

## A revision of the *Sclerocoelus galapagensis* group (Diptera: Sphaeroceridae: Limosiniinae)

S. A. Marshall

Department of Environmental Biology, University of Guelph,  
Guelph, Ontario, N1G 2W1, Canada.

**Abstract:** The *Sclerocoelus galapagensis* group is defined and revised, including the description of *S. galapagensis* new species from the Galapagos Islands; *S. caribensis* new species from the Caribbean and adjacent areas; *S. brasiliensis* new species from Brazil, Ecuador, Colombia, and Panama; *S. hemorrhoidalis* new species from Ecuador and Venezuela; and *S. andensis* new species from Argentina, Bolivia, and Venezuela. The south Atlantic species *Sclerocoelus subbrevipennis* (Frey), new combination, is redescribed as a member of the *S. galapagensis* group, and is considered the sister species to the rest of the species group. A key to species, character matrix, and cladogram are provided.

### Introduction

The genus *Sclerocoelus* Marshall is abundant in the New World, with over 40 species distributed from Canada to Argentina, and with one species, *Sclerocoelus subbrevipennis* (Frey) from the south Atlantic. The latter species is a member of the distinctive *Sclerocoelus galapagensis* group, and is here redescribed from Tristan da Cunha. The *S. galapagensis* group also includes five other new species from the Galapagos Islands, Mexico, the Caribbean, Central America, and South America (Map).

Most *Sclerocoelus* are associated with wet, decaying vegetation in cloud forests, where they are often collected in large numbers by sweeping a net over moist dead leaves. The species group revised here, the *S. galapagensis* group, is the most distinctive and easily diagnosed group of *Sclerocoelus*. All species in the group can easily be distinguished from congeners by the conspicuous, sclerotized male perianal pads or by the spinose apical bristles of the female cerci. They are also generally larger than congeners and, as outlined in the diagnosis below, form a clearly monophyletic group characterized by other striking apomorphic characters.

Other than the 6 species considered here, the only described species of *Sclerocoelus* are the widespread, Nearctic, type species, *S. sordipes* (Adams), and the Neotropical species *S. plumiseta* (Duda) and *S. regularis* (Malloch).

### *Sclerocoelus* Marshall

*Sclerocoelus* Marshall, 1995: 283. Type species *Limosina sordipes* Adams 1904

**Diagnosis of the genus *Sclerocoelus*:** Members of the genus *Sclerocoelus* can be recognized by the combination of a very broad alula, an enlarged intra-alar bristle just anterior to the prescutellar dorsocentral bristle, a very broad lunule and characteristic tibial chaetotaxy including a mid ventral bristle only in the female. Characteristics of the male genitalia, especially the complex subcerci and genital pouch, are defining for the genus (Marshall, 1995).

**Diagnosis of the *Sclerocoelus galapagensis* group:** All members of the species group have strongly developed male perianal pads, characteristically shaped surstyli, and one (or rarely 2) stout apical bristle on each female cercus. All Neotropical species have setae on the membrane flanking the prosternum.

**Description of the *Sclerocoelus galapagensis* group:** Dark, heavily pollinose limosinines, 2.0-3.0mm, usually ca. 2.5mm. Interfrontal area tapered, width at top equal to height; 3 equal interfrontal bristles. Lunule prominent, broadly rounded. Fore coxa with 3-4 short, stout medial preapical bristles. Acrostichal bristles in 8 rows between anterior dorsocentrals; prescutellar acrostichal bristle and posterior intra-alar bristle twice as long as anterior dorsocentral bristle; anterior dorsocentral bristle slightly longer than acrostichal setulae. Scutellum 1.3-1.5X as wide as long, four apical bristles 1.8-2.0X as long as scutellum. Dorsal surface of mid tibia with 2 large anterodorsal bristles and 1 small posterodorsal bristle proximally, posterodorsal bristle midway between anterodorsals; 2 anterodorsal bristles distally, the lower one twice as long as the upper; 1 very large posterodor-

sal distal bristle; 1 very small distal dorsal bristle at level of upper anterodorsal. Mid tibia of female with a midventral bristle; ventral surface of male mid tibia with a patch of short, stout bristles distally; mid tibia of both sexes with a strong apicoventral and weaker posteroventral and anteroventral apical bristles. Mid femur with short, stout anteroventral and posteroventral bristles basally; mid basitarsus with an enlarged ventral bristle in basal half. Wing with second and third costal sectors equal;  $R_{2+3}$  sinuate, strongly curved up to costa.

**Abdomen:** Syntergite 1+2 with broad, short, anterior pale area with a narrow posterior extension. Sinistral flange of synsternite 6+7 short, weakly developed; synsternite completely separated from sternite 8. Inner ventral corners of epandrium widely separated, forming narrow, truncate lobes. Sternite 10 (subepandrial sclerite) complete medially. Subcercus complex, with an outer (upper) part usually projecting posteriorly into the perianal pad and anteriorly to the posterior surstylar-epandrial junction, and an inner (lower) part often with a long posterior arm; junction of inner and outer parts of subcercus with posterior bristles; left and right subcerci meeting or almost meeting near posteromedial part of sternite 10 (subepandrial sclerite). Distiphallus short, broad, dorsoventrally flattened, with broad, laterally-directed basal sclerites, a basal ring, and a distal part comprising two curved lateral sclerites and a medial sclerite which is usually distally bifid. Three spermathecae, single one largest; swollen apically with a shallow invagination; ducts short, inserted near invagination; surface striate.

#### Phylogeny of the *Sclerocoelus galapagensis* species group

Analysis of a matrix of 22 characters, using Hennig 86, yielded three equally parsimonious cladograms (consistency index 82, retention index 87, length 35) which differed only in the placement of the two island endemics, the Atlantic *subbrevipennis* and the Pacific *galapagensis*. I prefer the cladogram treating *subbrevipennis* as the sister group to the rest of the genus, and placing *galapagensis* as the sister group to the rest of the New World species (Fig. 1, table 1). The latter sister group relationship is supported by two unusual, independent characters (16,17) which probably represent good synapomorphies. An alternative cladogram treats the phenetically very similar island endemics as sister species based on two wing char-

acters (18,19). The short, brown wings of *galapagensis* are extremely similar to those of *subbrevipennis*; however, shortening and darkening of wings is common in insular sphaerocerids and these characters are therefore considered especially subject to homoplasy. The third cladogram treats *galapagensis* as the sister group to the rest of the genus, and links the Atlantic *subbrevipennis* to mainland Neotropical and Caribbean species on the basis of two characters of equivocal polarity (6,21). Character 21, the presence of a single stout apical bristle at the apex of the female cercus, is probably a synapomorphy for the whole species group and is reversed in *galapagensis* by the enlargement of the inner preapical cercal bristle found in all members of the species group.

The relationships between the remaining four species, all found in mainland South America and the Caribbean basin, are well supported. *Sclerocoelus brasiliensis* is the most plesiomorphic of the mainland species, with superficial similarities to the island endemics. *Sclerocoelus brasiliensis* is treated as the sister group to the other mainland and Caribbean species on the basis of six weak synapomorphies (7,9,13,14,20,22), which are not conflicted elsewhere on the cladogram. The monophyly of a group containing the remaining three species in the group (*caribensis*, *andensis*, *hemorrhoidalis*) is much more strongly supported. Relative to other *Sclerocoelus*, members of this group seem to be characterized by progressive reduction of the complicated set of genital pouch sclerites (Character 1). Most members of the genus have an apparently homologous series of sclerites including 4 or 5 separate sclerites between the left side of synsternite 6+7 and the spiracular sclerite on the right side of the abdomen. In the basal lineages of the *galapagensis* species group, 3 of these sclerites are clearly visible, and 2 (sclerites C and D) are separate as in other *Sclerocoelus*. These sclerites disappear in the highly distinctive Neotropical clade including *caribensis*, *andensis*, and *hemorrhoidalis*, and are replaced with a deep, evenly sclerotized pouch. This group is also characterised by a number of other unique synapomorphies of the male and female genitalia, and the monophyly of this clade of three species seems unequivocal.

#### Zoogeography of the *Sclerocoelus galapagensis* species group

As is the case for the genus as a whole, members of the *Sclerocoelus galapagensis* group are almost

always associated with wet leaf litter in cloud forests or similar habitat. This might seem to suggest that these species are less likely to colonize islands than are littoral species. It is possible, however, that association with wet litter predisposes *Sclerocoelus* species to inclusion in flood debris washed out to sea after heavy rains. Peck (1994) found abundant fluvial debris in pleuston net samples taken between the Galapagos Islands during the strong 1992 El Niño event. The same pleuston net samples included almost 4,000 arthropods. Although none were identified as Sphaeroceridae, transport in riverine flood debris is a plausible mechanism for the dispersal of cloud forest species to islands. *Sclerocoelus subbrevipennis* is the only endemic sphaerocerid in the remote Tristan da Cunha group, and *S. galapagensis* is one of a very few endemic sphaerocerids on the Galapagos islands, so the group appears to be preadapted to overwater dispersal. *Sclerocoelus subbrevipennis* probably originated from an eastern South American population of the common ancestor of the whole group, subsequent to which the ancestral species of the new world clade acquired synapomorphies 16 and 17. Western South American populations of this species served as the source for the ancestor of *Sclerocoelus galapagensis*, which is now restricted to wet *Scalesia* forest on the Galapagos Islands. Division of the mainland ancestral species into the eastern South American *brasiliensis*, and a western Neotropical-Caribbean clade must have been the next occurrence in the zoogeographic history of the group. The western Neotropical-Caribbean clade then split into *caribensis* in the Caribbean basin, and an Andean species ancestral to *andensis* and *hemorrhoidalis*. Today, *andensis* is common in relatively undisturbed southern Andean cloud forests, and has been collected in cloud forests as far north as Venezuela. *Sclerocoelus hemorrhoidalis* is known from relatively few specimens, mostly from disturbed sites such as pasture and a riverbank in an urban area near Merida, Venezuela.

#### Key to species of the *Sclerocoelus galapagensis* group

1. Posterodorsal bristle of katapisternum well developed, reaching half way to wing base. Membrane beside prosternum bare. Posteromedial part of male sternite 5 with flat, scale-like bristles (Fig. 53). Tristan da Cunha .....  
*Sclerocoelus subbrevipennis* (Frey), new combination.
- Posterodorsal katapisternal bristle fine, hair-like, reaching at most one-third of the way to wing base.

Membrane beside prosternum with short bristles. Setae of posteromedial part of male sternite 5 not flattened. Caribbean, Mexico, South and Central America, and Pacific..... 2

2. Synsternite 6+7 of male broken into small, dark sclerites posterior to sternite 5 (Fig. 34). Perianal pad with a narrowed ventral part articulating with posterior arm of outer part of subcercus (Fig. 14). Posteroventral epandrial bristle shorter than epandrium (Fig. 16). Sternite 8 of female strongly differentiated into almost vertical lateral parts and concave ventral part (Fig. 58) ..... 3
- Pocket-like genital pouch well developed and sternite 5 sometimes with 2 dark posteromedial lobes (Fig. 5), but no small, separate, dark sclerites behind posteromedial part of male sternite 5. Perianal pad broad ventrally (Fig. 3). Posteroventral epandrial bristle longer than epandrium. Sternite 8 of female relatively simple, without prominent lateral parts ..... 4
3. Wing membrane brown, especially above and below  $R_{2+3}$ . Cerci of female dorsally concave, shining, terminating in 2 strong bristles (Fig. 38). Galapagos .....  
*Sclerocoelus galapagensis*, new species.
- Wing membrane clear. Cerci of female dorsally convex and setulose, terminating in a single short, stout bristle (Fig. 20). South and Central America...  
..... *Sclerocoelus brasiliensis*, new species.
4. Area behind posteromedial part of male sternite 5 simple. Posterior arm of surstylus with 3-6 prominent, short, stout bristles (Fig. 29) ..... 5
- Two prominent, bare, dark lobes arising behind posteromedial part of male sternite 5 (Fig. 5). Posterior arm of surstylus with relatively small bristles .  
..... *Sclerocoelus andensis*, new species.
5. Sternite 5 of male short, shorter than genital pouch and half as long as sternite 4, with posteromedial and posterolateral areas of long setae (Fig. 24). Genital pouch prominent, heavily sclerotized .....  
..... *Sclerocoelus caribensis*, new species.
- Sternite 5 of male longer than genital pouch and subequal in length to sternite 4, with two setose posteromedial lobes; setosity of posterolateral area sparse (Fig. 45). Genital pouch well developed, but relatively small and lightly sclerotized .....  
..... *Sclerocoelus hemorrhoidalis*, new species.

#### *Sclerocoelus andensis*, new species (Figs. 2-12)

**Description:** Length 2.2-3.0mm; dark brown to black; legs, pleuron, and gena reddish-brown, tarsi paler; interfrontal strips black, lower frons

otherwise reddish; vibrissal angle reddish brown like anterior gena and lateral parts of face, middle part of face darker. Minimum interantennal distance 1.7X width of ocellar triangle. Eye height 3.2-3.5X genal height; anterior genal bristle as long as genal height.

Prothorax with 3 small, bristle-bearing sclerites in membrane beside prosternum. Katepisternum with a short, fine posterodorsal bristle and a minute anterodorsal setula. Male mid tibia strongly curved; ventral surface with a row of slightly enlarged bristles on distal half, apical fifth covered with stout, curved bristles. Male mid femur with a row of 4 stout anteroventral and a patch of *ca.* 10 stout posteroventral bristles at base. Wing length 2.5x width; membrane clear.

**Male abdomen:** Tergite 5 with middle posterior bristles short but with 2 or 3 pairs of other posterior marginal bristles 1.5X tergite length. Sternite 5 similar in size to sternite 4; uniformly dark brown except for short, pale, striate portion normally telescoped over sternite 4; posteromedially with a setulose patch from which arise 2 very dark, posteriorly directed lobes. Synsternite 6+7 almost symmetrical, right side (spiracular sclerite) similar in size and shape to ventral part of left side, middle part forming a continuous narrow band ventral to a deep, sclerotized central pouch. Ring sclerite well developed, posterior to but separate from spiracular sclerite. Epandrium with two posterior bristles as long as epandrium and a posteroventral bristle twice as long as epandrium. Length of dorsal part of epandrium greater than height of anal fissure. Perianal pads strongly developed, longer than epandrium, expanded ventrally; anterior and dorsal parts well sclerotized but posteroventral part membranous, bulbous and setulose. Pseudocercus small, bearing 3 short bristles; connected to epandrium by a pale band of tissue. Halves of sternite 10 (subepandrial sclerite) uniformly narrow except at middle where they are slightly expanded and fused, middle part with weak ventrolateral lobes. Subcercus with large inner lobe, ventrally expanded into posterior and anterior lobes; outer part of subcercus narrow, with anterior arm only. Surstylus large, twice as long as deep in lateral view; anterior part with a digitate anterodorsal process, anteroventrally with 3 inner bristles, a tooth-like apical process, and laterally directed ventral ridge; posterior part of surstylus long, tapered. Paramere very broad basally, apically with a narrow, anteriorly hooked process. Basiphallus short, simple, posteriorly carinate; distal-

ly slightly expanded at point of contact with distiphallus. Distiphallus with distally expanded and serrate laterally directed basal sclerites; central sclerite broad, distally pale and bifid.

**Female abdomen:** Tergite 7 dark; tergite 8 divided into 2 large, dark lateral sclerites and an indistinct, pale dorsal sclerite. Epiproct minutely setulose, tapered between cerci; cerci tapered, with long, stout apical bristle and short stout dorsal preapical bristle. Sternite 7 strongly convex posteromedially. Main sclerite of sternite 8 trough-like; narrow anteriorly, broader posteriorly; anterior and lateral margins dark, middle part bare, pale and concave; 2 small setae on sclerotized bases present in membrane on each side. Hypoproct projecting ventrad and densely long-setose on posterior third.

**Holotype**(♂, CNC) and 43 Paratypes (22♂, 21♀, GUE, INESALT): Argentina. Salta. 1500m, 40kmN Salta, Camino La Cornisa, sweep in roadside forest remnant, 27.ii.1992, S.A. Marshall.

**Other paratypes:** ARGENTINA. Salta. 15kmW Chicoana, Canyada Gotera, 18.ii.1992, sweep in forest remnant, S.A. Marshall (11♂, 1♀, GUE); 30kmE Campo Quijano, 18-28.1992, Flight intercept trap and sweep in forest remnant, S.A. Marshall (1♂, 4♀, GUE); La Caldera, 1500m, forest sweep, 27.ii.1992, S.A. Marshall (6♂, 9♀, GUE); 22kmN La Caldera, El Ucumar, malaise, subtropical humid forest, 2-30.xii.1987, S.&J. Peck (1♂, CNC). BOLIVIA. Sta. Barbara, N. Coroico, Yungas, 4-5.i.1976, 1100m, L.E. Pena (4♂, 3♀, CNC). VENEZUELA. Merida. Los Choros, 2100m, Flight intercept trap and sweep among leaf debris, 1-5.v.1988, S.A. Marshall (17♂, 2♀, GUE, MIZA); Merida, 1500m, Calle Sta. Rosa trail, Flight intercept trap near spring, 24-30.iv.1988, S.A. Marshall (8♂, 3♀, GUE).

**Comments:** *Sclerocoelus andensis* is most easily separated from other *Sclerocoelus* on the basis of the 2 pairs of long posterior bristles on male tergite 5. This species is found in Andean cloud forests from Venezuela south to northern Argentina. In the northern part of its range it occurs sympatrically with the closely related *S. hemorroidalis*.

#### *Sclerocoelus brasiliensis*, new species

(Figs. 13-23)

**Description:** Length 2.4-2.6mm; dark brown to black; legs and gena dark reddish-brown, tarsi paler; lower frons usually luteous only along nar-

row anterior margin; vibrissal angle reddish, contrasting in colour with the dark gena and face. Minimum interantennal distance 1.3X width of ocellar triangle. Eye height 2.8-3.3X genal height; anterior genal bristle as long as genal height. Prothorax with 2-3 small, bristle-bearing sclerites in membrane beside prosternum. Katepisternum with a short, fine posterodorsal bristle and a minute anterodorsal setula. Male mid tibia strongly curved; ventral surface with a row of slightly enlarged bristles on distal half, apical fifth covered with stout, curved bristles. Male mid femur with a row of 6 stout anteroventral and a patch of ca. 10 stout posteroventral bristles at base, anteroventral bristles stouter. Wing length 2.4X width; membrane clear.

**Male abdomen:** Tergite 5 with middle posterior bristles short but with 3 pairs of posterior bristles ca. 1.1X tergite length and 1 pair of posterolateral bristles ca. 1.3X tergite length. All sternites with a medial longitudinal pale stripe. Sternite 5 equal in width and length to sternite 4; posteromedially with short, wide, pale area, each side bulging and with a pigmented, setose patch. Three small dark sclerites behind posteromedial part of sternite 5, of these the most sinistral (sclerite D) small and apparently fused with sternite 5, the other 2 (sclerites C and E) heavily sclerotized, with dextrally curved, tapered, posterior parts. Spiracular sclerite large, bilobed sinistrally, similar in size to remainder of genital pouch; ring sclerite large, anterior edge fused to spiracular sclerite, posterior edge thin. Right side of sternite 8 cleft; anteroventral part contiguous with spiracular sclerite. Epandrium sparsely setose dorsally, more densely long-setose ventrally, longest posterior bristles shorter than epandrium. Dorsal part of epandrium slightly shorter than anal fissure. Perianal pads flat, dark; tapered and bare ventrally, otherwise microsetulose; ventral lobe articulating with subcercus. Pseudocercus small, brown, free from epandrium, with 3 bristles, upper bristle twice as long as others and half as long as longest epandrial bristle. Each half of sternite 10 (subepandrial sclerite) long, narrow, weakly arched; flattened, expanded and fused medially into a quadrate middle part. Subcercus with inner part ventrally extended into a distally expanded lobe but without prominent posterior process; outer part with prominent anterior and posterior arms, posterior arm articulating with sclerotized part of perianal pad. Surstylus twice as long as deep in lateral view; setulose on ventral half; posterior part flat; anterior part thick,

deeper than posterior part, with 3 or 4 enlarged bristles and a small flat, carina on inner surface; inner anterior corner with a narrow, sharply tapered lobe. Paramere broad basally; distal half narrow, strongly bent posteriorly; apex swollen, with a narrow, anteroventrally recurved part. Basiphallus simple, cylindrical, basally enlarged. Distiphallus short, dorsoventrally flattened, with laterally directed basal sclerites broad but pale and with only 2 or 3 serrations distally; central sclerite narrow, distally bifid.

**Female abdomen:** Tergite 7 dark, shortened medially; tergite 8 divided into 2 elongate, dark lateral sclerites and an indistinct, pale dorsal sclerite. Epiproct setulose, tapered between cerci; cerci tapered, with stout apical bristle and short stout dorsal preapical bristle. Sternite 7 short, posterior margin appearing slightly concave because of pale posteromedial area. Sternite 8 almost egg-shaped, posterior margin weakly pigmented and appearing concave, lateral margins folded under; 2 small setae on sclerotized bases present in membrane on each side. Hypoproct projecting ventrad and densely long-setulose on posterior half, anterior part with medial and lateral bare, pigmented areas.

**Holotype** ( $\sigma$ , CNC) and 26 paratypes (15 $\sigma$ , 11 $\varphi$ , GUE, MNR) paratypes BRAZIL. Parana. Curitiba, under fallen epiphytes near Natural History Museum, 5.ii.1990, S.A. Marshall.

**Other paratypes:** Bolivia. Coroico Yungas de La Paz, 6-7.i.1976, 1100-1600m, L.E. Pena (1 $\sigma$ , CNC). Brazil. Rio de Janeiro, Jacara Pagua, wet litter by stream, 22.i.90, S.A. Marshall (6 $\sigma$ , 14 $\varphi$ , GUE); Mury, near Nova Friburgo, 1000m, swept off goat dung in wet area, 11.iii.1990, S.A. Marshall (1 $\varphi$ , GUE); São Paulo, Jaragua, 8.ii.1990, S.A. Marshall (3 $\sigma$ , 1 $\varphi$ , GUE); Parana, Londrina, Parque Arthur Thomas, sweep, 1.ii.1990, S.A. Marshall (3 $\sigma$ , 1 $\varphi$ , GUE); Curitiba, Flight intercept trap in woods behind Natural History Museum (1 $\sigma$ , 1 $\varphi$ , GUE); sweep of creek debris east of Curitiba, 8.ii.1990, S.A. Marshall (1 $\sigma$ , GUE). ECUADOR. Pichincha prov., Rio Palenque Station, 47km S Sto. Domingo, 29.iv-5.v.1987, L. Coote and B. Brown, 180m, Malaise trap, lowland rain forest (1 $\varphi$ , GUE). PANAMA. Barro Colorado Island, Canal Zone, 1.5.1929, C.H. Curran (1 $\sigma$ , 1 $\varphi$ , AMNH).

**Comments:** Males of this species are easily separated from other mainland species by the form of the perianal pads and the separate sclerites behind sternite 5. The name *brasilensis* reflects the abundance of this species in southern Brasil.

*Scleroceelus caribensis*, new species

(Figs. 24-33)

**Description:** Length 2.2-2.5mm, dark brown to black, legs dark reddish-brown, lower frons usually red only lateral to interfrontal strips; vibrissal angle reddish, contrasting with darker gena and face. Minimum interantennal distance 1.5X width of ocellar triangle. Eye height 3.5X genal height; anterior genal bristle as long as genal height.

Prothorax with 2-4 small, bristle-bearing sclerites in membrane beside prosternum. Katepisternum with a short, fine posterodorsal bristle and a minute anterodorsal setula. Male mid tibia strongly curved; ventral surface with a row of slightly enlarged bristles on distal half, apical fifth covered with stout, curved bristles and with a large apicoventral bristle. Male mid femur with 2-3 stout anteroventral bristles and 6-8 smaller posteroventral bristles at base. Wing length 2.4X width; membrane clear.

**Male abdomen:** Tergite 5 with 1 pair of median posterior marginal bristles 1.5X tergite length, other posterior bristles 0.5X tergite length. Sternite 5 0.5X as long as sternite 4; dark except anterolateral corners and posteromedial area; long-setose posterolaterally and posteromedially. Area behind posteromedial part of sternite 5 occupied by a deep sclerotized pouch (sclerite D), with a dark sinistral lobe (sclerite C) and a spinulose patch (sclerite E) posterior to sac. Right side of sclerotized sac with a posterior lip contiguous with spiracular sclerite. Spiracular sclerite very large, well sclerotized. Ring sclerite small, fused to posterolateral corner of spiracular sclerite. Epandrium with dense, short bristles, posterior bristles longer and bristle at posteroventral corner as long as epandrium. Length of dorsal part of epandrium greater than height of anal fissure. Perianal pads strongly developed but shorter than epandrium, expanded ventrally; anterior and dorsal parts well sclerotized but posteroventral part membranous, bulbous and setulose. Pseudocercus small, weakly pigmented, free from epandrium, with 3 small bristles. Halves of sternite 10 (subepandrial sclerite) dark, narrow; contiguous medially, medial part with weak ventral lateral lobes. Subcercus with a broad, elongate inner lobe, posteroventrally extended into a pointed, prominent process; outer part of subcercus with a short posterior arm and a longer anterior arm. Surstylus large, with a scoop-shaped posterior lobe with 4-6 short, stout posterior bristles; anterior part complex, with enlarged ventral bristles, an

anterodorsal inner lobe, and a broad, carinate lobe on medial surface. Paramere short, broad basally, sharply tapered on apical half. Basiphallus short, simple, compressed, partly contiguous with ventral part of distiphallus. Distiphallus with broad, distally serrate, laterally directed basal sclerites; central sclerite narrow, distally pale and bifid.

**Female abdomen:** Tergite 7 dark; tergite 8 divided into 2 large, dark lateral sclerites and an indistinct, pale dorsal sclerite. Epiproct setulose, truncate; cerci tapered, with long, stout apical bristle and short stout dorsal preapical bristle. Sternite 7 strongly convex posteromedially. Sternite 8 narrow anteriorly, broadened and concave posteriorly; 2 small setae on sclerotized bases present in membrane on each side. Hypoproct projecting ventrad and densely long-setose on posterior half.

**Holotype** (♂, CNC) and 24 paratypes (10♂, 14♀, GUE): DOMINICAN REPUBLIC. Near Cabo Rojo, 1300m, Las Abejas, cloud forest, 19.i.1989, S.A. Marshall.

**Other paratypes:** Costa Rica. Monteverde Reserve, 1500m, 15-20.viii.1986, L. Masner (18♂, 15♀, CNC); Estrella Valley, Pandora, 19.ii.1984, Malaise trap, H. & A. Howden (1♀, GUE); Cartago, 500m., Turrialba, Catie, 4.ix.1986, L. Masner (1♂, GUE); San Jose, San Antonio de Escazu, 25 Mar. to 9 April, 1984, Malaise trap, S.A. Cameron (SNOW, 1♂, 1♀); Puntarenas, Monte Verde, ca. 1500m, lower montane wet forest, 4-11.ii.89, D. Grimaldi (1♂, AMNH). Cuba. Pinar del Rio, Prov. Soroa, 27-28.iv.1983, W.N. Mathis (1♀, USNM). Dominica, W.I. Trafalgar Falls, 6.iii.1965, W.W. Wirth (1♂, USNM); Clarke Hall Est., 31.v.1.vi, 2.vi, 3.vi, 4.vi.1966, G. Steyskal (3♂, 2♀, USNM); Manets Gutter, 5.iii.1965, W.W. Wirth (1♂, 2♀, USNM). El Salvador. Los Chorros, 20.vi.1963, D.Q. Cavagnaro & M.E. Irwin (13♂, CAS). Guatemala. Isabal, 300m, Las Escobas at light, 14-16.xi.1986, M. Sharkey (11♂, 13♀, CNC). Jamaica. Hardwar Gap, 10.iii.1970, stream margin, Wirth & Farr (10♂, 3♀, USNM); Hardwar Gap, 25.vii.1966, 4000', Howden & Becker (1♀, CNC); Runaway Bay, ii.1969, W.W. Wirth, stream bed (4♂, 2♀, USNM). MEXICO. Tepic, Nayarit, 3000', viii.1964, light trap, Blanton & Broce (3♂, 1♀, USNM); SLP, 20kmW. Xilitia, 1600m, 12.vi-6.viii, 1983, cloud forest flight intercept trap, S. & J. Peck (1♂, GUE); SLP, 40kmW. Xilitia, 12.vi-6.viii.1983, 1700m, Pine-Oak forest, Flight intercept trap, S. & J. Peck (1♀, GUE); Chiapas, Union Juarez, 4kmN., 22.iv.1983, W.N. Mathis (1♂, USNM). Puerto Rico. Aguas Buenas Census,

Agua Buenas Cave, 14.v.1973, 250m., S. Peck (1♀, BERK). St. Kitts, W.I. Mt. Misery, 4-20.xii.1985, 730m, pond/rainforest, L.D. Coote (1♂, 4♀, GUE). Venezuela. Aragua, Rancho Grande, Parque Nacional Henry Pittier, 4.iii.1967, flight trap, 1100m, M.E. Irwin (3♂, CAS); Rancho Grande, Malaise intercept, 2-30.xii.1987, M. Sanborne (1♂, GUE); Caripe, Guachero caves, 20.iv.1986, oilbird refuse piles, S.A. Marshall (1♂, MIZA).

Other specimens examined (approx. 400, GUE): Dominican Republic. Las Abejas Valley, near Cabo Rojo; trail to Pico Duarte, near La Cienaga; Barahona; Puerto Plata.

**Comments:** This species is easily separated from congeners by the exceptionally distinctive male postabdomen with spinose surstyli and a short sternite 5. The name *caribensis* reflects the great abundance of this species throughout the Caribbean region.

*Sclerocoelus galapagensis*, new species  
(Figs. 34-41)

**Description:** Length 2.0-2.2mm, dark brown to black, legs and gena reddish-brown, lower frons extensively reddish; vibrissal angle concolorous with reddish gena and face. Minimum interantennal distance 2.0X width of ocellar triangle. Eye height 2.5-3.0X genal height; anterior genal bristle shorter than genal height.

Prothorax with 1 or 2 small bristles in membrane beside prosternum. Katepisternum with posterodorsal bristle reaching one third of way to wing base; anterodorsal bristle minute. Male mid tibia weakly curved; ventral surface with double row of slightly enlarged bristles on distal fifth. Male mid femur with 3 stout anteroventral and 6 or 7 stout posteroventral bristles at base. Wing length 1.9X width; membrane, especially above and below  $R_{2+3}$  heavily brown-tinted.

**Male abdomen:** Tergite 5 with three pairs of marginal bristles as long as or longer than tergite, other posterior bristles 0.5X tergite length. Sternite 5 as long as sternite 4; setose posterolaterally, bare medially; posteromedial area bilobed, darkly pigmented, densely setulose. Area behind posteromedial part of sternite 5 with three separate, subquadrate, heavily sclerotized sclerites overlapping each other (sclerites C, D, and E); anteriormost of these sclerites fused with inside surface of sternite 5. Spiracular sclerite large, pale, contiguous with well sclerotized ring sclerite. Epandrium with short bristles; posterior bristles longer and bristle

at posteroventral corner half as long as epandrium; anteroventral bristles stout. Length of dorsal part of epandrium subequal to height of anal fissure. Perianal pad strongly developed, almost entirely sclerotized, shorter than epandrium, setulose, ventral part with a narrow lobe articulating with subcercus. Pseudocercus small, weakly pigmented, fused with corner of epandrium, with 3 bristles, the lower 2 very small, upper bristle as long as longest epandrial bristle. Halves of sternite 10 (subepandrial sclerite) dark, narrow; contiguous medially, medial part deeply U-shaped and weakly lobate at middle. Subcercus with a broad, elongate inner part; outer part of subcercus with a very broad anterior lobe and a quadrate posterior lobe articulating with sclerotized part of perianal pad; inner and outer parts of subcercus broadly joined. Surstylus large, with a scoop-shaped posterior lobe with small, densely packed posterior bristles; anterior part with four slightly enlarged ventral bristles on outer surface and a pair of stout ventral bristles on inner surface; anterior lobe of surstylus quadrate, flattened. Paramere relatively broad, with a deep anterior notch near base, apex boot-shaped. Basiphallus with a short, quadrate epiphallus, distal part expanded dorsally. Distiphallus short and broad, with basal, laterally directed sclerites blade-like, distally smooth; central sclerite broad, short.

**Female abdomen:** Tergite 7 dark; tergite 8 divided into 2 large, dark lateral sclerites and a pale dorsal sclerite. Epiproct bare except for 4 small bristles; cerci tapered, with two long, stout apical bristles. Sternite 7 straight posteromedially. Sternite 8 with a central, pale sclerite with posteromedial part produced into 2 prominent, dark, laterally flattened processes; a minute bristle on sclerotized base present in membrane on each side. Hypoproct large, rounded, pale and bare except along dark, setulose posterior margin.

**Holotype** (♂, CNC) ECUADOR. Galapagos, St. Cruz, Los Gemelos, 600m, forest dung trap, 31.i-4.ii.1989, B.J. Sinclair.

**Paratypes:** ECUADOR. Galapagos, St. Cruz, Los Gemelos, 31kmN Santa Rosa, 23.vi.1985, *Scalesia* forest, 570m, Flight intercept trap and Malaise, S.J. Peck (5♂, 2♀, GUE); 1kmN Puntado, 650m, ii.1989, Malaise in *Scalesia* forest 89-26, S. Peck (1♂, 1♀, CNC); St. Cruz, 4kmN Bellavista, Media Luna, 620m, Miconia Zone Flight intercept trap, 14.v-13.vii.1985, S. & J. Peck (3♂, 3♀, GUE); Isabela, Sierra Negra Pampas, 1000m, Dec. 1986, S. Aberdrabbo (1♀, CNC).