Description: Form strongly convex and rounded. Length 3.5 to 4.0 mm; width 3.0 to 3.5 mm. Body, mouthparts, legs reddish yellow. Elytra shiny black, glabrous; head, eyes black, clypeus strongly explanate; maxillary palpi elongate, semi-securiform. Pronotum black with anterior angles greatly produced, yellow, and densely covered with yellowish pubescence. Punctation deep 1-2x diameter. Hypomeron slightly foveate for reception font leg. Elytron black, shiny; punctation deep 1-3x diameter. Epipleura deeply foveate for reception of femora, sparsely pubescent; postcoxal line not reaching anterior margin of 2nd abdominal segment, raised, running parallel to and almost reaching margin of sternite, and slightly curving upwards before reaching pleural margin. Six visible abdominal segments. Femur grooved for

reception of tibia. Tarsi pseudotrimerous (tetramerous); claw denticulate.

Type locality: Brazil.

Distribution: South America, Panama, Guadeloupe, Puerto Rico.

Remarks: USDA Bureau of Entomology and Plant Quarantine personnel, stationed at the Puerto Rico Experiment Station in Mayagüez between 1935-1940, likely introduced this shiny black lady beetle in 1939 from São Paulo, Brazil, for the biological control of scale insects. Wolcott (1948) remarks that a very similar beetle was found in the stomachs of crested lizards in San Juan several years before the Brazil introduction. However, no specimens exist in reference collections examined and thus, until recently, the 1939 introduction was presumed unsuccessful. First specimens seen by the authors were collected in 2010 from Guaynabo and Mayagüez, both collections associated with coconut scale *Aspidiotus destructor* Signoret on coconut. A possibility exists that these recent collections belong to another more recent introduction event. Guerreiro et al. (2003) indicate that *P. egena* is an important predator of scales in citrus in Brazil. Like other scale predator lady beetles, females lay eggs singly under the bodies of mature scale insects. Remarkably, this shiny dark beetle is now commonly found in student collections and occurs in all coastal habitats, associated with armored scale insects.

Pentilia discors Gorham [Plate VIII, Fig. E]
Pentilia discors Gorham, 1892: 181.

Description: Form strongly convex and rounded. Length 2.6 mm; width 2.2 mm. Elytra shiny black with a distinct elongate red area from suture laterally extending well beyond disc but not reaching margin. Glabrous; head, mouthparts, pale yellow. Epipleura foveate for reception of femora; clypeus and anterolateral margin pronotum explanate; postcoxal line incomplete, running parallel to, not reaching margin of sternite, and slightly curving upwards before reaching pleural margin. Abdomen piceous. Males with yellow prothorax. Females with black prothorax.

Type locality: Guatemala.

Distribution: Central America, northern South America, and Trinidad.

Remarks: This species is commonly found associated with scale infestations in fruit and shade trees, and bamboo. *Pentilia discors* was likely introduced between 1936-1939 from sources in Guy-

ana and Trinidad (Dohanian, 1937; USDA, 1940). Introduced specimens, however, were only described as "*dark brown with red spots on elytra*." Wolcott (1948) makes mention of this introduction, but does not confirm its establishment. In 1990, R.D. Gordon identifies this species from material sent to him by F.D. Bennett from Mayagüez. This material was collected in association with the black parlatoria scale, *Parlatoria ziziphi* (Lucas) in citrus. Since then, the species has been routinely collected from western Puerto Rico. Larvae strongly resemble mealybugs, and often this confusion leads to unnecessary pesticide applications that destroy them. Arias-Reverón (1990) found *P. discors* predating oyster scales (*Lepidosaphes* spp.) in citrus from Costa Rica.

Tribe Brachiacanthini

According to Gordon (1985), these are Scymninae beetles with elongate oval to rounded body, strongly convex; dorsal surface glabrous except head indistinctly pubescent. Head usually entirely yellow in male, at least with clypeus brown or black in female. Antenna 11-segmented; scutellum wider than long. Epipleuron of elytron narrow, and strongly excavated for reception of middle and hind femoral apices. Abdomen with seven apparent sterna in males, six in females; postcoxal line on first abdominal sternum incomplete.

Brachiacantha bistripustulata (Fabricius) [Plate VII, Fig. F)

Coccinella bis-3-pustulata Fabricius, 1801: 383.
Brachiacantha bis-tripustulata (F.) Mulsant, 1850: 528.
B. bistripustulata (F.) Leng, 1911: 296.
B. erythocephala Crotch, 1874: 211.

Description: Form oval to round. Length 3.1 to 4.0 mm, width 2.3 to 3.1 mm. Thorax with broad yellow or red margin, each elytron with three yellow or red spots, two about the middle, one behind them, sub apical. Body black, legs red. Males slightly paler than females. Head, the anterior margin of the thorax, and mesoepimeron, pale with a small humeral, pale spot on the elytra. Front tibiae armed with prominent tooth, slightly curved, and the posterior margin of the groove behind the tooth is arcuately expanded. Abdominal segment three is broadly, arcuately emarginated, the emargination limited on either side by a small elevation. The emargination of the fourth segment is equally wide but not so deep and it is not conspicuously elevated. Pronotum

of male mostly yellow with median black area not reaching anterior margin; pronotum of female black except for broad lateral area yellow. Postcoxal line angulate.

Type locality: Brazil.

Distribution: Mexico, Cuba, Jamaica, Hispaniola, Puerto Rico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Trinidad and Tobago, Colombia, Peru and Brazil (Milléo and de Almeida, 2007). A similar species, *B. decora* is found in Southern U.S.

Remarks: The first collection record for this species is from Peñuelas by J. Michelli in 1967 (MEBT). Adults appear rather uncommonly in collections, with most of these specimens collected on the southern coastal plains. Little is known of the biology of this species, and no recent taxonomic revisions are available. According to Leng (1911) and to Gordon (1985), the larvae of members of this genus, for which data are available, feed on Coccidae residing in ant nests.

Subfamily Coccidulinae

According to Vandenberg (2002a), this group of lady beetles is somewhat difficult to characterize as significant variability in character is common, perhaps an indication of polyphyletic ancestry. Their members may have a weakly or moderately convex dorsum, usually pubescent (except *Psorolyma* Sicard). Body length 2.0 to 7.5 mm. Head capsule is typical for coccinellids, usually with apex truncate; compound eyes sometimes coarsely faceted; apical segments of maxillary palpi are usually strongly divergent and securiform. Antennae are usually long (more than 2/3 head width), and eight to 11-segments. Meso- and meta-sternum are narrowly articulated. Epipleuron is usually broad and entire, without distinct foveae (except prominent in the Azyini). Female genital plates are very elongate. The host preferences of the New World members of the Coccidulinae are not well known, but they are apparently scale insect predators (Gordon, 1994b).

Key to the Coccidulinae of Puerto Rico

1. Body glabrous, elongate; dark metallic green; mouthparts, antennae pale yellow; Length 2.5 mm . . . . . .*Psorolyma maxillosa* Sicard.

— Body hairy . . . . . 2.

2. Body round, strongly convex and pubescent; charcoal black with one large apparently bare spot on each elytron; propleuron with

foveae to hold antenna and anterior femoral apex; Length 2.4-3.0 mm . . . . . *Pseudoazya trinitatis* (Marshall).

— Body not as above . . . . . 3.

3. Body oval to elongate with sides of elytra nearly parallel; body usually reddish with black spots. Length 3.5-4.5 mm . . . . . *Rodolia cardinalis* (Mulsant).

— Elytral sides not parallel, broadest behind humeral callus; dark reddish, usually without dark spots. Length 3.5-4.5 mm . . . . . *Anovia circumclusa* (Gorham).

Tribe Coccidulini

Psorolyma maxillosa Sicard [Plate IV, Fig. D]

Psorolyma maxillosa Sicard, 1922: 360; Blackwelder, 1945: 443; Wolcott, 1948: 302; Gordon, 1974: 229; Gordon, 1994c: 223.

Description: Dorsal habitus oval, convex and slightly elongate. Length 2.5 mm; width 1.8 mm. Head, pronotum, and elytra metallic greenish blue. Head wide, eyes widely separated, narrowed before antennal insertion. Apex of clypeus deeply emarginated in males, or feebly emarginated in females. Antennae long and slender with club two-segmented, with last segment conical. Maxillary palpi are securiform. Mouthparts, antennae are reddish brown. Legs conspicuously pale yellow, tarsi cryptotetramerous, claws simple, without tooth. Head punctation is almost imperceptible. Pronotum is short, wide, with fine dense punctation. Prosternal intercoxal process truncate apically, without carina. Elytron with sparse coarse punctation, and erect whitish hairs. Epipleuron flat, dark brown with no clearly discernible fovea. Abdomen with six visible segments. Postcoxal line is incomplete, extending to posterior margin of 1st sternite, and with apex nearly parallel to margin. Male genitalia with basal lobe compressed laterally. Parameres slender, 7/8 as long as basal lobe, and slightly bent close to base. Sipho is slender, with apex impressed sub-apically. Capsule with outer arm short and blunt; inner arm longer. Female genitalia with spermatheca elongate, slender and cornu abruptly bent apically.

Type locality: Lares, Puerto Rico. April 19, 1921. G.N. Wolcott.

Distribution: Puerto Rico. Likely endemic.

Remarks: This beautiful native metallic lady beetle is the type species for the genus *Psorolyma* Sicard and is its only member in Puerto Rico. *Psorolyma* Sicard belongs to tribe Coccidulini and is a small lady beetle genus with only five species: four in Hispaniola and one in Puerto Rico. Its closest allies are West Indian genera, i.e., *Bura* Mulsant, *Geodimmockius* Chapin, and *Botynella* Weise, which have not been reported in Puerto Rico. Recently, Vandenberg and Pérez-Gelabert (2007) transferred genus *Bura* to subfamily Sticholotidinae, perhaps indicating the current taxonomic instability of these coccidulines.

According to Wolcott (1948) these beetles are usually collected in coffee groves everywhere, but are possibly more abundant at higher elevations. Larvae are grey with small black spots, and are commonly observed wherever adults occur. Peculiarly, no prey has ever been documented for this species, and it is usually the case that close visual observation of both larvae and adults always fails to identify obvious ones, like aphids, mealybugs, or scale insects.

Tribe Azyini

Pseudoazya trinitatis (Marshall) [Plate IV, Fig. C]

Azya trinitatis Marshall, 1912: 320; Dohanian, 1937: 246; Blackwelder, 1945: 451; Wolcott, 1948: 310.

Pseudoazya trinitatis (Marshall) Gordon, 1980: 194.

Description: Body nearly round. Length 2.3 to 2.7 mm, width 2.0 to 2.4 mm. Head black with greenish tint except apex of clypeus yellow. Pronotum and elytra black. Epipleuron with distinctly deep fovea. Venter is black except legs and abdomen brownish yellow. Dorsal pubescence long, erect giving the impression of a spot at point of illumination. Dorsal surface is smooth and shiny. Punctures on head and pronotum separated by one diameter or less, and by one to two diameters on elytron. Male genitalia with broad phallobase; parameres longer than base; sipho capsule with slightly shorter inner arm, and outer arm with semi-bifid process.

Type locality: Cedros, Trinidad (lectotype designated by Gordon, 1980). Located at USNM.

Distribution: Dominica, Grenada, Grenadines, Nevis, Puerto Rico, St. Kitts, St. Lucia, St. Croix, and Trinidad; Colombia, Guyana, Surinam, Tobago, Venezuela.

Remarks: This charcoal black lady beetle is easily recognized by a bare shiny area on the disc of the elytron. It is uncommon, but collected widely within Puerto Rico, usually on coconut palms infested with armored scales. This beetle was introduced in Puerto Rico in 1936 as a biological control agent against the coconut scale, *Aspidiotus destructor*. According to Wolcott (1948), two close relatives of *P. trinitatis* were also introduced into Puerto Rico during the 20th century: *Azya orbigera* Mulsant in 1926 from Venezuela, and *Azya luteipes* Mulsant in 1938 from Brazil. The latter two species have not been recorded since, and can easily be recognized by the presence of an elevated prosternal intercoxal process that is altogether absent in *P. trinitatis*.

Tribe Noviini

Rodolia cardinalis (Mulsant) [Plate IV, Fig. B]

Vedalia cardinalis Mulsant, 1850: 906.

Novius cardinalis (Mulsant) Crotch, 1874: 283.

Rodolia cardinalis (Mulsant) Weise, 1905: 200; Wolcott and Martorell, 1944: 451; Blackwelder, 1945: 443; Ramos, 1946: 36; Wolcott 1948: 302.

Description: Body oval, elongate and convex; elytron seemingly parallel sided, widest at middle. Length 2.7 to 4.2 mm, width 2.0 to 3.3 mm. Color red; basal area of pronotum and head black; meso- and meta-sternum, as well as femura and median area of basal two abdominal sterna, piceous; elytron with black maculation. See Gordon (1972b) for a thorough discussion on the biology and historical significance of this lady beetle species. In addition to the characters used in the generic key, *R. cardinalis* can usually be distinguished from *A. cicumclusa* by body form that is definitely widest just posterior to the humeral callus, while *R. cardinalis* is widest at the middle of the elytra.

Type locality: Australia

Distribution: Worldwide.

Remarks: The now famous 'Vedalia' beetle has been introduced worldwide, from its native Australia, for the control of the cottony cushion scale *Icerya purchasi*, a serious pest of citrus. According to Wolcott (1948), after its importation from Florida, U.S., into Puerto Rico in 1932, a colony was kept at the Agricultural Experiment Station in Río Piedras with the

purpose of serving as a reservoir for introduction. By 1940 the beetle had spread widely in Puerto Rico, and was even collected on Mona Island. Wolcott also reports the Vedalia beetle feeding on a non-target native scale insect, *Crypticerya montserratensis* (Riley) (Hemiptera: Monophlebidae). Today, this lady beetle remains common wherever the cottony cushion scale is abundant, often bringing complete pest population collapses in very short order.

Anovia circumclusa (Gorham) [Plate IV, Fig. A]

Zenoria circumclusa Gorham, 1899: 262. Korschefsky, 1931: 108.

Blackwelder, 1945: 443.

Anovia circumclusa (Gorham), Gordon, 1972b: 27; Forrester and Vandenberg, (2008); Forrester et al., 2009 (redescription).

Description: Body hemispherical, laterally arcuate and convex. Length 4 to 4.5 mm. Head deflexed, not visible from above; vestiture pale, short, moderately dense, and decumbent. Head width 2x length; dorsal surface with evenly spaced, small, shallow punctures; eyes large, covered entirely by pale, sub-erect setae. Antennae with eight segments. Pronotum with dorsal surface punctate, moderately setose; femur deeply grooved ventrally for reception of tibia; tibia slightly widened at mid-length, ventral surface broader than dorsal, deeply grooved for reception of tarsus. Tarsi trimerous. Epipleuron complete to posterior margin, ventral surface moderately rugose. Postcoxal line incomplete to lateral margin of sternite; six abdominal segments, last narrower, tapering slightly to rounded apex in females; males with emarginated apex. Male genitalia with phallobase widest anteriorly; basal lobe slender, not extended laterally beyond internal margin of parameres. Sipho long, sinuate in apical fourth. Capsule with inner arm short, rounded; outer arm obsolete.

Type locality: Volcán de Chiriqui, Panama.

Distribution: Barbados, Honduras, Mexico, Panama, Puerto Rico; Florida, U.S.

Remarks: USDA-APHIS-PPQ collectors in San Juan first found this lady beetle in Puerto Rico in 2010, apparently the result of a natural invasion. It is not known how this lady beetle entered into Puerto Rico, but it is now widely distributed in all coastal areas throughout the island. These attractive beetles appear to

be associated with the introduction into Puerto Rico of the invasive *Crypticerya genistae* (Hempel) (Hemiptera: Monophlebidae). The latter is a generalist pest, abundant in natural areas, and known to attack Leguminosae, Malvaceae and other economically important plant families.

Subfamily Chilocorinae

The Chilocorinae are characterized by their noticeably and laterally expanded clypei. Antennae appear small, having between seven and 10 segments. The apical segment of maxillary palpi is cylindrical with truncate apex; maxillary cardo expanded or strongly sclerotized. Pronotum is sharply descending laterally, deeply concave on anterior margin. Base of elytron is distinctly broader than apex of pronotum. Metasternum impressed for reception of middle femora. Tibiae are often angulate externally. In most species there are six visible sterna in males, five in females with the exception of *Egius* Mulsant, where the fifth sternum is truncate in males. None of the species in this subfamily is indigenous to Puerto Rico. Most species appear to be scale insect feeders, and some, like *Curinus coeruleus*, are also associated with whiteflies and psyllids.

Key to the Puerto Rican Chilocorinae (After Chapin, 1965)

1. Meso- and meta-tibia with spurs, antenna 10-segmented . . . . 2.

— Tibial spurs absent, but tooth present on outer margin at extremity of tarsal groove. Antenna 8-segmented . . . . . 3.

2. Epipleura foveolate for reception of femora. Elytra blue with no greenish or violaceus sheen. Size 5-6 mm . . . *Curinus coeruleus* (Mulsant).

— Epipleura not as above. Metacoxal arcs complete. Elytra dark violet with bluish or greenish sheen. Size 4-5 mm . . . . . *Cladis nitidula* (Fabricius).

3. Elytra black strongly alutaceous (i.e., leathery) with weak greenish sheen. Pronotum bright yellow. Size 4-6 mm . . . . . .*Egius platycephalus* Mulsant.

— Elytra black, shiny with two bright red stigmata. Size 4-6 mm . . . . . *Chilocorus cacti* (Linnaeus).

Chilocorus cacti (Linnaeus) [Plate I, Fig. D]

Coccinella cacti Linnaeus 1767: 584.

Chilocorus cacti (L.) Mulsant, 1850: 459; Ramos, 1946: 37; Wolcott and Martorell, 1944: 451; Wolcott, 1948: 311; Gordon, 1985: 646.

Description: Form oval, convex. Length 4.5 to 6.1 mm. Color shiny black except large transverse reddish spot or stigmata on elytron. Apical segments of maxillary palpi parallel-sided, apical margins oblique. Prosternal lobe flat, wide. Elytral margin not reflexed, finely beaded; epipleura descending externally, with shallow fovea for reception of femoral apices. Mesosternum, metasternum, and abdomen yellow or red. Dorsal surface smooth, polished, punctures fine and distinct. Abdomen with six visible sterna in male, five in female. Postcoxal line incomplete merging with posterior margin of abdominal sternum as in *Egius*. Leg with stout femora; tibia with external, triangular tooth at basal third; tarsal claw with small, quadrate tooth at base.

Type locality: "*Habitat in America*" (Linnaeus, 1767).

Distribution: Widespread in Caribbean. Bahamas, Barbados, Cuba, St. Vincent, Mona Island, Vieques Island, Puerto Rico; Southern U.S. to Mexico to South America.

Remarks: This widely introduced lady beetle is an important biocontrol agent of scale insects in the Caribbean. Wolcott (1948) indicates that this lady beetle was introduced into Mayagüez, first from Texas, and subsequently in larger numbers from Cuba to control bamboo scales. Wolcott also documents how this species invaded Mona Island and Hispaniola, apparently unaided. Peck (2009) lists *Planococcus citri*, *Phenacoccus gossypii*, *Icerya purchasi*, *Aspidiotus destructor*, *Aleurodicus cocois*, *A. dispersus*, *Coccus viridis*, *Geococcus coffeae*, *Lepidosaphes beckii*, and *Asterolecanium bambusae* as prey. In Puerto Rico, the senior author has observed this species also feeding on cycad scales.

Exochomus* (Cladis) *nitidula (Fabricius) [Plate III, Fig. E]

Coccinella nitidula Fabricius, 1792: 286.

Cladis nitidula (F.) Crotch, 1874: 192. (from Mulsant, 1850: 1033, type *uva* "Clanis"). Syn*: Exochomus uva* Mulsant 1850: 479; Blackwelder 1945: 451. Wolcott 1948: 312; Pluke et al., 2005.

Exochomus (Cladis) *nitidula* (F.) Peck, 2006: 188.

Description: Form oval and convex. Length 4.5 mm. Antenna 10-segmented. Terminal segments of maxillary palpi slightly securiform to parallel-sided. Pronotum reddish orange with central darker area extending and widening from head to scutellum. This beautiful beetle has dark elytra with shiny iridescent greenish or purplish tinges, glabrous and with unequal punctation. Epipleura without foveas for reception of femoral apices. Postcoxal line incomplete, not reaching suture, and arching towards metathorax (as in *Scymnus*). Abdomen with five visible segments in males, six in females.

Type locality: "*Americae Insulis Dom. Isert.*" (Fabricius, 1792); *E. uva*: "*Les Antilles*" Mulsant, 1850.

Distribution: Barbados, Cuba, Dominica, Guadeloupe, Martinique, Puerto Rico, and St. Lucia.

Remarks: According to Wolcott (1948) this species was introduced from Trinidad and Martinique to control bamboo scales. First specimens were released in Mayagüez, and they were shortly reported preying on other Sternorrhynchous hosts, such as *Orthenzia*, *Coccus*, and *Protopulvinaria*. Pluke et al. (2005) found this a common species in citrus orchards, where *C. nitidula* preferred the Asian citrus psyllids, *Diaphorina citri* Kawayama, when offered a choice between different prey, such as aphids. Finally, there is still some debate as to the proper placement of this species, and on the validity of the genus *Exochomus*. Some authors have placed this species in the genus *Exochomus* Redtenbacher (e.g., Peck, 2006 and 2009) based on interpretation of Mulsant's confusing original designation. According to Chapin (1965), *Cladis* differs from *Exochomus* in that postcoxal lines are complete in the latter.

Curinus coeruleus (Mulsant) [Plate III, Fig. F]

Orcus coeruleus Mulsant, 1850: 472.

Curinus coeruleus (Mulsant) Crotch, 1874: 190; Wolcott 1948: 312; Pluke et al., 2005.

Description: Form nearly circular, strongly convex. Antenna 10-segmented. Length 4.8 mm. Head dark blue to greenish. Pronotum shape and color similar to that of *Exochomus nitidula,* except elytra is deep dark blue with faint bluish sheen. Terminal segments of maxillary palpi almost parallel-sided, with apical margins strongly oblique. Epipleura foveate for reception of femoral apices. Postcoxal line incomplete, failing to reach base of ster-

nite, similar to *Exochomus*. Abdomen with six visible sternites in males, five in females. Abdomen black, legs and mouthparts with reddish-orange tint.

Type locality: Brazil.

Distribution: South and Central America, U.S. (Florida), Barbados, Martinique, and Puerto Rico.

Remarks: The metallic blue lady beetle was apparently introduced from Martinique into Mayagüez in the 1930s. Wolcott (1948) remarks that the species self-spread from Mayagüez to Río Piedras shortly after its introduction. These appear to be uncommon lady beetles, occasionally collected from citrus groves in western Puerto Rico. It is somewhat similar to *C. nitidula*, except for its almost perfectly rounded body and deep blue color, hence the specific epithet of *coeruleus*. Among its recorded prey, Soemargono et al. (2008) list the whitefly *Aleurodicus dispersus,* the green scale *Coccus viridis*, the psyllids *Heteropsylla cubana,* and *Diaphorina citri*.

Egius platycephalus Mulsant [Plate III, Fig. D]

Egius platycephalus Mulsant, 1850: 464; Wolcott, 1948:312.

Syn.: *Chilocorus platycephalus* Mulsant in Leng and Mutchler, 1914: 410; Wolcott, 1948: 312.

Description: Form nearly circular, flattened convex, upper surface glabrous. Antenna eight-segmented. Length 4.2 mm. Head and elytra strongly alutaceus, iridescent greenish-purple color. Terminal segment of maxillary palpi elongate and tapered, similar to that of sticholotidines. Pronotum brilliant yellow. Elytrum charcoal black with faint grayish tint. Epipleura not foveate. Postcoxal line reaching bottom inter-segmental suture similar to *Diomus*. Abdomen with six visible sternites in both sexes. Body black with legs and mouthparts with reddish tint.

Type locality: Cuba.

Distribution: Cuba, Puerto Rico.

Remarks: This lady beetle was introduced from Cuba into Mayagüez in the 1930s, presumably to control bamboo scales. This beautiful species can be found throughout Puerto Rico, especially on bamboo feeding on scales. It has not been collected on other islands of the archipelago. Its larvae are black and thorny, and this species usually pupates in large groups of hundreds, generally attached to bamboo stems.

Subfamily Coccinellinae

Members of the Coccinellinae are the most iconic of lady beetles. The red, black and white colors of many of its species represent our collective image of coccinellids. These are the commonly collected red with black aphid predators of childhood books. Species are characterized by glabrous dorsal surfaces; size medium to large. Mandibles with single basal teeth, apex bifid (Coccinellini), or with several teeth arranged in a row (Psylloborini). Apical segments of maxillary palpi securiform. Mentum narrowly articulated with submentum, expanded apically; antenna long, 11-segmented, inserted more or less dorsally; femora elongate, tarsi cryptotetramerous.

Key to the Coccinellinae of Puerto Rico

1. Apex of mandible multi-denticulate with small comb-like denticles; eyes bean-shaped without abrupt emargination; eye with coarse facets; tibia without spurs; elytra with whitish or yellowish colors with black spots; mycophagous on powdery mildews (Haliziini). . . . . 2.

— Apex of mandible bifid; eye circular or oval with an abrupt notch (gena) or digitiform emargination caused by eye canthus; eyes with fine facets; one or a pair of spurs usually present on apex of middle and hind tibia; elytral colors variable (Coccinellini . . . 3.

2. Abdomen black; elytra white with rounded spots; size 2.4 mm . . . . . *Psyllobora nana* Mulsant.

— Abdomen yellowish white; elytra yellowish with small black spots; largest spot runs in central 1/3 of suture; size 2.2 mm . . . . . *Psyllobora lineola* (Fabicius).

3. Postcoxal line of first abdominal ventrite always present, joining or running parallel to posterior margin of ventrite. . . . . 4.

— Postcoxal line absent or recurved toward anterior margin of segment. . . . . 5.

4. Tarsal claw cleft near apical 1/3; pronotum with white convergent marks; elytra red with black spots . . . . . *Hippodamia convergens* Guerin-Meneville.

— Tarsal claw with sub-quadrate basal tooth; metasternum without postcoxal line; no white markings in pronotum; elytra immaculate red or with faint black markings; near aquatic habitats . . . . . *Coleomegilla innotata* (Mulsant).

5. Hind margin of mesepimeron with median triangular projection; pronotum hypomeron with well developed fovea to accommodate antennal club; elytra orange and black markings variable from absent to dominant; size 4.8 mm . . . . . *Coelophora inaequalis* (Fabricius).

— Mesepimeron and pronotum not as above . . . . . 6.

6. Head, abdomen, appendages and elytra dark reddish brown; body very rounded; size 5 mm . . . . *Procula ferriginea* (Olivier).

— Head, elytra and abdomen not as above . . . . . 7.

7. Elytron bright red without black markings; pronotum black with white border and white markings; size 4.2 mm . . . . . *Cycloneda sanguinea* (L.)

— Elytron black with red spot, or pale ashen with minute dark spots; head and anterior margin of pronotum white; size 5.1 mm . . . . . *Olla v-nigrum* (Mulsant)

Tribe Coccinellini

Coccinellinae with body length usually 3.0 mm or more. Worldwide distribution. Head with gena extending onto eye, usually finely faceted; mandible bifid at apex; anterior border of pronotum deeply excavated around head. This group holds the most popularly recognized lady beetles or "mariquitas."

Coelophora inaequalis (Fabricius) [Plate I, Fig. F]

Coccinella inaequalis Fabricius, 1775: 80.

Coelophora inaequalis (F.) Mulsant, 1850: 404; Wolcott, 1948: 312.

Description: Body rounded, convex. Length 3.5 to 5.6 mm; elytron reddish yellow, immaculate, or with black markings; pronotum yellow with black base. Hind margin of mesepimeron with median triangular projection; pronotum hypomeron with well developed fovea to accommodate antennal club; apex of middle and hind tibia each with two spurs. Tarsal claw with large, sub-quadrate basal tooth. Postcoxal line incomplete, reaching neither suture nor border of abdomen. Female genitalia without infundibulum.

Type locality: "la Nouvelle Hollande" (Australia).

Distribution: Worldwide due to their use in classical biological control programs.

Remarks: This is perhaps the most abundant coccinelline lady beetle in Puerto Rico. It has been collected from all elevations, and from Culebra and Caja de Muertos islands. A native of Australia, this lady beetle was introduced from Hawaii in 1938 and released in Mayagüez, Cabo Rojo, and Villalba for the control of sugarcane aphids, e.g., *Sipha flava* (Wolcott, 1948). This species is aphidophagous, but Wolcott (1948) also lists it as feeding on sugarcane leafhopper, *Perkinsiella saccharicida* Kirkaldy. In Puerto Rico, about half of all individuals have immaculate elytra, and variable black markings on the rest.

Coleomegilla innotata (Mulsant) [Plate I, Fig. A]

Megilla innotata Mulsant, 1850: 24; Gundlach, 1893: 342; Leng and Mutchler, 1914: 409.

Coleomegilla innotata (Mulsant), Blackwelder, 1945: 453; Wolcott, 1948: 314.

Description: Body oval and elongate, with femur usually visible beyond lateral margin of elytron. Length 3.1 to 6.4 mm; head black with a pale longitudinal spot in frons between eyes, but not extending into clypeus. Pronotum mostly black with broad reddish border, except at base. Elytra red, and in most specimens, immaculate. Where maculation appears it is very faint, and generally these individuals are rare. Legs, abdomen black and pubescent. Postcoxal line absent. Apex of middle and hind tibiae each with two spurs. Tarsal claw with subquadrate basal tooth. Postcoxal line on abdomen lacking. Female genitalia with small infundibulum.

Type locality: "*Les Antilles.*"

Distribution: Puerto Rico. Likely endemic.

Remarks: A common species in and around aquatic habitats, and at all elevations. The species is only found in Puerto Rico with no records from adjacent islands. Mulsant (1850) described this species from material in Dejean's collection, and the specimen was only marked with location "Les Antilles" (no date). It is likely that this individual was one collected by Ledru in 1797, as no other expedition records exist in the 19th century before Gundlach's in the 1860s. The species appears to be a close relative of *C. maculata* (DeGeer), a common species in North America, South America and some Caribbean islands, such as Hispaniola. *Coleomegilla innotata* is presumably aphidophagous, but

it is common to see adults feeding on flower nectar and pollen. Some specimens have been collected at light. An encyrtid parasitic wasp, *Homalostylus terminalis* Say (identified as *H. obscurus* Howard), is recorded attacking this endemic lady beetle (Jones, 1915).

Cycloneda sanguinea (L.) ssp. ***limbifer*** Casey [Plate I, Fig. B]

Coccinella sanguinea Linnaeus, 1763: 10;
Daulis sanguinea (L.) Mulsant, 1850: 326;
Neda sanguinea (L.) Weise 1887: 167; Gundlach, 1893: 343.
Cycloneda sanguinea (L.) Crotch, 1874:164; Leng and Mutchler, 1914: 410; Ramos, 1946: 37; Wolcott, 1948: 313.

Description: A large lady beetle with length 3.2 to 5.2 mm and a median length of 4.2 mm. Eyes, legs and body black. Males with white head, while females with black marking on frons. Pronotum mostly black with white areas near lateral border and two isolated white spots enclosed by black area; males with median white line that extends ventrad from anterior border of pronotum, between the white spots, towards the scutellum. Prosternum and procoxa mostly white in males; elytra orange to red and immaculate. Female genitalia with sclerotized infundibulum.

Type locality: "L'Amerique" (Linneaus, 1763).

Distribution: Western Hemisphere, from southern U.S. to Argentina.

Remarks: North American species are revised in Vandenberg (2002b). Casey (1899) designated the subspecies occurring in the West Indies as *sanguinea limbifer*. This taxon is distinguished from other subspecies, such as *C. s. sanguinea*, *C. s. immaculata,* and *C. s. rubripennis,* by the black lateral border of the elytra. All specimens examined from local collections have this characteristic, some, however, very faintly so. This lady beetle is one of the most commonly seen in Puerto Rico and is found at all elevations. Frequency distribution data suggests that adults are least common during the warmer months of June through August. It is an important aphidophagous species and has been collected associated with aphids in corn, sorghum, eggplant, citrus, and crepe myrtle (*Lagoerstroemia* sp.). There are records of this species from Caja de Muertos, Culebra, Mona, and Vieques islands. Leonard (1933) identified the encyrtid parasitic wasp *Homalotylus terminalis* Say as an important source of mortality of this lady beetle. *Homalotylus terminalis* (as *H. obscurus*

Howard) is also recorded attacking the endemic *Coleomegilla innotata* (Jones, 1915).

Hippodamia convergens Guérin-Méneville [Plate I, Fig. E]
Hippodamia convergens Guérin-Méneville, 1842: 321; Leng and Mutchler, 1917: 200; Wolcott, 1948: 314.

Description: Body elongate and oval, with femur visible beyond lateral margin of elytron. Length 5.2 to 7.0 mm. Pronotum black with two pale spots, convergent towards scutellum, and a white margin, except at base; elytron red, typically with full complement of small black spots, varying from that pattern to nearly immaculate. Body, legs black, with tarsal cleft arising in apical 1/3. Dorsal color usually red with black maculae. Apex of middle and hind tibiae each with two spurs. Each front and middle tarsus of male dilated in some species, unmodified in others. Postcoxal line on abdomen very feeble or absent. Female genitalia with large infundibulum.

Type locality: Mexico and California (Gordon, 1985).

Distribution: Range of *H. convergens*, from Canada to the Antilles, and Central and South America (Chapin, 1946).

Remarks: This is perhaps the largest lady beetle on the islands of Puerto Rico, with specimens of up to 7.0 mm. Specimens are normally maculate but a range of maculation exists with some specimens nearly immaculate. *Hippodamia convergens* was first introduced into Mayagüez from California in 1912 by USDA entomologist C.W. Hooker to control sugarcane aphids, as reported by R.H. Van Zwaluwenburg (Wolcott, 1948). Wolcott also reported that the species had not been seen since and may have become extinct shortly after its introduction. In fact, no specimens are found in Puerto Rico collections until 1979, when a couple of individuals were collected from Mayagüez labeled "*Mayagüez, P.R. Finca RUM. Zea mays. Abril 28, 1979. A.M. Armstrong*") (MEBT 034421, 034421). Now the species is frequently found in coastal areas and associated with aphid populations in cropland. The senior author has seen it preying on *Aphis gossypii* in pumpkin and on *Rhopalosiphum maidis* on sorghum and corn.

Olla v-nigrum (Mulsant) [Plate I, Fig. C]
Harmonia v-nigrum Mulsant 1866: 64.
Coccinella abdominalis Say, 1824: 295.
Cycloneda sayi Crotch, 1871: 6.

Cycloneda abdominalis: Crotch, 1874:163; Gorham, 1892: 172.
Olla abdominalis: Casey, 1899: 93.
Olla v-nigrum: (Mulsant) Timberlake, 1943: 24.

Description: Body round, convex. Length 4.5 to 5.7 mm; width 3.8 to 5.2 mm. Body color black. Elytra with red macula on anterior half. Head, mouthparts dark brown. Eyes, legs black. Tarsi cryptotetramerous. Prothorax black with anterior margin white, explanate. Thoracic sternites dark brown, except mesepimeron and metepimeron white. Prosternum with no carina. Elytra black with pale red macula. Six sternites visible. Sternites brown to reddish brown. Male genitalia phallobase elongated, parameres longer than base. Sipho stout, short, strongly bifurcated apically.

Type locality: Oaxaca, Mexico.

Distribution: North America and the West Indies.

Remarks: This is an aphidophagous species not recorded by Wolcott (1948) and presumably introduced since. This species was first collected in Puerto Rico from Añasco in 1981 by R. Inglés and N. Semidey (MEBT 033458). Other early collections include specimens at MEBT from 1984 ("*Isabela. 2-II-1984. R. A. Franqui*"); and from 1986 ("*P.R. Acc. No. 197-86. Lajas, PR. Rice plants. May 19, 1986. S. Medina-Gaud and A. Pantoja*" and "*P.R. Acc. No. 410-86. Isabela, PR., Playa Jobos. Weeds. Aug. 11, 1986. N. Virkki*". It is likely that this species was present here earlier but may have been mistaken for the more common *Chilocorus cacti*, which it resembles superficially in being entirely black and "twice stabbed" with red spots. *Olla v-nigrum* has two color variants: a dark form which is the most commonly collected, and a strikingly different pale form of which there is only one collected specimen in MEBT, labeled "*Quebradilla [sic]. Bo. San Antonio. 13.X.2008. D. Padín.*"

Procula ferruginea Olivier [Plate II, Fig. D]
Coccinella ferruginea Olivier, 1808:991.
Daulis ferruginea (Olivier) Mulsant, 1850:323.
Neda ferruginea (Olivier) Gundlach, 1893:343; Leng and Mutchler, 1914:410.
Procula ferruginea (Olivier) Blackwelder, 1945; Wolcott, 1948:313.

Description: Body round and convex; length 5.1 mm. Body dark rusty brown, hence its specific name "*ferruginea*". Head, abdomen, thorax, pronotum and elytra, of the same color. Some specimens with pronotum slightly paler with weakly marked spots.

Type locality: Haiti.

Distribution: Hispaniola, Puerto Rico.

Remarks: This is the largest indigenous coccinellid in Puerto Rico. A large dull brown coccinellid usually collected from mid- to higher elevations, but some specimens have been collected from coastal locations. The species tends to be uncommon, and can be more successfully collected by beating trees, such as citrus. Wolcott (1948) suggests that psyllids may be part of its diet.

Other Coccinellini Records

Recently, a single individual of the multicolored Asian lady beetle, *Harmonia axyridis* (Pallas) [Plate II, Figure C] was collected in Hatillo by an entomology student. This species is an extremely polyphagous predatory lady beetle, 5 to 8 mm long, variable in color pattern (yellow to orange to black) with a variable number of spots (0 to 21). It is native to Central and Eastern Asia, but human and natural introductions have spread this beneficial insect worldwide. No further collections of this beetle are on record.

Tribe Halyziini

Coccinellinae with body length usually 3.0 mm or less; head with gena not extending onto eye; eye coarsely faceted; mandible with five teeth, two apical, three internal; anterior border of pronotum weakly emarginate, partially concealing head. In *Diomus* type postcoxal line incomplete. Most species are neotropical. Members of *Psyllobora* are known to feed on fungus, particularly powdery mildew. Other hosts such as mites, aphids, and scale insects have been recorded in the literature, but much of this data is likely the result of inaccurate observation and assumption (Gordon, 1985).

Psyllobora lineola (Fabricius) [Plate II, Fig. A]

Coccinella lineola Fabricius, 1792: 283.

Psyllobora lineola (F.) Mulsant, 1850: 185; Gundlach, 1893: 342; Crotch 1874: 141; Gundlach, 1893: 342; Leng and Mutchler, 1917: 200; Blackwelder, 1945: 455; Ramos, 1946: 37; Wolcott, 1948: 314.

Description: Body strongly oval and convex. Length 2.0 to 2.5 mm. Head yellowish with eyes black. Mouthparts, antenna and legs pale yellow. Abdomen pale yellowish brown. Some specimens with part of metaventrite dark brown. Prothorax covering head,

white with four spots. Elytra yellowish white distad from callus, with small isolated black spots, including one elongated running through middle third of suture.

Type locality: According to Fabricius (1792): "Les Iles de L'Amerique".

Distribution: Widespread in Caribbean, recorded from Guadeloupe, Jamaica, Martinique, Caja de Muertos Island, Mona Island, Puerto Rico, St. Eustatius, and St. Thomas.

Remarks: This species is slightly smaller than its congener *P. nana*, with smaller black spots and brighter yellow colors on the elytra. Judging by the number of specimens in collections, apparently this species is also less abundant or more difficult to collect than *P. nana*. The small lady beetle appears to be distributed throughout the island, including at higher elevations, such as Orocovis and Maricao. We have seen adults and larvae feeding on the powdery mildew *Erysiphe* (=Golovinomyces) *cichoracearum* (Erysiphales) infecting *Prosopis* sp. in Guánica. Larvae are pale yellow and very active during the day, apparently in search of fungal bodies.

Psyllobora nana Mulsant [Plate II, Fig. B]

Psyllobora nana Mulsant, 1850:181; Crotch 1874:141; Gundlach, 1893: 342; Leng and Mutchler, 1917: 200; Blackwelder, 1945: 455; Ramos, 1946: 37; Wolcott, 1948: 314.

Description: Body oval and convex. Length 2.0 to 2.8 mm. Head white with black spot on frons; eyes black. Mouthparts, antenna and legs pale yellow. Abdomen black, except for mesepimeron and metepistenum stramineus white. Prothorax covering head, stramineus white with five spots. Elytra pale white with eight to nine black spots. Yellowish or orange tinge towards outer border of elytra apparent in some specimens when freshly collected.

Type locality: Cuba.

Distribution: Widespread in Caribbean, recorded from: Bahamas, Cuba, Hispaniola, Jamaica, Mona Island; Puerto Rico, and St. Thomas.

Remarks: This lady beetle is easily distinguished from *P. lineola* by its much larger black spots on the elytra. Freshly collected specimens are brilliantly colored with elytra yellow and sometimes orange tinged. *Psyllobora nana* seems to be better represented in older collections than in more recent ones. All specimens examined (n=134 adults) were collected from lower and coastal

elevations, including Mona Island. The species is presumably a predator of fungi, with several collection records on pumpkin, cassava, and guava. Ramos (1946) found it attracted to light on Mona Island.

Checklist of Coccinellidae in Puerto Rico

Subfamily **Chilocorinae**

TRIBE Chilocorini

1. *Chilocorus cacti* (L.)
2. *Curinus coeruleus* (Mulsant)
3. *Egius platycephalus* Mulsant
4. *Exochomus* (=Cladis) *nitidula* (F.)

Subfamily **Coccidulinae**

TRIBE Azyini

5. *Pseudoazya trinitatis* (Marshall)

TRIBE Coccidulini

6. *Psorolyma maxillosa* Sicard

TRIBE Noviini

7. *Anovia circumclusa* (Gorham)
8. *Rodolia cardinalis* (Mulsant)

Subfamily **Coccinellinae**

TRIBE Coccinellini

9. *Coelophora inaequalis* (F.)
10. *Coleomegilla innotata* (Mulsant)
11. *Cycloneda sanguinea* (L.)
12. *Harmonia axyridis* (Pallas)
13. *Hippodamia convergens* Guérin-Méneville
14. *Olla v-nigrum* (Mulsant)
15. *Procula ferruginea* (Olivier)

TRIBE Halyziini

16. *Psyllobora lineola* (F.)
17. *Psyllobora nana* Mulsant

Subfamily **Scymninae**

TRIBE Brachiacanthini

18. *Brachiacantha bistripustulata* (F.)

TRIBE Diomini

19. *Decadiomus austrinus* (Gordon)
20. *Decadiomus hayuyai* Otero
21. *Decadiomus martorelli* Segarra
22. *Decadiomus pictus* Chapin
23. *Decadioumus ramosi* Segarra
24. *Decadiomus tricuspis* Chapin
25. *Diomus ochroderus* (Mulsant)
26. *Diomus roseicollis* (Mulsant)

TRIBE Hyperaspidini

27. *Hyperaspidius* sp.
28. *Hyperaspis connectens* (Thunberg)
29. *Hyperaspis festiva* Mulsant
30. *Hyperaspis onerata* (Mulsant)

TRIBE Pentiliini

31. *Pentilia discors* Gorham
32. *Pentilia egena* Mulsant

TRIBE Scymnillini

33. *Zilus barbosi* n. sp.
34. *Zilus cyanescens* (Sicard)
35. *Zilus gilvifrons* Chapin
36. *Zilus variipennis* Sicard

TRIBE Scymnini

37. *Cryptolaemus montrouzieri* Mulsant
38. *Nephaspis acuta* Gonzalez
39. *Nephaspis magnopunctata* Gordon
40. *Scymnobius bilucernarius* (Mulsant)
41. *Scymnus creperus* Mulsant
42. *Scymnus floralis* (F.)

TRIBE Stethorini

43. *Parastethorus histrio* (Chazeau)
44. *Stethorus caribus* Gordon
45. *Stethorus tridens* Gordon

Subfamily **Sticholotidinae**

TRIBE Microweisini

46. *Coccidophilus cariba* Gordon

TRIBE Serangiini

47. *Delphastus chapini* Gordon
48. Delphastus nebulosus Chapin

TRIBE Sticholotidini

49. *Lenasa jayuyai* Gordon
50. *Neaptera doyeni* Gordon
51. *Neaptera viridissima* Gordon
52. *Semiviride loisobrienae* Gordon
53. *Semiviride portoricensis* Gordon

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TABLE 1.—*LIST OF COCCINELLID SPECIES INTRODUCED TO PUERTO RICO.*

Subfamily	Species	Origin	Intended Prey	Status	Reference
Chilocorinae	*Chilocorus cacti* (L.)	Texas, Louisiana and Cuba (1938)	Armored scales (Diapididae)	Established and common	USDA, 1939; Wolcott, 1948
	Cladis nitidula (F.)	Martinique (1938)	Bamboo scales	Established and common	USDA, 1939; 1940
	Curinus coeruleus (Mulsant)	Trinidad (1938)	Bamboo scales	Established and common	USDA, 1939; Wolcott, 1948
	Egius platycephalus Mulsant	Cuba (1938)	Pit scale insects (Asterolecaniidae)	Established and common	USDA, 1939
	Exochomus (=Neda) *jourdani* (Mulsant)	Brazil (1939)	Scale insects	Not collected since	USDA, 1940
	Exochomus orbiculus Weise	Brazil (1938-1939)	Bamboo scales	Not collected since	USDA, 1939
Coccidulinae	*Azya luteipes* Mulsant	Brazil (1938)	Scale insects	Not collected since	USDA, 1939
	Azya arbigera Mulsant	Venezuela (1926)	Scale insects	Not collected since	Wolcott, 1948
	Pseudoazya trinitatis (Marshall)	Trinidad (1936-1940) Guyana (1938)	Scale insects, Coconut scales, *Aspidiotus destructor*	Established and uncommon	USDA, 1938; 1939 Wolcott, 1948
	Rodolia cardinalis (Mulsant)	Australia via Florida (1932)	*Icerya purchasi*	Established and common	Wolcott, 1948
Coccinellinae	*Coelophora inaequalis* (F.)	Australia via Hawaii, (1938)	Sugarcane aphid, *Sipha flava*	Established and abundant	USDA, 1939
	Hippodamia convergens Guerin	California (1912)	Aphids	Established and common	Wolcott, 1948
Epilachninae	*Mada* (=*Ladoria*) *desarmata* (Mulsant)	Brazil (1939)	Scale insects	Not collected since	USDA, 1940

TABLE 1—*(CONTINUED) LIST OF COCCINELLID SPECIES INTRODUCED TO PUERTO RICO.*

Subfamily	Species	Origin	Intended Prey	Status	Reference
Scymninae	*Cryptognatha nodiceps* Marshall	Trinidad (1936, 1939)	Coconut scales, *Aspidiotus destructor*	Not collected since 1948	Donahian, 1937; Wolcott, 1948
	Cryptognatha simillima Sicard	Trinidad (1936)	Coconut scales	Not collected since	Donahian, 1937; Wolcott, 1948
	Cryptolaemus montrouzieri Mulsant	Australia via California (1911)	Pineapple and Sugarcane mealybugs	Established and abundant	USDA, 1913, Wolcott, 1948
	Hyperaspis billoti Mulsant	Trinidad (1939)	Citrus scales	Not collected since	USDA, 1940
	Hyperaspis trilineata Mulsant	Barbados (1932-1935)	Sugarcane mealybugs	Not collected since	Wolcott, 1948
	Pentilia discors Gorham	Trinidad (1936-1938); Guyana (1938); Brazil (1939)	Coconut scales	Established uncommon	Dohanian, 1937; USDA, 1939
	Pentilia egena Mulsant	Brazil (1939)	Coconut scales	Established uncommon	USDA, 1940; Wolcott, 1948
	Pentilia insidiosa (=castanea) Mulsant	Trinidad (1936-1938); Guyana (1938); Brazil (1939)	Coconut scales	Not collected since	Dohanian, 1937; USDA, 1939
	Scymnodes (=Platyomus) lividigaster (Mulsant)	Australia via Hawaii (1938)	Yellow Sugarcane Aphid	Not collected since	USDA, 1939
	Zagloba (=Scymnus) *aeneipennis* (Sicard)	Trinidad (1937-1939)	Coconut scales	Not collected since	USDA, 1939
Sticholotidinae	*Delphastus* sp.	Trinidad (1937-1939)	Bamboo scales	Unknown	USDA, 1939

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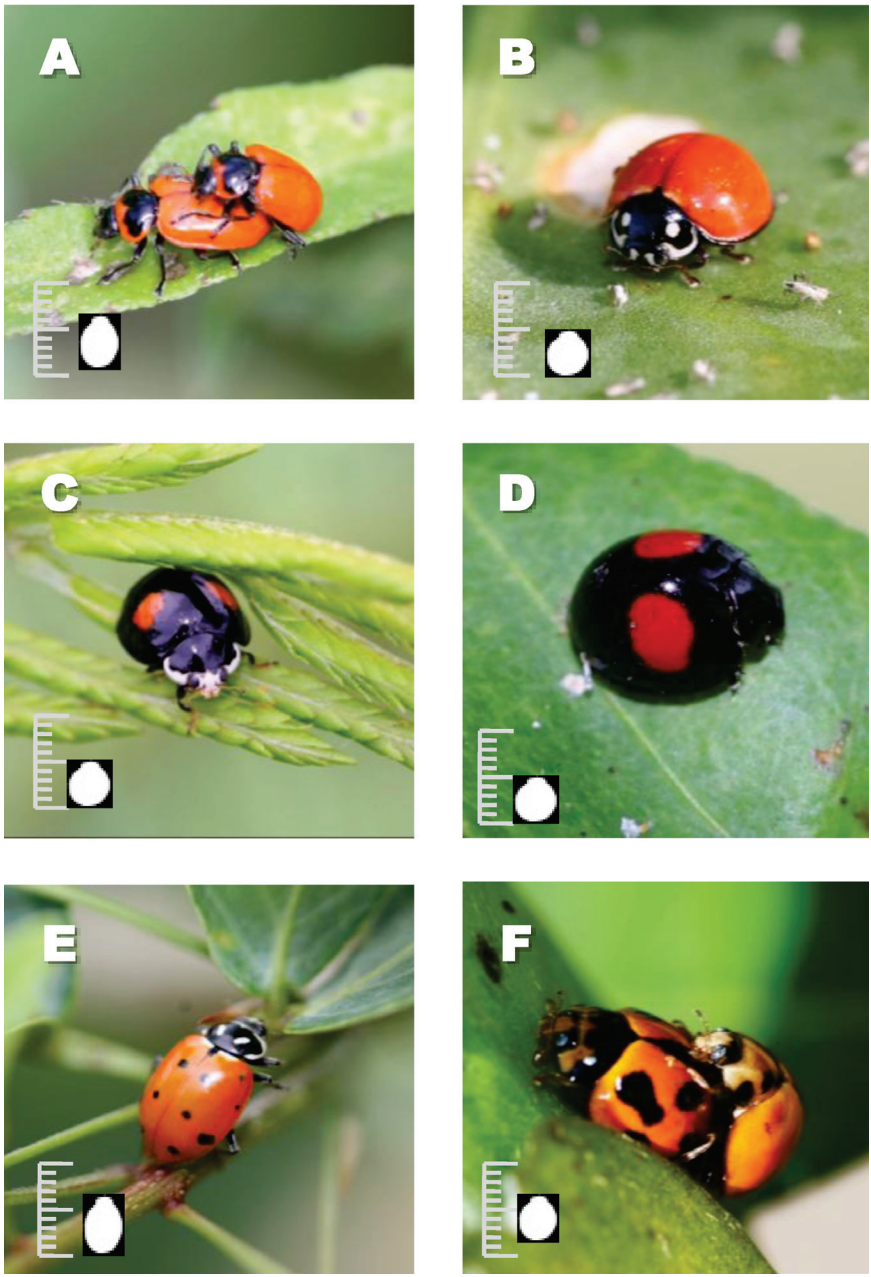

PLATE I. Habitus: A- *Coleomegilla innotata* (Mulsant); B- *Cycloneda sanguinea* (L); C- *Olla v-nigrum* (Mulsant); D- *Chilocorus cacti* (L.); E- *Hippodamia convergens* Guérin-Méneville; and F- *Coelophora inaequalis* (F.).

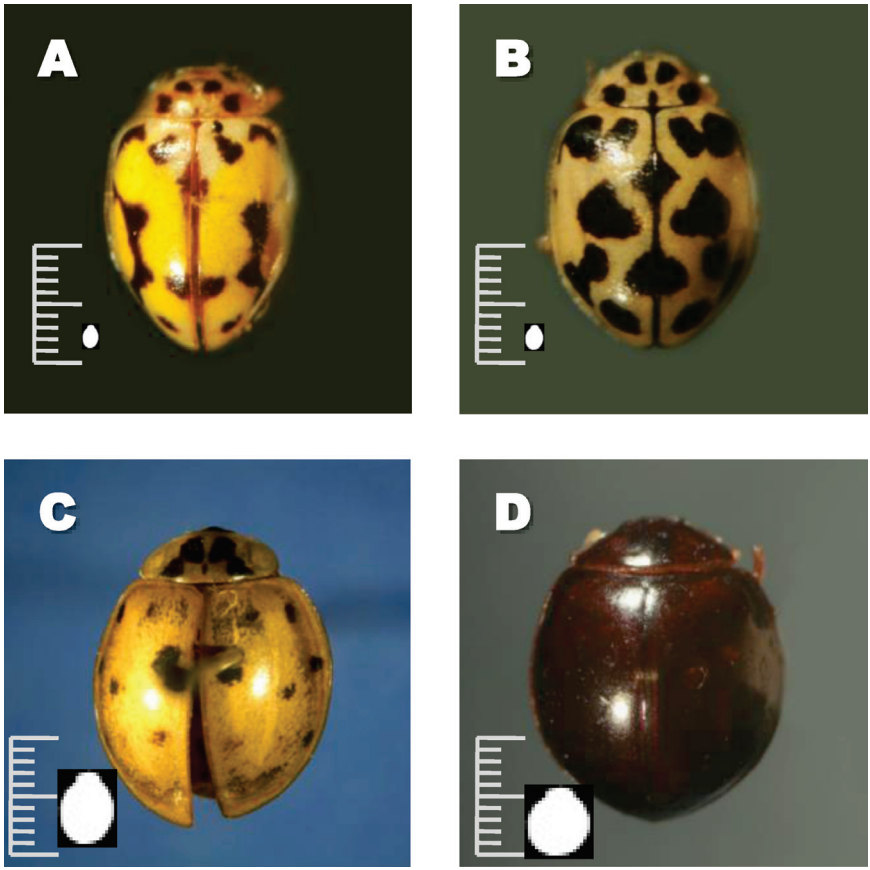

PLATE II. Habitus: A- *Psyllobora lineola* (F.); B- *Psyllobora nana* Mulsant; C- *Harmonia axyridis*; and D- *Procula ferruginea* (Olivier).

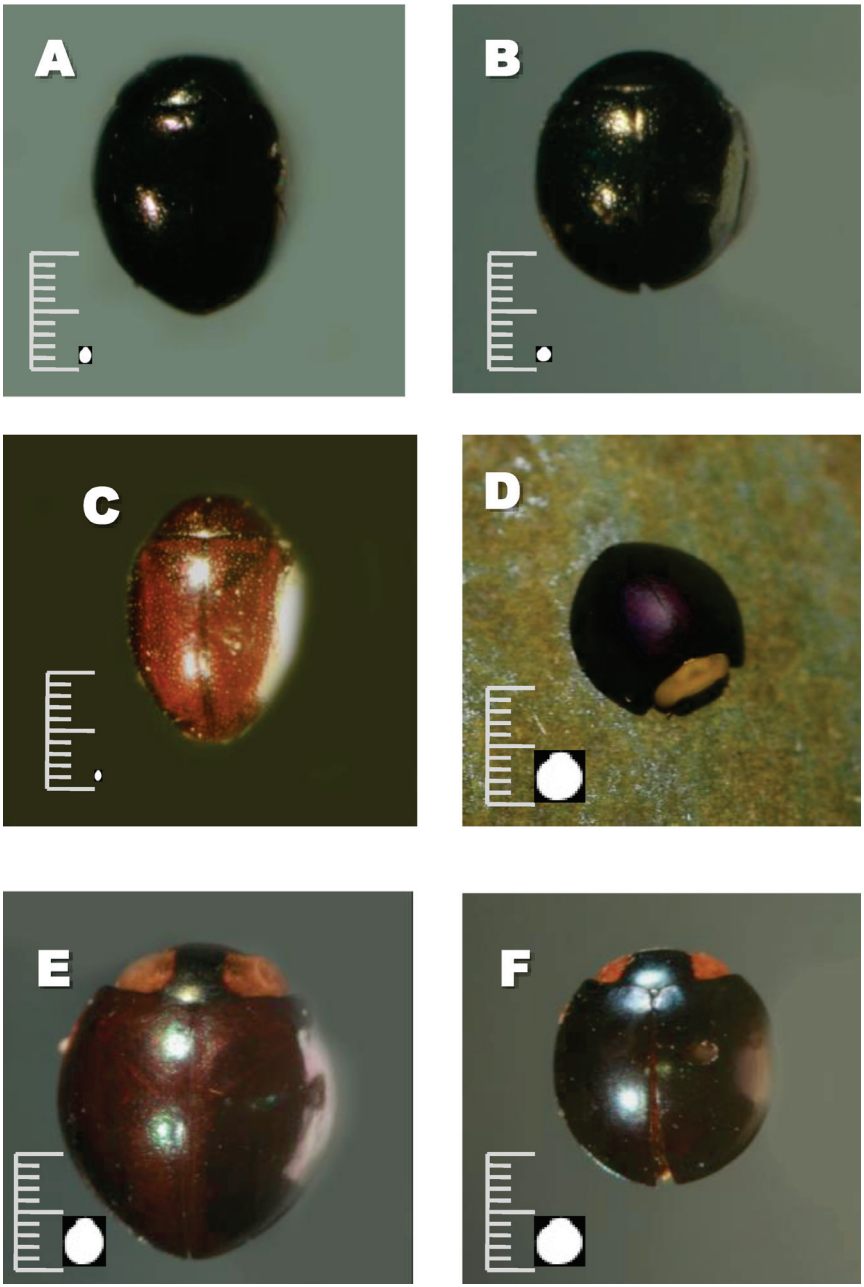

PLATE III. Habitus: A- *Semiviride loisobrienae* Gordon; B- *Lenasa jayuyai* Gordon; C- *Coccidophilus cariba* Gordon; D- *Egius platycephalus* Mulsant; E- *Cladis nitidula* (F.); and F- *Curinus coeruleus* (Mulsant).

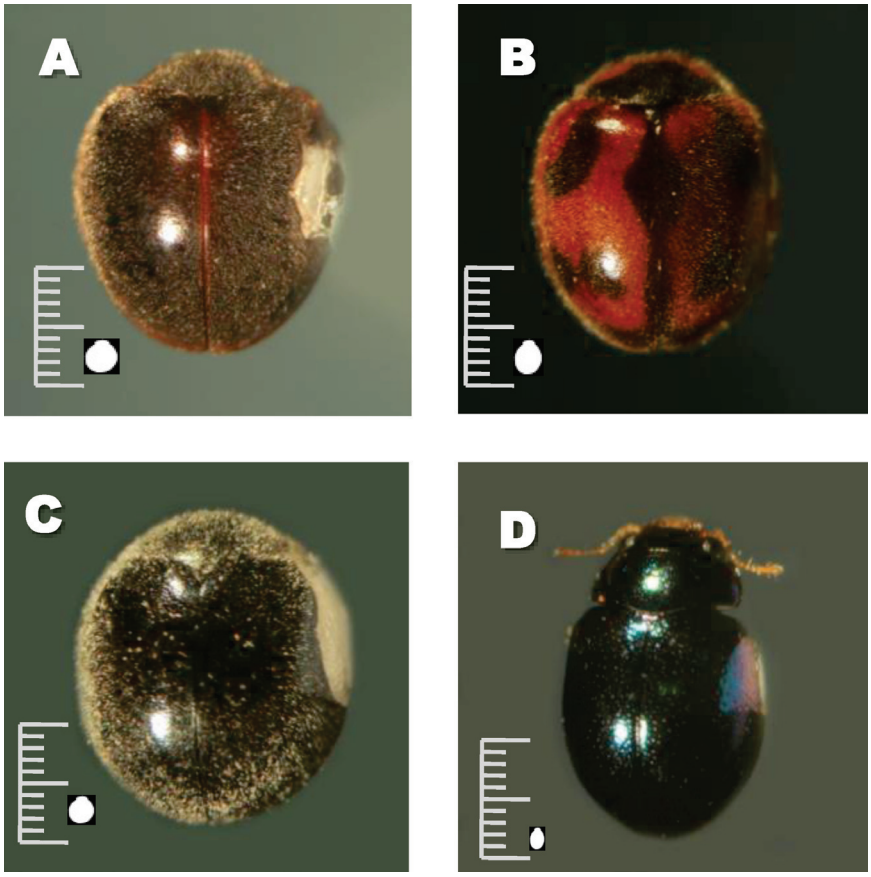

PLATE IV. Habitus : A- *Anovia circumclusa* (Gorham); B- *Rodolia cardinalis* (Mulsant); C- *Pseudoazya trinitaris* (Marshall); and D- *Psorolyma maxillosa* Sicard.

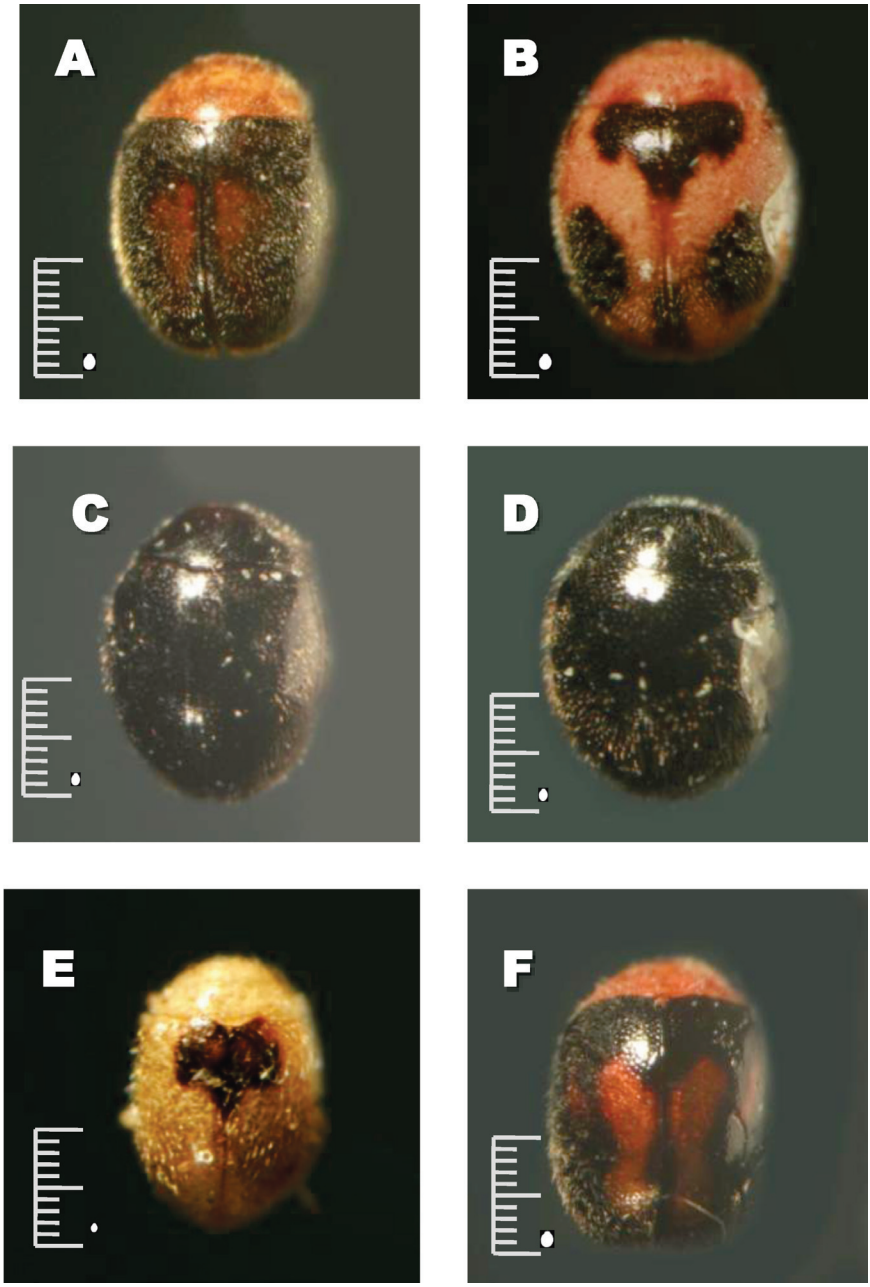

PLATE V. Habitus: A- *Decadiomus ramosi* Segarra & Otero; B- *Decadiomus pictus* Chapin; C- *Decadiomus martorelli* Segarra & Otero; D- *Decadiomus austrinus* (Gordon); E- *Decadiomus tricuspis* Chapin; and F- *Decadiomus hayuyai* Otero.

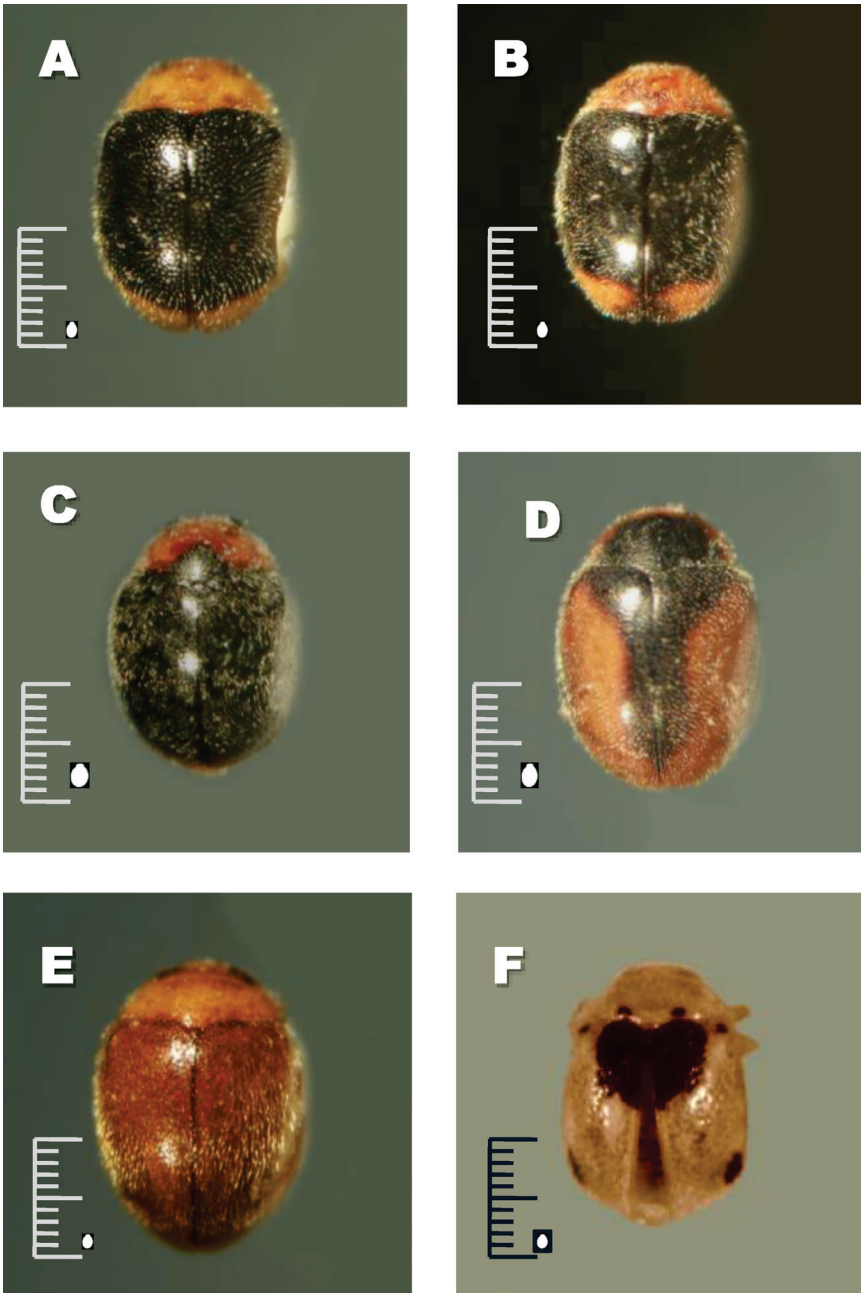

PLATE VI. Habitus: A- *Diomus ochroderus* (Mulsant); B- *Diomus roseicollis* (Mulsant); C- *Scymnus creperus* Mulsant; D- *Scymnus floralis* (F.); E- *Nephaspis acuta* Gonzalez; and F- *Nephaspis magnopunctata* Gordon.

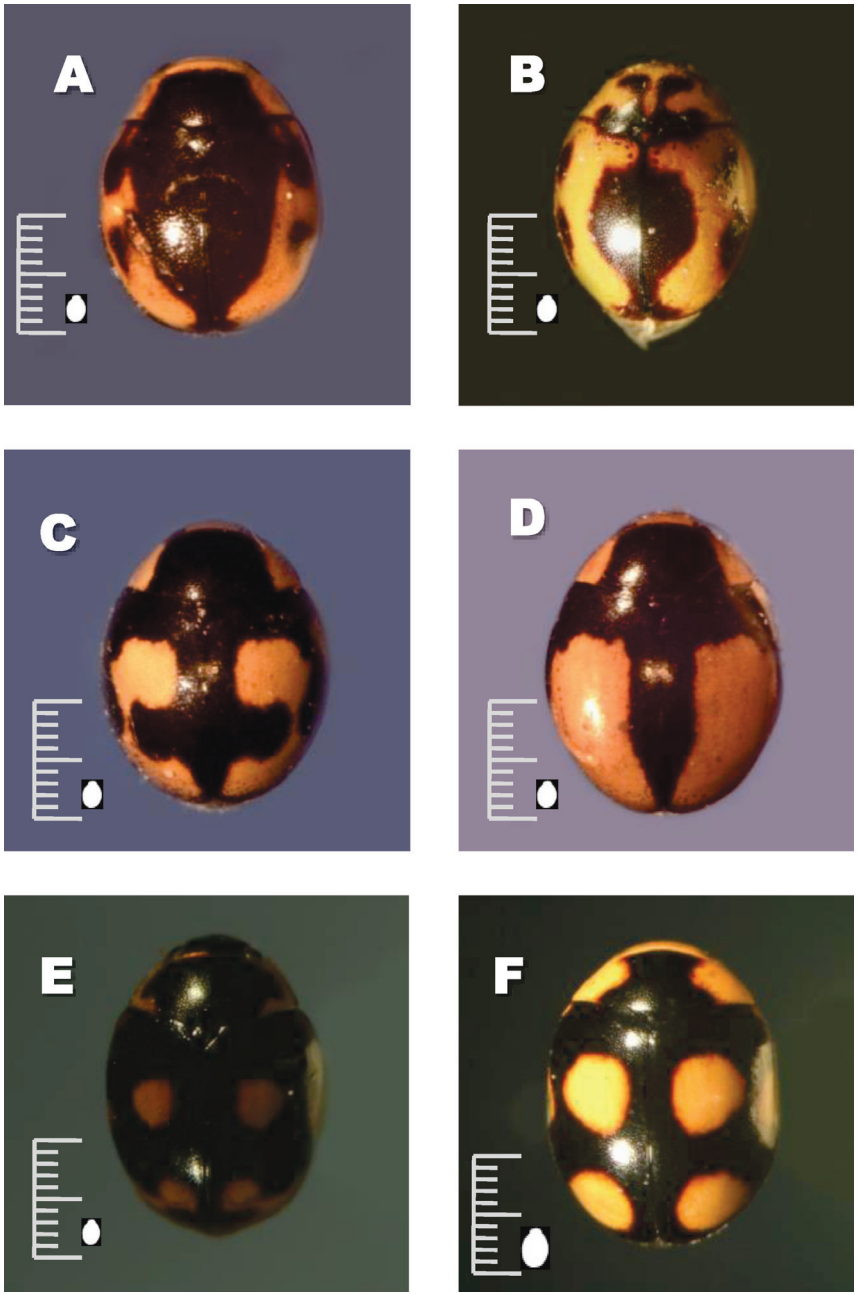

PLATE VII. Habitus: A- *Hyperaspis onerata* (Mulsant) dark form; B- *Hyperaspis onerata* light form; C- *Hyperaspis connectens* (Thunberg) dark form; D- *Hyperaspis connectens* light form; E- *Hyperaspis festiva* Mulsant; and F- *Brachiacantha bistripustulata* (F.).

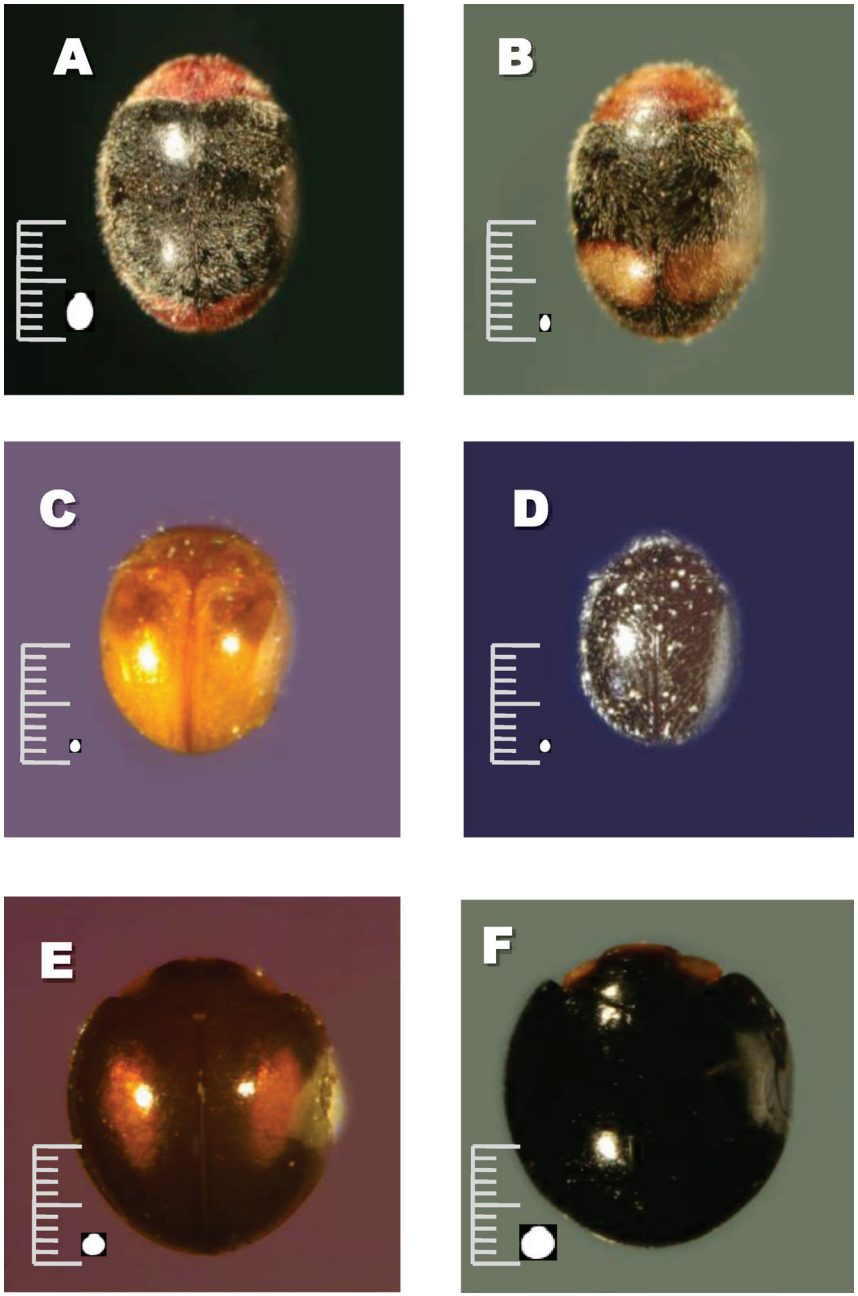

PLATE VIII. Habitus: A- *Cryptolaemus montrouzieri* Mulsant; B- *Scymnobius bilucernarius* (Mulsant); C- *Delphastus nebulosus* Chapin; D- *Stethorus caribus* Gordon & Chapin; E- *Pentilia discors* Gorham; F- *Pentilia egena* Mulsant.

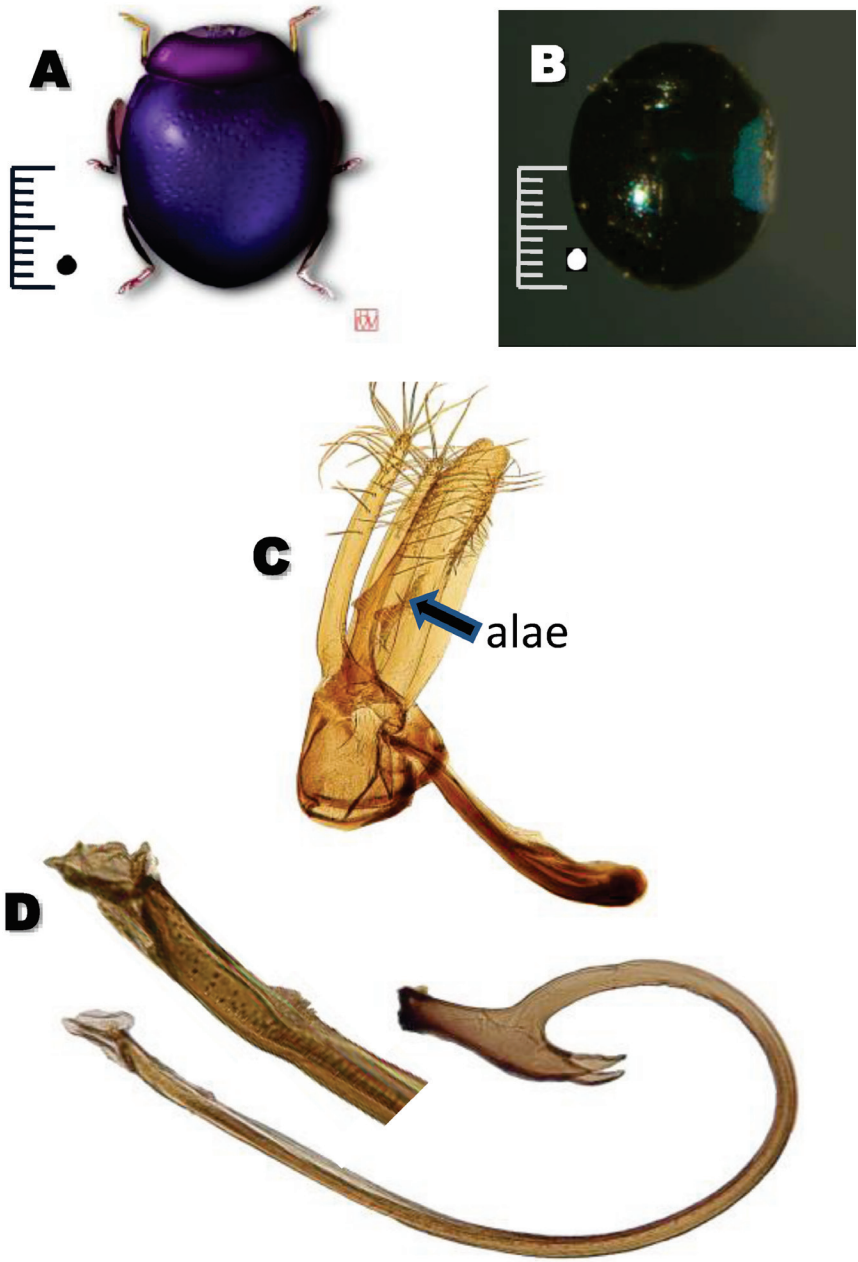

PLATE IX. *Zilus gilvifrons* (Chapin): A- Habitus illustration; B- Habitus picture; C- Lateral view of phallobase with pointer on alae; D- Sipho and tip enlargement.

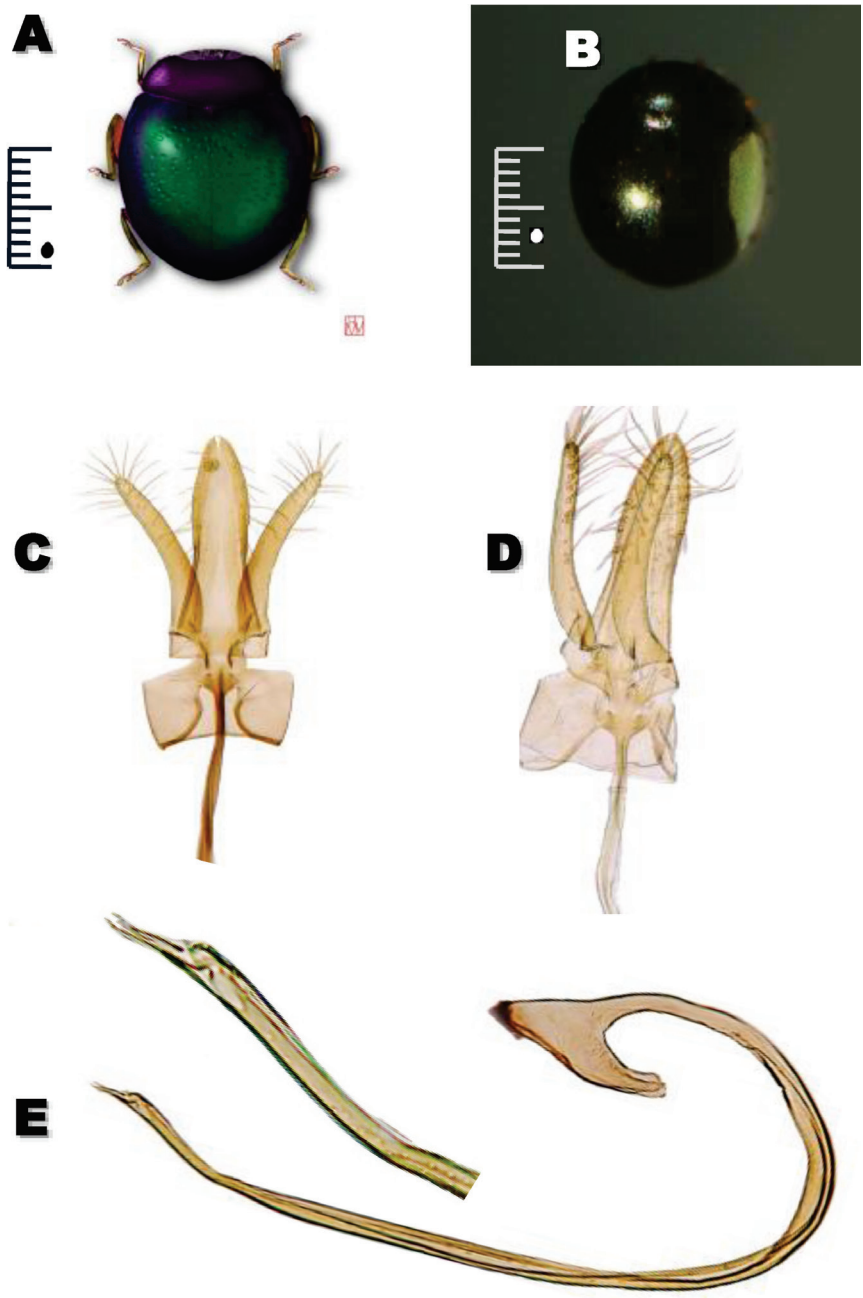

PLATE X. *Zilus barbosi* sp. nov.: A- Habitus illustration; B- Habitus picture; C- Dorsal view of phallobase; D- Lateral view of phallobase; E- Sipho and tip enlargement.

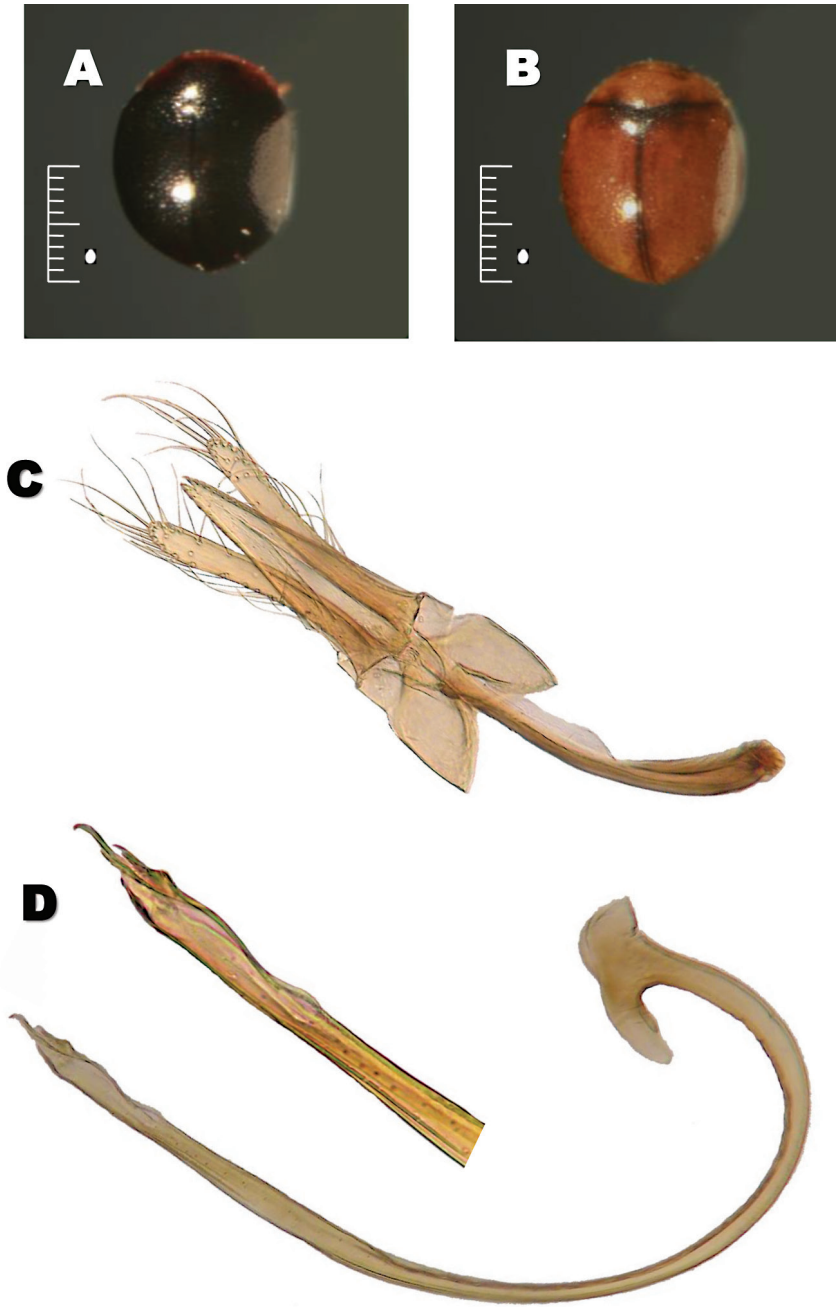

PLATE XI. *Zilus variipennis* (Sicard): A- Habitus dark form; B- Habitus light form; C- Lateral view of phallobase; D- Sipho and tip enlargement.

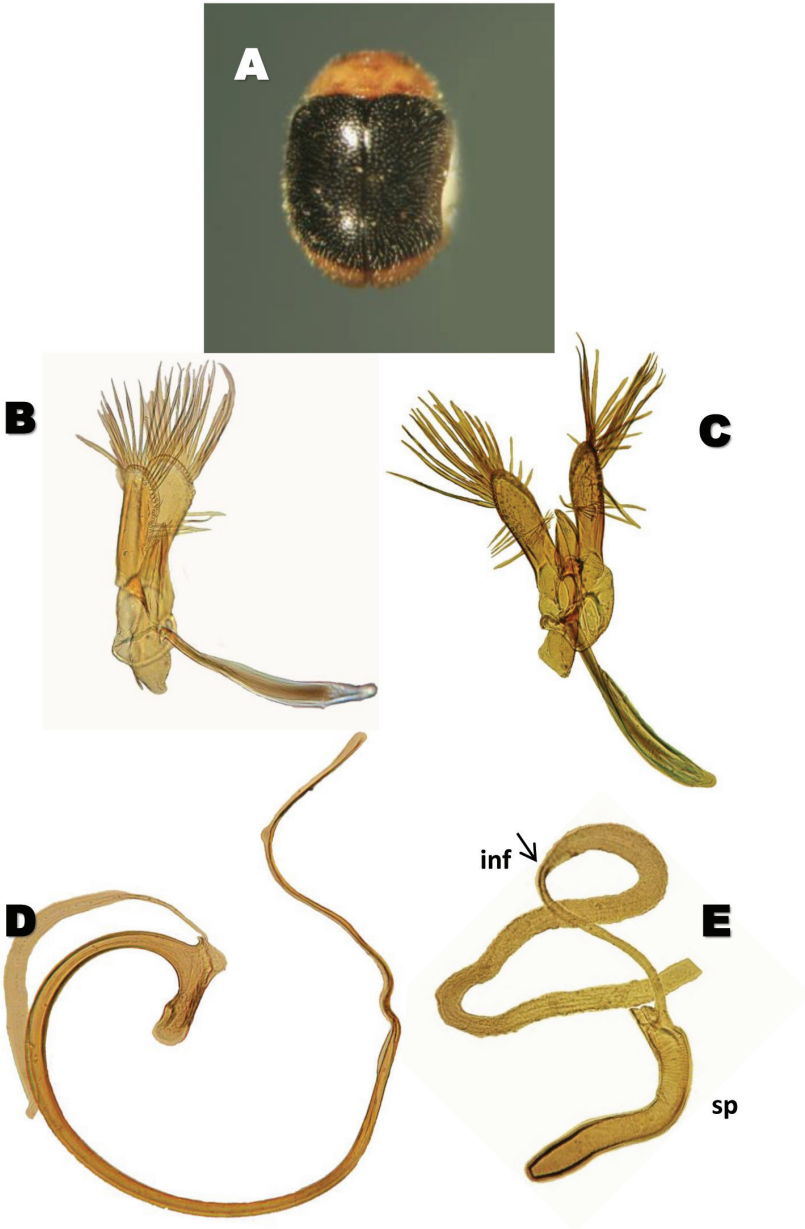

PLATE XII. *Diomus ochroderus* (Mulsant): A- Habitus; B- Lateral view of phallobase; C- Latero-ventral view phallobase; D- Sipho; E- Spermatheca (sp), infundibulum (inf), and duct.

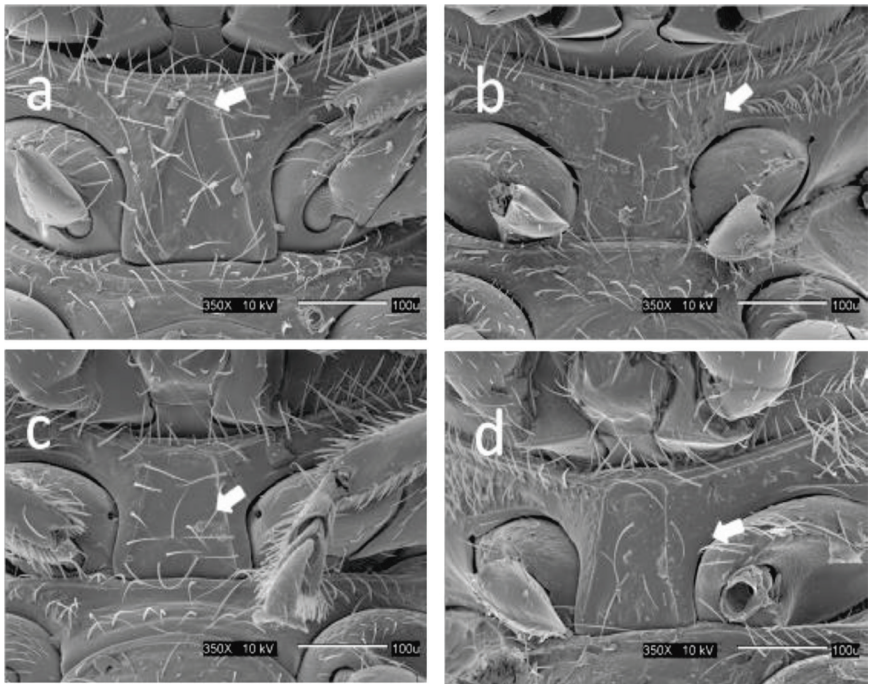

PLATE XIII. Prosternal carina of *Decadiomus* species: (a) *D. martorelli*; (b) *D. austrinus*; (c) *D. hayuyai*; and (d) *D. ramosi*.