

**Revision and Phylogeny of *Perelleschus*
(Coleoptera: Curculionidae) with Notes on
its Association with *Carludovica*
(Cyclanthaceae)**

NICO M. FRANZ

Department of Entomology, Comstock Hall, Cornell University, Ithaca, NY 14853
USA — Phone: (607) 255-8050, Fax: (607) 255-0939, Email: nmf2@cornell.edu

CHARLES W. O'BRIEN

Center for Biological Control, 105 Perry-Paige Bldg., Florida A&M University,
Tallahassee, FL 32307-4100 USA — Phone: (850) 599-3149, Fax: (850) 561-2221,
Email: charles.obrien@fam.u.edu

ABSTRACT

Perelleschus Wibmer & O'Brien (Curculionidae: Curculioninae: Derelomini) is revised, including the redescription of *P. carludovicae* (Günther) from Costa Rica and *P. rectirostris* Voss from Perú, as well as the addition of six new species: *P. evelynae*, new species, from Colombia and Panama; *P. variabilis*, new species, from Ecuador; *P. biventralis*, new species, from Ecuador; *P. splendidus*, new species, from Costa Rica and Panama; *P. pubicoxae*, new species, from Panama; and *P. sulcatae*, new species, from Costa Rica. The following putative synapomorphies are proposed for *Perelleschus*: (1) row of spines that extends along the entire length of the protibial apex; (2) basally broadened aedeagal apodemes in males (excepting *P. rectirostris*); and (3) basal, acute appendix of the spermatheca in females. *Perelleschus subcinctus* Voss lacks these and is transferred to *Phyllotrox* Schönherr as *Phy. subcinctus* (Voss), new combination. *Perelleschus* is associated with *Carludovica* Ruiz & Pavón (Cyclanthaceae). Observations on the biologies of the species, in particular *P. carludovicae* and *P. sulcatae* on *C. sulcata* Hammel at La Selva, Costa Rica, indicate that the adults are pollinators, whereas the larvae consume the pulp and seeds of the infructescences. A cladistic analysis - with *Staminodeus vectoris* Franz, a new species of Derelomini, and *Systemotelus costaricensis* Anderson & Gómez as outgroup taxa - proposes the phylogenetic relationships (*P. rectirostris*, ((*P. evelynae*, *P. variabilis*), (*P. biventralis*, *P. splendidus*, (*P. pubicoxae*, (*P. carludovicae*, *P. sulcatae*))))).

RESUMEN

Se revisa *Perelleschus* Wibmer & O'Brien (Curculionidae: Curculioninae: Derelomini), incluso la redescipción de *P. carludovicae* (Günther) de Costa Rica y *P. rectirostris* Voss de Perú, así como la adición de seis especies nuevas: *P. evelynae*, especie nueva, de Colombia y Panamá; *P. variabilis*, especie nueva, de Ecuador; *P. biventralis*, especie nueva, de Ecuador; *P. splendidus*, especie nueva, de Costa Rica y Panamá; *P. pubicoxae*, especie nueva, de Panamá; y *P. sulcatae*, especie nueva, de Costa Rica. Se

proponen las siguientes sinapomorfias putativas para *Perelleschus*: (1) fila de espinas que se extiende por el largo entero del ápice de la protibia; (2) apodemas del edeago basalmente hinchados en machos (exceptuando *P. rectirostris*); y (3) apéndice basal y puntiagudo de la espermateca en hembras. *Perelleschus subcinctus* Voss carece de esas y se transfiere a *Phyllotrox* Schönherr como *Phy. subcinctus* (Voss), combinación nueva. *Perelleschus* está asociado con *Carludovica* Ruíz & Pavón (Cyclanthaceae). Observaciones sobre las biología de las especies, en particular *P. carludovicae* y *P. sulcatae* en *C. sulcata* Hammel en La Selva, Costa Rica, indican que los adultos son polinizadores, mientras que las larvas consumen la pulpa y las semillas de las infructescencias. Un análisis cladístico - con *Staminodeus vectoris* Franz, una especie nueva de Derelomini, y *Systemotelus costaricensis* Anderson & Gómez como grupos externos - propone las relaciones filogenéticas (*P. rectirostris*, ((*P. evelynae*, *P. variabilis*), (*P. biventralis*, *P. splendidus*, (*P. pubicoxae*, (*P. carludovicae*, *P. sulcatae*))))).

INTRODUCTION

According to Günther (1936), the association between *Perelleschus* Wibmer & O'Brien and *Carludovica* Ruíz & Pavón was discovered by the German coleopterist W. H. Ferdinand Nevermann in 1934 at the Hamburg-Farm in Costa Rica. Nevermann - who (while collecting at night and using a headlamp) was accidentally killed in 1938 by a Costa Rican game hunter who mistook him for a large animal (Anonymous, 1938) - observed that *P. carludovicae* (Günther) develops in the infructescences of the 'Panama hat palm' *C. palmata* Ruíz & Pavón (Cyclanthaceae). Apparently, very little damage was inflicted upon the host. When Voss (1954) described *P. rectirostris* Voss and *P. subcinctus* Voss from Perú, he transferred *Perelleschus* from Tychiini to Anthonomini. However, he failed to assign a type species (see also below). Wibmer & O'Brien resolved this problem in 1986 by designating *P. carludovicae* as the type species and transferring the genus from Petalochilini (Kuschel, 1955) to Derelomini (Curculionidae: Curculioninae *sensu* Marvaldi and Morrone, 2000) where it remains at present (Alonso-Zarazaga and Lyal, 1999).

Two additional described derelomine genera are associated with Cyclanthaceae in the Neotropics: *Staminodeus* Franz and *Systemotelus* Anderson & Gómez. Their biologies differ from *Perelleschus* in various aspects. *Staminodeus* (specifically, *Sta. vectoris* Franz at La Selva, Costa Rica) is associated with the staminodes of the inflorescences of several genera of Cyclanthaceae, and the larvae are detritivorous, developing and pupating in the leaf litter (Franz, 2001). Contrastingly, the three species of *Systemotelus* appear to be specific to *Carludovica* (particularly, *C. drudei* Masters and *C. palmata*) in Costa Rica and Panama (Anderson and Gómez, 1997). The adults are attracted to the fragrant inflorescences during the pistillate anthesis - feeding, copulating, and ovipositing into the pistillate flowers. The larvae consume the pulp and seeds of the infructescences. They pupate in the seed pockets and emerge with the exposure of the berries. Neither *Staminodeus* nor *Systemotelus* are consid-

ered to be pollinators of their hosts because they do not contact the receptive stigmas and leave before the pollen is released (Franz, 1999). However, whereas the biology of the immatures of *Perelleschus* resembles that of *Systemotelus*, the adults of the former are pollinators of *Carludovica* (e.g., see below for natural history of *P. carludovicae* and *P. sulcatae*, new species, on *C. sulcata* Hammel at La Selva, Costa Rica). A phylogenetic context is required to explain the history which generated these differences in life habits. Meanwhile, based on specimens already at hand, it is obvious to us that the vast majority of cyclanth derelomines in the Neotropics remain to be discovered and described.

In the present paper we redescribe *Perelleschus*, adding six new species and subtracting one misplaced species from the genus. We present a key to the species of *Perelleschus* as well as a phylogeny which includes the outgroup taxa *Sta. vectoris*, an undescribed species of Derelomini which shares various characters with the ingroup taxa, and *Sys. costaricensis* Anderson & Gómez. We provide notes on the biologies of all *Perelleschus* species.

METHODS

Morphological description.— The entomological terminology follows Nichols (1989); as well as Ting (1936) for the mouthparts; Crowson (1944) for the metendosternite; Zherikhin and Gratshev (1995) for wing venation; and Burke (1959) for the genital complex in both sexes. In order to homologize the characters of the tibiae, the terms “dorsal, ventral, anterior, and posterior” refer to an idealized anatomical position of 90° from the main body axis for all three pairs of legs. Measurements were made with a digital micrometer (Lasico XD) on a dissecting microscope (Wild M5A) at 50x magnification. Body length was measured from anterior margin of eye to posterior margin of elytron; rostral length was measured from apex of rostrum to anterior margin of eye (number of measurements in parentheses, e.g. N=15 for the preceding values). These abbreviations were used: l=length, w=width, r=rostrum, p=pronotum, t=tibia, and f=femur. Ventrites are numbered according to their homology within the curculionoid condition (e.g., see Thompson, 1992), i.e. the first externally visible ventrite is ventrite III. Male descriptions are followed by those of females. Morphological descriptions are complementary, i.e. the shared features between genus and species, male and female, and serial homologs (e.g., legs) are not repeated after being mentioned for the first time. Habitus photos were taken with a SEM Hitachi S-4700, and illustrations were prepared using the drawing tube of a compound microscope (Leitz Dialux 20) at 160x magnification. We applied the phylogenetic species concept (*sensu* Wheeler and Platnick, 2000) to *Perelleschus*. Type labels include the species name, e.g. “*Perelleschus sulcatae*”, the type status and gender, e.g. “Holotype, [male symbol]”, and “Franz & O’Brien, 2001”. They are red, blue, and yellow for holotypes, allotypes, and paratypes, respectively. Insect collections are coded as in Arnett et al. (1993); the codon for the collection of the senior author is NMFC.

Cladistic analysis.— Reductive coding (Strong and Lipscomb, 1999)

was applied to homologize the internal structures of the median lobe in males. The primary homology assessments of host plant associations were included in the matrix (e.g., Luckow and Bruneau, 1997, see also discussion). The outgroup choice was complicated by the present lack of phylogenetic resolution and the large number of undescribed taxa within Derelomini. However, these conditions are acceptable as long as the character homologies are applicable to the ingroup taxa (Nixon and Carpenter, 1993, see also discussion). *Sta. vectoris* and *Sys. costaricensis* were chosen because they represent the two genera of Derelomini for which the association with Cyclanthaceae is known. Furthermore, a new species of Derelomini was used as the third outgroup: it resembles *Perelleschus* in having the apically broadened protibia, the perpendicular pygidium in males, and the association with *Carludovica*, but presents additional autapomorphies (Franz and O'Brien, in prep.). Species of *Phyllotrox* Schönherr were excluded because the genus is probably not monophyletic and in need of revision. All species of *Perelleschus* were included in the cladistic analysis. The data matrix was operated in Winclada (Nixon, 1999), and the tree search was performed with NONA (Goloboff, 1993), using the following commands: "whennig" and "mswap+" (which found all most parsimonious trees). Bremer branch support values (Bremer, 1994) were calculated in NONA with "hold 5000", "suboptimal 20", and "bsupport 20". The resulting trees and character distributions were examined in Winclada. Autapomorphies for the species of *Perelleschus* (see descriptions) and for the outgroup taxa were excluded from the matrix. The character arrangement follows the sequence of description.

REDESCRIPTION OF *PERELLESCHUS* Wibmer & O'Brien 1986: 197

Perelleschus Wibmer & O'Brien 1986: 197 (Derelomini); type species: *Perelleschus carludovicae* (Günther); by original designation.

=*Elleschus carludovicae* Günther 1936: 190 (Tychiini, also in Blackwelder, 1947: 842).

=*Perelleschus* Voss 1954: 353 (Anthonomini); not available, no type species designated.

=*Perelleschus* Voss (Petalochilini, Kuschel, 1955: 271).

=*Ellescus* Dejean 1821: 87 (Ellescini, O'Brien & Wibmer, 1982: 116). *Elleschus* Schönherr 1836: 321, original spelling (*Ellescus*) resurrected by Alonso-Zarazaga and Lyal, 1999: 78.

Diagnosis.—*Perelleschus* (Figs. 1a+1b) keys to *Phyllotrox* in Kuschel (1952: 271-273, key to Petalochilinae), but is distinguished from *Phyllotrox* and all other derelomines, including *Staminodeus* and *Systemotelus*, by the putative synapomorphies: (1) protibia posteriorly with row of 6-10 long, broad, triangular spines, extending along entire length of projected margin; (2) male with aedeagal apodemes distinctly broadened in basal 1/3 (excepting *P. rectirostris*); and (3) female with spermatheca basally with elongate, triangular, acute appendix. Additional characters for diagnosis are the compressed shape, the short, subrectate, broad rostrum, and the ventrally pubescent protibia; as well as the subcircular, broad,

perpendicular pygidium and the distinctly deflexed median lobe in males. With respect to the characters of the tibiae, *Perelleschus* may be confused with other derelomine taxa which are often (but probably erroneously) assigned to *Phyllotrox*. However, they differ from that of *Perelleschus* by having more and narrower spines or similar spines which do not extend along the entire margin of the protibial apex (although they may do so on the meso- and metatibial apices).

MALE.— Small to fairly small, length 1.9-3.3 mm, width 0.9-1.6 mm, oval to elongate, $l/w=1.9-2.2$, greatest width near middle of elytron, compressed, dorsally convex, ventrally slightly convex to slightly concave, color light reddish-brown to dark reddish-brown, sculpture punctulate to punctate, vestiture glabrate to short (ventrally more distinct), fine, appressed, shiny.

HEAD. *Mandible* (Fig. 2a). With 2 large dentes, inner dens with small, deep indentation, outer dens slightly superposed. *Maxilla* (Fig. 2b). Cardio basally bilobed, apically broadened; stipes triangular, apically narrowed, with 1 large seta; galea+lacinia+palpiger fused, outer margin centrally with 1 large seta, apically with 1 small seta, inner margin setose in apical $2/3$, with 5-8 lacinial dentes (*sensu* Ting, 1936); maxillary palp 2-segmented, protruded from apex of palpiger; I slightly longer than II, equilateral, clavate, apically with 1 small seta; II elongate, apically papillate. *Labium* (Fig. 2c). Prementum equilateral, margins rotundate, dorsally with setose region, extending to labial palps, and 2 large setae; labial palp 3-segmented, protruded from apical margin of prementum; I similar in length to II, equilateral, clavate, ventrally with 1 large seta; II longer than III, elongate, apically narrowed, oblique; III equilateral, retracted into II, apically papillate. Postmentum elongate.

Rostrum. In lateral view short, 0.4-0.7 mm, shorter than pronotum, $r/p=0.5-0.8$, dorsally slightly arcuate, ventrally subrectate, slightly narrowed in apical $1/3$; in dorsal view fairly broad, breadth similar throughout; in cross-section subrectangular, slightly depressed; dorsally with elongate, shallow, median impression, extending along middle; ventrally with 2 median sulci, extending along basal $1/4$; antennal insertion near middle of rostrum; scrobe extending to eye, broad, deep, subrectate, apically acuminate, shallow, basally broadened, vaguely defined. **Antenna.** 11-segmented, extending to anterior margin of pronotum, stout; scape extending to eye, slightly shorter than funicle+club, slightly arcuate, clavate; funicle 7-segmented; I large, similar in length to II+III, equilateral, distinctly clavate; II-VII small, similar in length, gradually progressing from elongate to transverse, clavate; club 3-segmented, similar in length to V-VII of funicle, oval to elongate, compact; I longer than II+III; II shorter than III; funicle+club with short pubescence. **Eye.** Fairly small, subcircular, slightly protruded, distant from anterior margin of pronotum by $1/2-2/3$ diameter of eye, separated by distance similar to diameter of eye, black. **Head.** Fairly large, transverse, globular.

THORAX. **Pronotum.** In dorsal view large, globular, $l/w=0.6-1.0$, greatest width near middle, anteriorly narrowed, slightly convex, anterior margin explanate, lateral margins rotundate, posterior margin bisinuate, medially with obscure maculation; in lateral view conical,

narrowed in posterior 1/3. *Epipleura*. Mesepisternum triangular; mesepimeron small, triangular, narrow, projecting to elytron; metepisternum tetragonal, extending along lateral margin of metasternum, anteriorly broadened, posteriorly narrowed; metepimeron extending above posterior 1/4 of metepisternum. *Sterna*. Prosternum slightly longer than mesosternum, transverse, slightly convex, with long vestiture, procoxal cavity inserted near middle, contiguous; mesosternum nearly 1/2 as long as metasternum, transverse, slightly convex, distinctly retracted from ventral plane, posteriorly projecting between mesocoxae, mesocoxal cavity inserted at posterior margin, separated by distance nearly 2/3 as broad as mesocoxa; metasternum transverse, laterally convex, centrally concave, medially canaliculate, anterior margin with obtuse projection between mesocoxae, posterior margin with small, triangular projection near inner margin of each metacoxa, metacoxal cavity inserted at posterior margin, separated by distance nearly 3/4 as broad as metacoxa. *Metendosternite* (Fig. 3a). Stalk similar in length to furcal arms, ventrally slightly broadened, medially emarginate, separated by median flange; ventral flange broader than stalk, laterally concave; lamina nearly 1/5 as long as central sclerotization, broadened along median flange; lateral projections apically broadened, truncate; anterior tendons inserted near base of furcal arms; furcal arms diverging, dorsally narrowed, bifurcate.

Legs. Prothoracic leg similar in length to mesothoracic leg, fairly stout; procoxa elongate, conical, apically obliquely truncate, inner surface with 1 subapical foveola; protrochanter transverse, apically broadened, oblique; profemur shorter than pronotum, $f/p=0.5-0.8$, stout, slightly sinuate, in cross-section elliptical, compressed, greatest width near middle; protibia (Fig. 3b) similar in length to profemur, $t/f=0.8-1.1$, stout, slightly sinuate, in cross-section subcircular, slightly compressed, apically distinctly broadened, ventrally pubescent in apical 1/2, apically obliquely truncate, ventral margin with row of setae, posterior margin with row of 6-10 long, broad, triangular spines, extending along entire length of projected margin, inermous; protarsus 5-segmented, nearly 2/3 as long as protibia; I similar in length to II, elongate, clavate; II similar in length to III, equilateral, clavate; III apicodorsally emarginate, ventrally fused, equilateral, ventrally with long vestiture; IV nearly 1/2 as long as III, equilateral; V similar in length to I+II, elongate, clavate; protarsal claw nearly 1/2 as long as V, paired, simple. Mesothoracic leg slightly shorter than metathoracic leg; mesocoxa transverse, in cross-section elliptical; mesotibia short, ventrally lacking pubescence, anterior margin with row of 6-10 spines; mesotarsus: I longer than II. Metacoxa transverse, in cross-section elliptical, medially canaliculate; metatibia fairly long, ventrally lacking pubescence, anterior margin with row of 6-10 spines.

Scutellum. Exposed, fairly large, triangular. *Elytron*. In dorsal view oval to elongate, $l/w=1.1-1.5$, greatest width near middle, slightly broader than posterior margin of pronotum, humeri rotundate, anterior margin concave, lateral margins subparallel in anterior 1/2, gradually converging in posterior 1/2, posterior margin rotundate, subcontiguous; in lateral view convex, lateral margin slightly sinuate; 10-striate; striae

nearly 1/2 as broad as intervals, punctate, shallow, maculations dark, subcircular, separated to subcontiguous; intervals lighter; III+VIII merging before posterior margin, VII-IX ascending in anterior 1/3, X contiguous with lateral margin. *Wing* (Fig. 3c). Slightly longer than body, wing/body=1.1-1.5, elliptical to elongate, l/w=2.6-3.5, greatest width near middle, anterior margin slightly sinuate, posterior margin slightly convex, undulate in basal 1/5, anal lobe small (indistinct); Sc, R, Cu, Cu1, and 2A present, C and 4A obsolete; with 1 large, elongate, apically broadened maculation in radial field, and 2 large, elongate maculations in apical field; 2 radial sclerites and 1 radiomedial sclerotization present; long macrosetae along margin of anal lobe; short macrosetae sparse along apical 1/2 of R, dense along posterior margin; microsetae throughout surface.

ABDOMEN. *Venter*. Slightly shorter than 2x lateral margin of metasternum, laterally convex, III+IV centrally concave, V-VII centrally subplane, posteriorly gradually converging; III+IV fused, V-VII separated; III slightly longer than IV, transverse, anterior margin with large, broad, triangular projection between metacoxae, anterior edges projected; IV similar in length to V+VI, transverse; V+VI similar in length, transverse; VII similar in length to V+VI, transverse, posterior margin bisinuate. *Pygidium*. Exposed, similar in length to ventrites VI+VII, subcircular, slightly convex, broad, posterior margin ventrally emarginate, perpendicular to orientation of venter.

Tergum VIII (Fig. 4a). Similar in length to spiculum gastrale, equilateral, distinctly convex, anterior edges projected, obtuse, posterior margin rotundate, medially emarginate. *Sternum VIII* (Fig. 4b). Consisting of 2 transverse, posteriorly converging sclerites, nearly 1/2 as long as tergum VIII, posterior 1/2 separated, margins bisinuate. *Spiculum gastrale* (Fig. 4c). Slightly shorter than median lobe, fairly stout, subrectate, medially distinctly flanged, basally broadened, apically bifurcate (Y-shaped), with clavate, explanate projections. *Tegmen* (Fig. 4d). Nearly 1/2 as long as median lobe, fairly stout, Y-shaped; tegminal apodeme longer than lateral apodemes, subrectate or deflexed; lateral apodemes slightly arcuate, projecting to lateral region of median lobe. *Aedeagus*. Median lobe in dorsal view elongate, l/w=2.7-4.2, basal margin concave, heavily sclerotized, lateral margins slightly sinuate, concave in basal 1/3, apical margin rotundate; in lateral view fairly broad, apically gradually narrowed, distinctly deflexed; apical 1/2-2/3 tubulose, tubuli denser towards apex; internally membranous, with fused or paired, small or large, variously shaped, oriented, and positioned, weakly or heavily sclerotized sclerites; aedeagal apodemes shorter than median lobe, narrow, distinctly broadened in basal 1/3.

VARIATION. Color variation is considerable in *Perelleschus*. In part this may be due to the fact that specimens which are extracted from the infructescences of *Carludovica* are teneral. These individuals have incomplete pigmentation, and the darker colors which characterize mature individuals are absent, especially on the head, the elytron, and the venter (see diagnoses of species). As a result, the recognition of species based on color may be problematic if specimens are teneral.

FEMALE.— Length 1.9-3.4 mm, width 0.9-1.6 mm, l/w=1.9-2.3. Rostrum 0.4-0.8 mm, r/p=0.5-0.8, median impression indistinct. Pronotum l/w=0.6-0.9. Metasternum centrally subplane. F/p=0.5-0.9; t/f=0.8-1.0. Elytron l/w=1.2-1.5. Venter slightly longer than 2x lateral margin of metasternum, centrally slightly convex; VII similar in length to IV-VI, posterior margin emarginate, bisinuate. Pygidium indistinct (covered), similar in length to ventrite VII, transverse, subplane, narrow, lateral margins posteriorly converging, posterior margin subrectate, subparallel to orientation of tergum.

Tergum VIII. Nearly 2/5 as long as sternum VIII, transverse, slightly convex, lateral margins posteriorly converging, posterior margin concave. **Tergum IX.** Shorter than sternum VIII, triangular, weakly sclerotized (indistinct). **Sternum VIII** (Fig. 4e). Narrow, subrectate, medially flanged, apically broadened, circular, explanate (O-shaped), apical margin medially emarginate, setose. **Coxites.** Nearly 1/2 as long as sternum VIII, elongate, posteriorly converging, setulose, styli elongate, slender, apically setose. **Vagina+bursa copulatrix.** Large, elongate, longer than sternum VIII, with common oviduct. **Spermathecal complex.** Duct inserted at base; spermatheca elongate, abruptly deflexed (ca 120°) near middle (C-shaped), basal margin irregular, with elongate, triangular, acute appendix, apically gradually narrowed, rotundate (with membranous projection) or acute; reservoir inserted near base, large, elongate.

VARIATION. See comments on male.

TYPE SPECIES. *Perelleschus carludovicae* (Günther), by original designation (Wibmer & O'Brien, 1986).

KEY TO THE SPECIES OF *PERELLESCHUS*

- 1 Striae I-III of elytron dark reddish-brown, striae IV-X of elytron light reddish-brown; male with basal 1/2 of scape dark brown, apical 1/2 of scape light brown, internal sclerite of median lobe fused, basal, and weakly sclerotized, aedeagal apodemes similar throughout (Fig. 5) ***P. rectirostris*** Voss
- 1' Striae I-X of elytron of similar color throughout; male lacking previous character combination, with aedeagal apodemes distinctly broadened in basal 1/3 (Figs. 6-12) **2**
- 2(1') Male with internal sclerites of median lobe extending along basal 1/2-2/3; female with apex of spermatheca acute (Figs. 6+7) **3**
- 2' Male with internal sclerites of median lobe extending along apical 1/2; female with apex of spermatheca rotundate (Figs. 8-12) **4**
- 3(2) Length 1.9-2.5 mm; male with internal sclerites of median lobe extending along basal 1/2 (Fig. 6); Colombia and Panama
..... ***P. evelynae*** n. sp.
- 3' Length 2.4-3.0 mm; male with internal sclerites of median lobe extending along basal 2/3 (Fig. 7); Ecuador
..... ***P. variabilis*** n. sp.

- 4(2') Male with tegminal apodeme subrectate, apical sclerite in median lobe fused (Figs. 8+9) 5
- 4' Male with tegminal apodeme deflexed, apical sclerites in median lobe paired (Figs. 10-12) 6
- 5(4) Vestiture short; male with ventrite III dark reddish-brown, ventrites IV-VII light reddish-brown, internal sclerite of median lobe heavily sclerotized (Fig. 8) *P. biventralis* n. sp.
- 5' Vestiture glabrate, appearance distinctly shiny; male with venter of similar color throughout, internal sclerite of median lobe weakly sclerotized (Fig. 9) *P. splendidus* n. sp.
- 6(4') Male with basal 1/2 of scape dark brown, procoxa with dense apical vestiture (genitalia in Fig. 10); associated with *C. palmata* *P. pubicoxae* n. sp.
- 6' Male with basal 1/2 of scape light brown, procoxa lacking dense apical vestiture (genitalia in Figs. 11+12); associated with *C. rotundifolia* and *C. sulcata* 7
- 7(6') Length 2.6-3.4 mm; male with internal sclerites of median lobe heavily sclerotized; female with short, membranous projection at apex of spermatheca (Fig. 11) *P. carludovicae* (Günther)
- 7' Length 1.9-2.5 mm; male with internal sclerites of median lobe weakly sclerotized; female with long, membranous projection at apex of spermatheca (Fig. 12) *P. sulcatae* n. sp.

***Perelleschus rectirostris* Voss 1954: 354**

Diagnosis.— Distinguished by the comparatively small size and the unique color (see below); as well as the bicolored scape, the fused, basal, weakly sclerotized internal sclerite of the median lobe, and the basally narrow aedeagal apodemes in males. The color of the elytron varies to the extent that the difference in pigmentation between striae I-III and IV-X is absent in the most teneral and the most darkened individuals. This is true for the teneral female holotype that Voss described (1954: 354, "...Färbung dunkelrot; Fühler, Hüften und Beine hellrot..."). Voss failed to observe the row of spines along the posterior margin of the protibial apex ("...Tibien an der Spitze aussen nicht zahnartig erweitert...").

Male.— Small, length 2.1-2.3 mm, width 1.0-1.2 mm, l/w=2.0-2.2; head, sterna, and epipleura reddish-brown; pronotum+striae IV-X of elytron dark reddish-brown; legs, striae I-III of elytron, venter, and pygidium light reddish-brown; vestiture short. Rostrum 0.4-0.5 mm, r/p=0.6-0.7. Basal 1/2 of scape dark brown, apical 1/2 of scape light brown. Pronotum l/w=0.8-1.0. F/p=0.6-0.8; t/f=0.8-1.0; protarsus similar in length to protibia. Elytron l/w=1.3-1.5 (N=15). Wing/body=1.3-1.4, wing l/w=2.9-3.0 (N=2). Tegminal apodeme subrectate. Median lobe (Figs. 5a+5b) l/w=3.3-3.8 (N=3), internally with fused, large, elongate, narrow, fusiform sclerite, extending along basal 1/2, basal 1/2 bifurcate, projections narrow, subparallel, superposed, centrally broadened, weakly scler-

rotized; aedeagal apodemes similar throughout.

Female.— Length 2.2–2.6 mm, width 1.0–1.2 mm, l/w=2.0–2.3. Rostrum 0.5–0.6 mm, r/p=0.6–0.7. Scape color indistinct. Pronotum l/w=0.8–0.9. F/p=0.6–0.7; t/f=0.8–1.0. Elytron l/w=1.3–1.5 (N=15). Spermatheca (Fig. 5c) apically rotundate, with short, membranous projection.

Type information.— Holotype label (female) “Chanchamayo, XI, Perú, 1000 m/ Coll. Pape/ Holotypus [red label]/ *Perelleschus rectirostris* n. sp., det. E. Voss/ Dtsch. Entomol. Institut Berlin/ coll. DEI Eberswalde/ *Perelleschus rectirostris* Voss [white label]” (DEIC).

Distribution.— *Perelleschus rectirostris* has been collected in the Amazonian lowland of Perú, Departamento Huánuco, Río Pachitea (label information: “Perú, Panguana, Río Yuyapichi/Pachitea, 260 m, 09°37' S, 74°56' W, on *Carludovica palmata*, leg. G. Gottsberger, VIII-05/08/12-1988”); and on the Pacific slope of Perú, Departamento Ica, Chanchamayo (Fig. 13b). Male individuals of this species are reported for the first time. Thirty-two specimens from the former locality were deposited in the following collections: males (CWOB, 5; DEIC, 1; MUSM, 5); females (CMNH, 5; CWOB, 5; DEIC, 1; MUSM, 5; QCAZ, 5).

Natural history.— In Perú, Río Pachitea, the adults have been collected on *C. palmata*. Gottsberger (1990: 361–363) observed that they arrive at the fragrant inflorescences during the pistillate anthesis, around 06:00 a.m., feeding on staminodes, pollen, as well as other floral organs, and mating. They depart during the staminate anthesis of the following morning, around 05:00 a.m. Because the adults contact the receptive stigmas, they are pollinators of *C. palmata*. In Gottsberger (1990), all derelomines were identified as *Phyllostrox* spp., however, the largest individuals which are depicted in figure 1c (p. 362) are *P. rectirostris*.

***Perelleschus evelynae*, new species**

Diagnosis.— Distinguished by the comparatively small size and dark color; the paired, basal, heavily sclerotized internal sclerites of the median lobe in males; as well as the apically acute spermatheca in females. Individuals vary from light reddish-brown to almost black-brown, depending on the level of pigmentation. Darker colored individuals have an elongate, black maculation along the anterior 3/4 of stria VIII–X, and the posterior 1/4 of the elytron is lighter. The difference in size to *P. variabilis* is, according to our small sample size, continuous in males but discontinuous in females. The internal sclerites of the median lobe are shorter, broader, and comparatively more superposed than in males of *P. variabilis*.

Male.— Small, length 1.9–2.5 mm, width 0.9–1.2 mm, l/w=1.9–2.1; color reddish-brown; pronotum+elytron dark reddish-brown; vestiture short. Rostrum 0.4–0.5 mm, r/p=0.5–0.6. Pronotum l/w=0.8–0.9. F/p=0.6–0.8; t/f=0.8–0.9. Elytron l/w=1.1–1.3 (N=15). Wing/body=1.1–1.4, wing l/w=3.0–3.2 (N=2). Tegminal apodeme subrectate. Median lobe (Figs. 6a+6b) l/w=3.0–3.7 (N=5), internally with paired, large, elongate, narrow, oblique, partly superposed sclerites, extending along basal 1/2, centrally broadened, apically narrowed, converging, margins irregular, heavily sclerotized.

Female.—Length 1.9–2.3 mm, width 0.9–1.2 mm, l/w=1.9–2.2. Rostrum 0.4–0.5 mm, r/p=0.5–0.7. Pronotum l/w=0.7–0.9. F/p=0.5–0.8; t/f=0.8–1.0. Elytron l/w=1.2–1.4 (N=15). Spermatheca (Fig. 6c) apically narrowed, acute.

Type information.— Male holotype “Panamá, Colón, BCI, 100 m, on *Carludovica palmata*, leg. N. Franz, VI-1999” (MIUP); female allotype, same label as male holotype (MIUP); male paratypes, same labels as male holotype (MIUP, 35; UNCB, 2), same labels as male holotype with different date “VII-1999” (CMNC, 5; CWOB, 5; INBC, 5; MUCR, 5; MUSM, 5; QCAZ, 5; UNCB, 3), “PANAMA, Pan. C. Z., Pipeline Rd., P. N. Soberanía, VII-12-1995, C. W. & L. B. O'Brien/ reared ex mature cones *Carludovica palmata* Ruíz & Pavón” (CMNC, 30; CWOB, 95; MUCR, 10; NMFC, 5); female paratypes, same labels as male holotype (MIUP, 35; UNCB, 5), same labels as male holotype with different date “VII-1999” (CMNC, 5; CWOB, 5; INBC, 5; MUCR, 5; MUSM, 5; QCAZ, 5), “PANAMA, Pan. C. Z., Pipeline Rd., P. N. Soberanía, VII-12-1995, C. W. & L. B. O'Brien/ reared ex mature cones *Carludovica palmata* Ruíz & Pavón” (CMNC, 30; CWOB, 95; MUCR, 10; NMFC, 5).

Etymology.— Named to acknowledge the love and support of Evelyn Beese, the kind mother of the senior author.

Distribution.— *Perelleschus evelynae* has been collected on the Pacific slope of Colombia, Departamento Chocó, Estación Biológica El Amargal (Nuquí) and Río Sanpichí; in the Canal Zone of Panama, Provincias Colón/Panamá, Bohío, Frijoles, Isla de Barro Colorado, and Pipeline Road; and on the Pacific slope of Panama, Provincia Panamá, Cerro Campana (Fig. 13a).

Natural history.— In Colombia, Estación Biológica El Amargal and Río Sanpichí, the adults have been collected on the inflorescences of *C. palmata* during the pistillate and staminate phase of the anthesis (label information: L. Nuñez and R. Bernal, Cur. 57, II-28-1999; and R. Bernal and F. Ervik; B & E 103, IV-04-1994; B & E 104, III-12-1994, respectively). In Panama, Bohío, the adults have been observed “flying at dusk” (label information: A. Busck, IV-29-1911). In Panama, Frijoles, the adults have been extracted from mature infructescences of *C. palmata* (label information: I. Molina and J. Zetek, Zetek 2004, V-03-1923, this record predates the observations by Nevermann, but the specimens were misidentified as *Phyllotrox suturalis* (Boheman)). Croat (1978: 179) observed the anthesis of *C. palmata* on Isla de Barro Colorado, Panama, suggesting that bees of *Trigona* spp. (Apidae: Apinae: Meliponini) are the pollinators. However, one of us (NMF) collected *P. evelynae* from *C. palmata* on the island. These observations (V/VII-1999) suggest that the biology of *P. evelynae* is similar to that of *P. carludovicae* and *P. sulcatae* (as described below), and that bees are unable to contact the receptive stigmas. In Panama, Pipeline Road (VII-12-1995), more than 250 adults have been extracted from mature infructescences of *C. palmata* by one of us (CWOB). Furthermore, Anderson and Gómez (1997: 895, misidentified as *P. carludovicae*) observed that they remain inside until the exposure of the berries.

Perelleschus variabilis, new species

Diagnosis.— Distinguished by the comparatively large size and dark color; the paired, basal, heavily sclerotized internal sclerites of the median lobe in males; as well as the apically acute spermatheca in females. Individuals vary from light reddish-brown to almost black-brown, depending on the level of pigmentation. Darker colored individuals have an elongate, black maculation along the anterior 3/4 of stria VIII-X, and the posterior 1/4 of the elytron is lighter. The difference in size to *P. evelynae* is, according to our small sample size, continuous in males but discontinuous in females. The internal sclerites of the median lobe are longer, narrower, and comparatively less superposed than in males of *P. evelynae*.

Male.— Fairly small, length 2.4-3.0 mm, width 1.2-1.5 mm, l/w=2.0-2.1; color reddish-brown, pronotum dark reddish-brown; vestiture short. Rostrum 0.5-0.7 mm, r/p=0.6-0.7. Pronotum l/w=0.7-0.8. F/p=0.6-0.7; t/f=0.8-1.0. Elytron l/w=1.2-1.3 (N=15). Wing/body=1.2-1.3, wing l/w=2.9-3.1 (N=2). Tegminal apodeme subrectate. Median lobe (Figs. 7a+7b) l/w=2.9-3.6 (N=3), internally with paired, large, elongate, narrow, subparallel, partly superposed sclerites, extending along basal 2/3, similar throughout, apically converging, heavily sclerotized.

Female.— Length 2.6-2.9 mm, width 1.3-1.5 mm, l/w=1.9-2.2. Rostrum 0.6-0.7 mm, r/p=0.6-0.8. Pronotum l/w=0.7-0.9. F/p=0.6-0.7; t/f=0.9-1.0. Elytron l/w=1.2-1.4 (N=15). Spermatheca (Fig. 7c) apically narrowed, acute.

Type information.— Male holotype "ECU: Esmer, 11 km, SES. Lorenzo, La Chiquita, 3-10.VI.1975, S. & J. Peck/ palm flower" (CMNH); female allotype, same label as male holotype (CMNH); male paratypes, same labels as male holotype (CMNH, 5; CWOB, 5; MIUP, 5; MUCR, 5), "Ecuador, Pichincha, 47 km S Sto. Domingo, Río Palenque, on palm flowers, leg. S. & J. Peck, V-18/30-1975" (MUSM, 4), "Ecuador, Pichincha, 16 km SE Sto. Domingo, 680 m, on palm flowers, leg. S. & J. Peck, VI-27-1975" (QCAZ, 4), "ECUADOR, Pich., 680 m, 16 km SE S. Domingo, Tinalandia, 27.VI.1975, S. & J. Peck, on palm flowers" (MUSM, 1; QCAZ, 1); female paratypes, same labels as male holotype (CMNH, 5; CWOB, 5; MIUP, 5; MUCR, 5; MUSM, 5; QCAZ, 3), "Ecuador, Pichincha, 47 km S Sto. Domingo, Río Palenque, on palm flowers, leg. S. & J. Peck, V-18/30-1975" (QCAZ, 2).

Etymology.— Named for the considerable color variation in the adults (see also comments on variation in redescription of *Perelleschus*) — *variabilis* signifying "changeable" (Brown, 1956).

Distribution.— *Perelleschus variabilis* has been collected on the Pacific slope of Ecuador, Provincia Esmeraldas, San Lorenzo; and Provincia Pichincha, Santo Domingo de los Colorados, Río Palenque and Tinalandia (Fig. 13b).

Natural history.— In Ecuador, San Lorenzo and Santo Domingo de los Colorados, the adults have been collected "on palm flowers" (label information: S. Peck and J. Peck, VI-3/10-1975 and VI-27-1976). These are likely to belong to *C. palmata* (for comparison see types of *P. biventralis*).

Perelleschus biventralis, new species

Diagnosis.—Distinguished by the comparatively large size and unique color (see below); the fused, apical, heavily sclerotized internal sclerite of the median lobe in males; as well as the apically elongate sternum VIII in females. Variation in color is considerable, e.g. the basal 1/2 of the scape is black in darker colored individuals, and lighter colored males lack the diagnostic ventral character! However, the autapomorphic male genitalia are sufficient for diagnosis (this holds for all other species of *Perelleschus*).

Male.—Fairly small, length 2.6-3.0 mm, width 1.3-1.6 mm, l/w=1.9-2.1; rostrum, pronotum, epipleura, sterna, anterior 3/4 of elytron, and ventrite III dark reddish-brown; (apex of rostrum and) head, legs, posterior 1/4 of elytron, ventrites IV-VII, and pygidium reddish-brown; vestiture short. Rostrum 0.5-0.6 mm, r/p=0.6-0.7. Pronotum l/w=0.6-0.8. F/p=0.6-0.8; t/f=0.9-1.1. Elytron l/w=1.1-1.4 (N=15). Wing/body=1.4-1.5, wing l/w=3.1-3.2 (N=2). Tegminal apodeme subrectate. Median lobe (Figs. 8a+8b) l/w=3.0-3.8 (N=5); internally, ventrally with fused, large, elongate, broad, triangular sclerite, extending along apical 1/2, basally with triangular emargination, subapically with 2 dentes, apically narrowed, concave, heavily sclerotized; dorsally with large, equilateral, denticulate region, basally fused with and extending along sclerite, lateral margins undulate, apical margin concave, weakly sclerotized.

Female.—Length 2.4-2.9 mm, width 1.3-1.5 mm, l/w=1.9-2.0; ventrite III light reddish-brown. Rostrum 0.6-0.7 mm, r/p=0.6-0.9. Pronotum l/w=0.6-0.8. F/p=0.6-0.9; t/f=0.8-1.0. Elytron l/w=1.1-1.4 (N=15). Sternum VIII apically elongate. Spermatheca (Fig. 8c) apically rotundate, with short, membranous projection.

Type information.— Male holotype "ECUADOR, Napo P., 5 mi. W. Biol. Sta. Jatún Sacha, 7.XII.1992, F. Ervik, 51.1/ on *Carludovica palmatum*" (CWOB); female allotype, same label as male holotype (CWOB); male paratypes, same labels as male holotype (CMNH, 5; CWOB, 20; MIUP, 5; MUCR, 5; MUSM, 5), "ECU: Napo, 250 m, Limoncocha, 17.VI.76, S. & J. Peck, Palmetto & Toquilla/ 'Palmetto' palm flowers, Toquilla palm" (NMFC, 5; QCAZ, 5); female paratypes, same labels as male holotype (CMNH, 5; CWOB, 20; MIUP, 5; MUCR, 5), "ECU: Napo, 250 m, Limoncocha, 17.VI.76, S. & J. Peck, Palmetto & Toquilla/ 'Palmetto' palm flowers, Toquilla palm" (MUSM, 5; NMFC, 5; QCAZ, 5).

Etymology.— Named for the diagnostic character of having a bicolored venter (only in males) — *bi* signifying "two" and *ventralis* signifying "of the belly" (Brown, 1956).

Distribution.— *Perelleschus biventralis* has been collected in the Amazonian lowland of Ecuador, Provincia Napo, Estación Biológica Jatún Sacha and Limoncocha (Fig. 13b).

Natural history.— In Ecuador, Estación Biológica Jatún Sacha, the adults have been collected on *C. palmata* (label information: F. Ervik, 51.1, XII-07-1992). In Ecuador, Limoncocha, the adults have been collected on *C. palmata* (label information: S. Peck and J. Peck, VI-17-1976, toquilla is the local Spanish name for *C. palmata*, which is cultivated in Ecuador for fiber (Harling, 1958: 116-118), hence the name 'Panama hat plant').

Perelleschus splendidus, new species

Diagnosis.— Distinguished by the comparatively large size and shiny appearance; as well as the explanate projections of the spiculum gastrale and the fused, apical, weakly sclerotized internal sclerite of the median lobe in males. Individuals vary from light reddish-brown to almost black-brown, depending on the level of pigmentation. The basal 1/2 of the scape is almost black-brown in darker colored individuals, the elytron is often variously darkened, although the posterior 3/4 is lighter.

Male.— Fairly small, length 2.7-3.3 mm, width 1.4-1.6 mm, l/w=1.9-2.1; color light reddish-brown, pronotum dark reddish-brown, elytron yellowish-brown, appearance distinctly shiny; vestiture glabrate. Rostrum 0.6-0.7 mm, r/p=0.6-0.7. Pronotum l/w=0.7-0.9. F/p=0.6-0.8; t/f=0.8-1.1. Elytron l/w=1.2-1.3 (N=15). Wing/body=1.3-1.4, wing l/w=3.1-3.3 (N=2). Bifurcate projections of spiculum gastrale apically transversely explanate. Tegminal apodeme subrectate. Median lobe (Fig. 9a+9b) l/w=2.7-3.0 (N=3), internally with fused, small, equilateral, broad, trapezoidal, funnel-shaped sclerite, positioned in apical 1/2, laterally open, dextrally broadened, weakly sclerotized.

Female.— Length 2.6-3.4 mm, 1.2-1.6 mm, l/w=2.0-2.2. Rostrum 0.6-0.7 mm, r/p=0.6-0.8. Pronotum l/w=0.7-0.9. F/p=0.6-0.8; t/f=0.9-1.0. Elytron l/w=1.3-1.5 (N=15). Spermatheca (Fig. 9c) apically rotundate.

Type information.— Male holotype "Costa Rica, Puntarenas, Coto Brus, Las Cruces, 1150 m, 08°47'03" N, 82°57'36" W, on *Carludovica palmata*, leg. R. Anderson, VI-21-1998" (CMNH); female allotype, same label as male holotype (CMNH); male paratypes, same labels as male holotype (CMNH, 5; CWOB, 5; INBC, 5; MIUP, 2;), "Costa Rica, Puntarenas, Coto Brus, Fila de Cal, 560 m, on Cyclanthaceae (# 941307), leg. L. Gómez, XII-16-1994" (MIUP, 3; MUCR, 5); female paratypes, same labels as male holotype (CMNC, 30; CWOB, 25), "Costa Rica, Puntarenas, Coto Brus, Fila de Cal, 560 m, on Cyclanthaceae (# 941307), leg. L. Gómez, XII-16-1994" (INBC, 5; MIUP, 5; MUCR, 5; MUSM, 5), "Costa Rica, Puntarenas, Coto Brus, Las Cruces, on *Carludovica palmata*, leg. L. Gómez, XII-1994" (NMFC, 5; QCAZ, 3), "Costa Rica, Puntarenas, Coto Brus, Fila de Cal, 560 m, 08°43'16" N, 82°57'25" W, on Cyclanthaceae (# 94310), leg. L. Gómez, XII-1994" (QCAZ, 3).

Etymology.— Named for the distinctly shiny appearance of the adults — *splendidus* signifying "bright" (Brown, 1956).

Distribution.— *Perelleschus splendidus* has been collected in the Cordillera de Talamanca of Costa Rica, Provincia Puntarenas, Fila de Cal and Las Cruces; and in Panama (label information: "Panama, #5151, H. Pittier/ on Cyclanthaceae") (Fig. 13a).

Natural history.— In Costa Rica, Las Cruces, the adults have been collected on *C. palmata* (label information: R. Anderson, VI-21-1998, and L. Gómez, XII-1994, respectively).

Perelleschus pubicoxae, new species

Diagnosis.— Distinguished by the comparatively large size; as well as the procoxal vestiture, the deflexed tegmen, and the paired, apical, heavily sclerotized internal sclerites of the median lobe in males. The basal 1/2 of the scape is almost black-brown in darker colored individuals (compare with *P. biventralis*, *P. rectirostris*, and *P. splendidus*). However, the distinct procoxal vestiture in males is autapomorphic.

Male.— Fairly small, length 2.7-3.1 mm, width 1.3-1.5 mm, l/w=2.0-2.1; color reddish-brown, pronotum dark reddish-brown; vestiture short. Rostrum 0.6-0.7 mm, r/p=0.6-0.7. Pronotum l/w=0.7-0.8. Procoxa apically with dense vestiture. F/p=0.6-0.7; t/f=0.9-1.1. Elytron l/w=1.2-1.3 (N=8). Wing/body=1.2-1.4, wing l/w=2.6-2.8 (N=2). Tegminal apodeme distinctly deflexed. Median lobe (Figs. 10a+10b) l/w=3.7-4.2 (N=3), internally with paired, large, elongate, broad, angulate, partly superposed sclerites, extending along apical 1/2, margins undulate, apically projected, heavily sclerotized.

Female.— Length 2.8-3.1 mm, width 1.4-1.5 mm, 2.0-2.1. Rostrum 0.6-0.7 mm, r/p=0.6-0.7. Pronotum l/w=0.7-0.9. Procoxal apex indistinct; f/p=0.5-0.8; t/f=0.8-1.0. Elytron l/w=1.2-1.4 (N=8). Spermatheca (Fig. 10c) apically rotundate.

Type information.— Male holotype "PANAMA, Pan., km 7.5-9 Llano-Cartí road, VII-28-1995, C.W. & L. O'Brien/ on *Carludovica drudei* flower" (CWOB); female allotype, same label as male holotype (CWOB); male paratypes, same labels as male holotype (CWOB, 15; MIUP, 1; STRI, 1); female paratypes, same labels as male holotype (CWOB, 10; MIUP, 1; STRI, 1).

Etymology.— Name for the diagnostic character of having a pubescent procoxa (only in males) — *pubes* signifying "down" and *coxae* signifying "of the hip" (Brown, 1956).

Distribution.— *Perelleschus pubicoxae* has been collected on the Pacific slope of Panama, Provincia Panamá, El Llano-Cartí (Fig. 13a).

Natural history.— In Panama, El Llano-Cartí, the adults have been collected on *C. drudei* (label information: C. W. O'Brien and L. B. O'Brien, VII-28-1995). Pollen is present on the vestiture of the procoxae of several male individuals.

Perelleschus carludovicae (Günther) 1936: 190

Diagnosis.— Distinguished by the comparatively large size and uniform color; as well as the basal projections of the spiculum gastrale, the deflexed tegmen, and the paired, apical, heavily sclerotized internal sclerites of the median lobe in males. The difference in size to *P. sulcatae* is discontinuous, albeit by no more than 0.2-0.3 mm. The maculation of the elytron that Günther (1936: 190, "...längsgedehnter schwarzer Fleck..."), see also figure 1) described is apparently caused by the wing underneath the elytron. Günther failed to observe that the row of spines extends along the posterior margin of the protibial apex (see generic redescription).

Male.— Fairly small, length 2.6-3.2 mm, width 1.3-1.6 mm, l/w=1.9-

2.2, color reddish-brown, vestiture glabrate. Rostrum 0.6-0.7 mm, $r/p=0.6-0.7$. Pronotum $l/w=0.7-0.9$. $F/p=0.5-0.8$; $t/f=0.8-1.0$. Elytron $l/w=1.2-1.4$ (N=15). Wing/body=1.2-1.3, wing $l/w=3.1-3.2$ (N=2). Spiculum gastrale basally with transverse projections (T-shaped). Tegminal apodeme distinctly deflexed. Median lobe (Figs. 11a+11b) $l/w=3.6-4.0$ (N=5), internally with paired, large, elongate, narrow, subparallel, flexed sclerites, extending along apical 1/2, basal 1/3 distinctly broadened, slightly diverging, heavily sclerotized.

Female.—Length 2.8-3.4 mm, width 1.3-1.6 mm, $l/w=2.1-2.3$. Rostrum 0.6-0.7 mm, $r/p=0.5-0.7$. Pronotum $l/w=0.8-0.9$. $F/p=0.6-0.7$; $t/f=0.9-1.0$. Elytron $l/w=1.3-1.5$ (N=15). Spermatheca (Fig. 11c) apically rotundate, with short, membranous projection.

Type information.—Cotype labels (male and female) “Hamburg-Farm, Reventazon, Ebene Limon/ Costa Rica, F. Nevermann, 23.X.34/ Entwicklung im Fruchtkolben *Carludovica palmata*/ *Elleschus carludovicae* Günther, Entom. Rundschau 53, 1936, p. 190/ Cotype No. 54660 U.S.N.M.” (USNM).

Distribution.—*Perelleschus carludovicae* has been collected on the Carribean slope of Costa Rica, Provincia Limón, Reventazón; and Provincia Heredia, La Selva (Fig. 13a). Thirty-five specimens from the latter locality were deposited in the following collections (label information: Costa Rica, Heredia, La Selva, 40 m, on *Carludovica sulcata*, leg. N. Franz, IX-01/06/09-1997): males (CMNC, 5; MUCR, 5; MIUP, 5); females (CMNC, 5; MUCR, 5; MIUP, 5).

Natural history.—Prior to the publication of the description and biology of *Systemotelus* by Anderson and Gómez (1997), *P. carludovicae* was the only derelomine taxon for which the association with *Carludovica* was known. The original observations by Nevermann (in Günther, 1936: 190) refer to the development of *P. carludovicae* in the maturing infructescences of *C. palmata*. At the time *C. sulcata* was still undescribed, and Hammel (1986: 9, pers. comm.) asserts that the diversity of *Carludovica* in Central America is greater than perceived by Harling (1958: 127-139) who applied a broad species concept to the genus. The distributions of *C. palmata* and *C. sulcata* on the Carribean slope of Costa Rica overlap. Therefore, it is doubtful whether the identification by Nevermann was correct, in spite of the predominance of the former species in open, cultivated areas. The mention of *Perelleschus* on *C. palmata* in Panama, Gamboa, by Anderson and Gómez (1997: 895) refers to *P. evelynae* rather than *P. carludovicae*. At present we consider valid the records from La Selva, Costa Rica, where *P. carludovicae* is associated with *C. rotundifolia* H. Wendl. ex Hook. fil. and *C. sulcata* (Franz, 1999). The taxon which was coded as “*Perelleschus* sp. C1” in Franz (1999) now turns out to be *P. carludovicae* as well as *P. sulcatae*! Except for the difference in size, the external morphology (e.g., color, sculpture, vestiture) of both species is similar. A reconsideration of the data leads to the conclusion that the majority (i.e., 2/3-3/4) of the individuals of “*Perelleschus* sp. C1” were *P. sulcatae*. Here we present a summary of the observations on *C. sulcata* at La Selva (this species is planted in open areas, e.g. in front of ‘Casa Iguana’).

Carludovica sulcata flowers from March to October, producing more inflorescences under better lighting. The anthesis lasts for approximately 24 hours. The inflorescences are protogynous although the pistillate and staminate phase overlap during the second morning. They display thermogenesis (3-8° C above ambient temperature, N=3) when the fragrances are volatilized (first morning, pistillate phase, around 05:00 a.m.) and when the pollen is released (second morning, staminate phase, around 04:00 a.m.). The adults of *P. carludovicae* and *P. sulcatae* arrive around 05:30 a.m. during the pistillate phase (approximately 100 individuals per inflorescence, N=5), flying to the staminodes, and entering the epistigmatic spaces between the staminate flowers. Apparently, they are covered with pollen from other inflorescences and contact the receptive stigmas with all body parts. After remaining inside during the day, the majority depart after the pollen is released. Therefore, in contrast to *Staminodeus* and *Systemotelus*, *P. carludovicae* and *P. sulcatae* are considered to be co-pollinators of *C. sulcata*.

After arriving at the inflorescences, the adults of *P. carludovicae* and *P. sulcatae* begin to detach the staminodes and enter the epistigmatic spaces. Because the staminate flowers of *C. sulcata* leave little space to enter (they are apically broadened and therefore subcontiguous), and because the staminodes are basally reinforced (these bases remain on the infructescence after the staminate flowers are detached), the larger individuals of *P. carludovicae* need 15-60 minutes to pass this external 'barrier'. Typically, they 'chew' their way to the interior by eating a hole between the staminate flowers. Contrastingly, the smaller individuals of *P. sulcatae* have immediate access to the pistillate flowers (which are covered by elongate tepals) between the staminodes. It is conceivable, although not tested, that *P. sulcatae* is the more efficient pollinator because of these features. Individuals of *Sys. costaricensis*, which are even more sizable than *P. carludovicae* (i.e., the females are 8.8-9.9 mm, N=8, see Anderson and Gómez 1997: 893), are absent at La Selva from *C. sulcata* but present on *C. rotundifolia* (Franz, 1999). The females oviposit into the pistillate flowers from the outside, using their elongate abdomen. However, the interfloral spaces of *C. rotundifolia* are larger than those of *C. sulcata*. Clearly, a cladistic analysis of *Carludovica* is necessary to test whether the morphological characters which appear to exclude *Sys. costaricensis* entirely and *P. carludovicae* partly from *C. sulcata* are autapomorphies.

On the inside, the adults of *P. carludovicae* and *P. sulcatae* feed on the floral organs, mate, and oviposit into the pistillate flowers, often lateral to the ovaria. The larvae are herbivorous. Their development continues in the interfloral pulp, although few or many seeds may be consumed and pupation occurs near or in the seed pockets. Approximately 50% of the infructescences are infested (N ca. 20). Typically, there are 1-2 individuals (for a total of 10-50 individuals per infructescence, N ca.10, approximately 5-25% of the seeds are consumed per berry; they have a fibrous shell) present near the proximal region of each berry, but absent from the apical and basal regions of the infructescence. It would be interesting to observe whether *P. carludovicae* destroys relatively more seeds than *P. sulcatae*. After pupation, some individuals eat their way to the outside,

leaving a circular exit hole. The entire cycle lasts 25-45 days (N ca. 50). As stated by Anderson and Gómez (1997: 895), the majority remain inside until the exposure of the berries. Unlike in many species of *Asplundia* Harling at La Selva, all the infructescences of *C. palmata* matured successfully, in spite of the infestation by *Perelleschus* (Franz, 1999).

***Perelleschus sulcatae*, new species**

Diagnosis.— Distinguished by the comparatively small size and uniform color; the deflexed tegmen and the paired, apical, weakly sclerotized internal sclerites of the median lobe in males; as well as the long, membranous projection of the spermatheca in females. The difference in size to *P. carludovicae* is discontinuous, albeit by no more than 0.2-0.3 mm.

Male.— Small, length 1.9-2.4 mm, width 1.0-1.1 mm, l/w=2.0-2.1, color reddish-brown, vestiture glabrate. Rostrum 0.4-0.5 mm, r/p=0.6-0.8. Pronotum l/w=0.8-0.9. F/p=0.6-0.8; t/f=0.8-1.0. Elytron l/w=1.1-1.3 (N=15). Wing/body=1.3-1.5, wing l/w=3.4-3.5 (N=2). Tegminal apodeme distinctly deflexed. Median lobe (Figs. 12a+12b) l/w=3.2-4.2 (N=5), internally with paired, small, equilateral, narrow, subtriangular, superposed sclerites, positioned in apical 1/2, margins irregular, weakly sclerotized.

Female.— Length 2.1-2.5 mm, width 1.0-1.2 mm, l/w=2.0-2.2. Rostrum 0.6-0.8 mm, r/p=0.6-0.8. Pronotum l/w=0.8-0.9. F/p=0.6-0.8; t/f=0.9-1.0. Elytron l/w=1.2-1.3 (N=15). Spermatheca (Fig. 12c) apically rotundate, with long, membranous projection.

Type information.— Male holotype “Costa Rica, Heredia, La Selva, 40 m, on *Carludovica sulcata*, leg. N. Franz, VIII-25-1997” (MUCR); female allotype, same label as male holotype (MUCR); male paratypes, same labels as male holotype (CWOB, 5; MUCR, 15), same labels as male holotype with different dates “IX-02-1997” (CMNC, 5; INBC, 2), “IX-09-1997” (INBC, 3; MIUP 5; MUSM, 5; NMFC, 5), “COSTA RICA, Her., Puerto Viejo de Sarapiquí, Est. Biol. La Selva (OTS), 40 m, VIII-13-1997, leg. Nico Franz, on *Carludovica sulcata* Hammel” (CMNC, 10; CWOB, 25), “COSTA RICA: Her., Biol. Sta. La Selva, 50 m, IX-01-1998, C. W. O’Brien, on *Carludovica sulcata* flowers” (CWOB, 30; QCAZ, 5); female paratypes, same labels as male holotype (MUCR, 15), same labels as male holotype with different dates “IX-02-1997” (CMNC, 5; CWOB, 2), “IX-09-1997” (CWOB, 3; INBC, 5; MIUP 5; MUSM, 5; NMFC, 5), “COSTA RICA, Her., Puerto Viejo de Sarapiquí, Est. Biol. La Selva (OTS), 40 m, VIII-13-1997, leg. Nico Franz, on *Carludovica sulcata* Hammel” (CMNC, 10; CWOB, 40, QCAZ, 5), “COSTA RICA: Her., Biol. Sta. La Selva, 50 m, IX-01-1998, C. W. O’Brien, on *Carludovica sulcata* flowers” (CWOB, 30).

Etymology.— Named for the association with *C. sulcata* at La Selva, Costa Rica (see notes on biology of *P. carludovicae*).

Distribution.— *Perelleschus sulcatae* has been collected on the Caribbean slope of Costa Rica, Provincia Heredia, La Selva; and Provincia San José, Parque Nacional Braulio Carrillo (label information: N. Franz & C. W. O’Brien, VIII-30-1998) (Fig. 13a).

Natural history.— See notes on *P. carludovicae*.

CLADISTIC ANALYSIS

Characters.—The following characters were used to construct the data matrix (Table I). All are binary.

1. Segment I of maxillary palp apically with 1 small seta: (0) absent; (1) present.
2. Distinct apical expansion of protibia: (0) absent; (1) present.
3. Apex of protibia with row of 6-10 spines extending along entire length of projected margin: (0) absent; (1) present.
4. Male tegminal apodeme with deflexion: (0) absent; (1) present.
5. Male median lobe with deflexion: (0) absent; (1) present.
6. Male with heavily sclerotized internal sclerites of median lobe: (0) absent; (1) present. Inapplicable in outgroup taxa.
7. Male with apically positioned internal sclerites of median lobe: (0) absent; (1) present. Inapplicable in outgroup taxa.
8. Male with paired apical internal sclerites of median lobe: (0) absent; (1) present. Inapplicable in outgroup taxa, *P. evelynae*, *P. rectirostris*, and *P. variabilis*.
9. Male with distinctly broadened aedeagal apodemes in basal 1/3: (0) absent; (1) present.
10. Female spermatheca with basal, acute appendix: (0) absent; (1) present.
11. Female spermatheca with narrow, acute apex: (0) absent; (1) present.
12. Association with *C. rotundifolia* and *C. sulcata*: (0) absent; (1) present. Missing in outgroup taxa.

Analysis.—The cladistic analysis for 11 taxa and 12 characters yields two most parsimonious cladograms with L=15, CI=80, and RI=84. Only the preferred cladogram is presented here (Fig. 14, see also discussion). The alternative cladogram places *P. splendidus* after *P. rectirostris* as the sister taxon to the remaining species of *Perelleschus*. Therefore, the strict consensus collapses the node after *P. rectirostris* to a polytomy with four branches. Bremer values indicate support for the monophyly of *Perelleschus*, as well as that of all the species of *Perelleschus* except *P. rectirostris*, of (*P. evelynae*, *P. variabilis*), and of (*P. pubicoxae*, (*P. carludovicae*, *P. sulcatae*)). According to ACCTRAN optimization, homoplasy is hypothesized for character 2 (apically expanded protibia, reversal in *Sys. costaricensis*) and character 6 (male median lobe with heavily sclerotized sclerites, reversals in *P. splendidus* and *P. sulcatae*).

DISCUSSION

The monophyly of *Perelleschus* is indicated by the row of spines that extends along the entire length of the protibial apex; the basally broadened aedeagal apodemes in males (excepting *P. rectirostris* which is sister to the remaining species); and the basal, acute appendix of the spermatheca in females. The new species of *Derelomini* in the character matrix presents an apically broadened protibia, however, the row of spines is restricted to the ventral 2/3 of the margin. *Perelleschus* and *Systemotelus* have the following putative synapomorphies: maxillary palp I with seta; and deflexed median lobe in males. Presently, we consider them to be closely related taxa, although internal sclerites are absent in the median lobe of the latter genus.

A reexamination of *Per. subcinctus* Voss 1954: 354 indicates that it lacks the synapomorphies of *Perelleschus* as defined here. In order to avoid the creation of a generic name for this species, in the absence of a phylogeny of Derelomini, we prefer to transfer it to *Phyllotrox* as *Phy. subcinctus* (Voss), new combination. *Phyllotrox*, which now has 43 species (C. W. O'Brien, pers. comm.), is probably not monophyletic. To include *Phy. subcinctus* in *Phyllotrox* appears to be the least unstable assignment.

The relationships within *Perelleschus* are based on genital characters; we refrained from including such external features as color in the character matrix, partly because of their apparent variation within species. Particularly the internal sclerites of the median lobe in males are autapomorphic - e.g. in *P. biventralis*, *P. splendidus*, and *P. sulcatae* - to the extent that primary homology assessments are difficult to propose (for comparison see Franz, 2001). We used reductive coding (i.e., binary characters) in order to homologize the internal sclerites with three characters: level of sclerotization, position, and number of sclerites. In general, the lack of external cladistic characters appears to be an indicator of relatively recent speciation within *Perelleschus*. However, the fossil record of Derelomini provides little additional information on the subject, as the only derelomine fossil to date is *Electrotribus weigangae* (Ulke) from Eocene Baltic amber (Kuschel, 1992), and no cyclanth fossils have been recorded without uncertainty (Eriksson, 1994).

The two cladograms disagree with respect to the phylogenetic position of *P. splendidus*: either sister to the clade of *P. evelynae* to *P. sulcatae* or nested within it (Fig. 14). In preferring the latter cladogram, we consider the position of the internal sclerites (character 7) more informative phylogenetically than the level of sclerotization (character 6). The obvious way to test this hypothesis is by discovering additional characters within *Perelleschus*, possibly through new species. Without further information, the reduced internal sclerite of *P. splendidus* remains difficult to homologize.

The monophyly of *P. evelynae* and *P. variabilis* is indicated by the narrowed, acute apex of the spermatheca in females; the male genitalia of this taxon differ comparatively little. The clade of *P. pubicoxae* to *P. sulcatae* presents males with a deflexed tegminal apodeme, as well as paired internal sclerites in the apical region of the median lobe. Finally, the association of *P. carludovicae* and *P. sulcatae* with *C. rotundifolia* and *C. sulcata* is considered to constitute evidence for the monophyly of these two species, in spite of the reduced internal sclerites in males of *P. sulcatae*. All other species of *Perelleschus* - except *P. pubicoxae* which has been collected on *C. drudei* - appear to be associated with *C. palmata*. We agree that the putative primary homology of host plant associations has to be subjected to the test of congruence with other cladistic characters (McDonald, 2001).

It is noteworthy that *P. rectirostris*, which is sister to the remaining species of *Perelleschus*, has the southernmost distributional record (i.e., Perú) within the genus, whereas some younger species like *P. carludovicae* and *P. sulcatae* occur much further north (i.e., Costa Rica). However, we believe that more locality records are necessary before a biogeographic

analysis of *Perellesschus* should be attempted. In order to explain the evolution of characters (as putative historical adaptations) in *Carludovica* and *Perellesschus*, we require cladistic analyses for both taxa, as well as more comprehensive studies on the behavior of all the species of *Perellesschus* as pollinators and predators of seeds.

ACKNOWLEDGEMENTS

We thank Lutz Behne (Deutsches Entomologisches Institut, Eberswalde, Germany) for locating and loaning the types of *P. rectirostris* and *P. subcinctus*; Robert Anderson, Gerhard Gottsberger, and Alexander Konstantinov for specimen loans; Paul Skelley and Mike Thomas for assisting with the use of photographic equipment at the Florida State Collection of Arthropods, Gainesville, FL; David Grimaldi and Tam Nguyen for facilitating the use of the SEM at the American Museum of Natural History; Lutz Behne and Martin Schlabach for reference to obituaries of Nevermann; Barry Hammel for information on the diversity of *Carludovica*; as well as Roberto Keller, Kelly Miller, and Quentin Wheeler for valuable comments. The research of NMF in Costa Rica was funded by the German National Merit Foundation and the Organization for Tropical Studies. The research of CWOB was supported in part by the Cooperative State Research, Education, and Extension Service, USDA (FLAX 85006).

LITERATURE CITED

- Alonso-Zarazaga, M. A. and C. H. C. Lyal. 1999. A world catalogue of families and genera of Curculionoidea (Insecta: Coleoptera) (excepting Scolytidae and Platypodidae). Entomopraxis, Barcelona, Spain. 315 pp.
- Anderson, R. S. and L. D. Gómez. 1997. *Systemotelus*, a remarkable new genus of weevil (Coleoptera: Curculionidae) associated with *Carludovica* (Cyclanthaceae) in Costa Rica and Panamá. *Revista de Biología Tropical* 45: 887-904.
- Anonymous. 1938. Obituary (W. H. F. Nevermann). *Entomological News* 49: 239-240.
- Arnett, R. H. Jr., G. A. Samuelson and G. M. Nishida. 1993. The insect and spider collections of the world. Second edition. *Fauna & Flora Handbook* no. 11. Sandhill Crane Press, Gainesville, Florida. 310 pp.
- Blackwelder, R. E. 1947. Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. Part 5. *Smithsonian Institution United States National Museum Bulletin* 185: 765-925.
- Bremer, K. 1994. Branch support and tree stability. *Cladistics* 10: 295-304.
- Brown, R. W. 1956. *Composition of scientific words*. Revised edition. Smithsonian Institution Press, Washington, D. C. 882 pp.
- Burke, H. R. 1959. Morphology of the reproductive systems of the cotton boll weevil (Coleoptera, Curculionidae). *Annals of the Entomological Society of America* 52: 287-294.
- Croat, T. B. 1978. *Flora of Barro Colorado Island*. Stanford University Press, California. 943 pp.
- Crowson, R. A. 1944. Further studies on the metendosternite in Coleoptera. *Transactions of the Royal Entomological Society of London* 94: 273-310.
- Dejean, P. F. M. A. 1821. *Catalogue de la collection de Coléoptères de M. le Baron Dejean*. Crevot, Paris. 146 pp.
- Eriksson, R. 1994. Phylogeny of the Cyclanthaceae. *Plant Systematics and*

- Evolution 190: 31-47.
- Franz, N. M. 1999. Biología reproductiva de algunas ciclantáceas (Cyclanthaceae) y de los picudos asociados (Coleoptera: Curculionidae). Tesis de Maestría, Universidad de Costa Rica, San José, Costa Rica. 97 pp.
- Franz, N. M. 2001. Description and phylogeny of *Staminodeus*, a new genus of Derelomini (Coleoptera: Curculionidae) associated with Cyclanthaceae. *Coleopterists Bulletin* (in press).
- Hammel, B. E. 1986. Notes on the Cyclanthaceae of Southern Central America including three new species. *Phytologia* 60: 5-15.
- Harling, G. 1958. Monograph of the Cyclanthaceae. *Acta Horti Bergiani* 18: 1-428. 110 plates.
- Goloboff, P. A. 1993. NONA. Version 2.0 (for Windows). Published by the author, INSUE Fundación e Instituto Miguel Lillo, Miguel Lillo 205, 4000 S. M. de Tucumán, Argentina.
- Gottsberger, G. 1990. Flowers and beetles in the South American tropics. *Botanica Acta* 103: 360-365.
- Günther, K. 1936. Notizen über Rüsselkäfer aus Costa Rica. *Entomologische Rundschau* 53: 190-192.
- Kuschel, G. 1952. Los Curculionidae de la Cordillera Chileno-Argentina (1.a parte). *Revista Chilena de Entomología* 2: 229-279.
- Kuschel, G. 1955. Nuevas sinonimias y anotaciones sobre Curculionoidea (Coleoptera). *Revista Chilena de Entomología* 4: 261-312.
- Kuschel, G. 1992. Reappraisal of the Baltic Amber Curculionoidea described by E. Voss. *Mitteilungen des Geologisch-Paläontologischen Instituts der Universität Hamburg* 73: 191-215.
- Luckow, M. and A. Bruneau. 1997. Circularity and independence in phylogenetic tests of ecological hypotheses. *Cladistics* 13: 145-151.
- Marvaldi, A. E. and J. J. Morrone. 2000. Phylogenetic systematics of weevils (Coleoptera: Curculionoidea): a reappraisal based on larval and adult morphology. *Insect Systematics & Evolution* 31: 43-58.
- McDonald, M. J. 2001. Host associations as taxonomic characters, pp. 145-173. In: McDonald, M. J. *Systematic studies in Euphorinae (Hymenoptera: Braconidae)*, with a revision of the New World species of *Aridelus*. Ph. D. dissertation, Cornell University, Ithaca, New York. 262 pp.
- Nichols, S. W., compiler. 1989. *The Torre-Bueno glossary of entomology, including supplement A* by George S. Tulloch. New York Entomological Society, New York. 840 pp.
- Nixon, K. C. 1999. Winclada. (Beta) version 0.9.99m24. Published by the author, Ithaca, New York.
- Nixon, K. C. and J. M. Carpenter. 1993. On outgroups. *Cladistics* 9: 413-426.
- O'Brien, C. W. and G. J. Wibmer. 1982. Annotated checklist of the weevils (Curculionidae *sensu lato*) of North America, Central America, and the West Indies (Coleoptera: Curculionoidea). *Memoirs of the American Entomological Institute* 34: 1-382.
- Schönherr, C. J. 1836. *Genera et species curculionidum, cum synonymia hujus familiae. Species novae aut hactenus minus cognitae, descriptionibus a Dom. Leonardo Gyllenhal, C. H. Boheman, et entomologis aliis illustratae.* Volume 3(1): 1-505. Roret, Paris.
- Strong, E. E. and D. Lipscomb. 1999. Character coding and inapplicable data. *Cladistics* 363-371.
- Thompson, R. T. 1992. Observations on the morphology and classification of weevils (Coleoptera, Curculionoidea) with a key to major groups. *Journal of Natural History* 26: 835-891.
- Ting, P. 1936. The mouth parts of the coleopterous group Rhynchophora.

- Microentomology 1: 93-114.
- Voss, E. 1954. Curculionidae (Col.), pp. 193-376. In: Titschack, E., ed. Beiträge zur Fauna Perús, Band IV, Wissenschaftliche Bearbeitungen. VEB Gustav Fischer Verlag, Jena, Germany. 386 pp.
- Wheeler, Q. D. and N. I. Platnick. 2000. The phylogenetic species concept (*sensu* Wheeler and Platnick), pp. 55-69. In: Wheeler, Q. D. and R. Meier, eds. Species concepts and phylogenetic theory: a debate. Columbia University Press, New York. 230 pp.
- Wibmer, G. J. and C. W. O'Brien. 1986. Annotated checklist of the weevils (Curculionidae *sensu lato*) of South America (Coleoptera: Curculionoidea). *Memoirs of the American Entomological Institute* 39: 1-563.
- Zherikhin, V. V. and V. G. Gratshev. 1995. A comparative study of the hind wing venation of the superfamily Curculionoidea, with phylogenetic implications, pp. 633-777. In: Pakaluk, J. and S. A. Slipinski, eds. *Biology, phylogeny, and classification of Coleoptera: papers celebrating the 80th birthday of Roy A. Crowson*. Volume 2. Muzeum i Instytut Zoologii PAN, Warszawa, Poland. 533 pp.

TABLE 1. Character matrix for the cladistic analysis of *Perelleschus*.

Taxon/character	5					10						
<i>Sta. vectoris</i>	0	0	0	0	0	-	-	-	0	0	0	?
<i>Derelomini</i> sp. nov.	0	1	0	0	0	-	-	-	0	0	0	?
<i>Sys. costaricensis</i>	1	0	0	0	1	-	-	-	0	0	0	?
<i>P. rectirostris</i>	1	1	1	0	1	0	0	-	0	1	0	0
<i>P. evelynae</i>	1	1	1	0	1	1	0	-	1	1	1	0
<i>P. variabilis</i>	1	1	1	0	1	1	0	-	1	1	1	0
<i>P. biventralis</i>	1	1	1	0	1	1	1	0	1	1	0	0
<i>P. splendidus</i>	1	1	1	0	1	0	1	0	1	1	0	0
<i>P. pubicoxae</i>	1	1	1	1	1	1	1	1	1	1	0	0
<i>P. carludovicae</i>	1	1	1	1	1	1	1	1	1	1	0	1
<i>P. sulcatae</i>	1	1	1	1	1	0	1	1	1	1	0	1

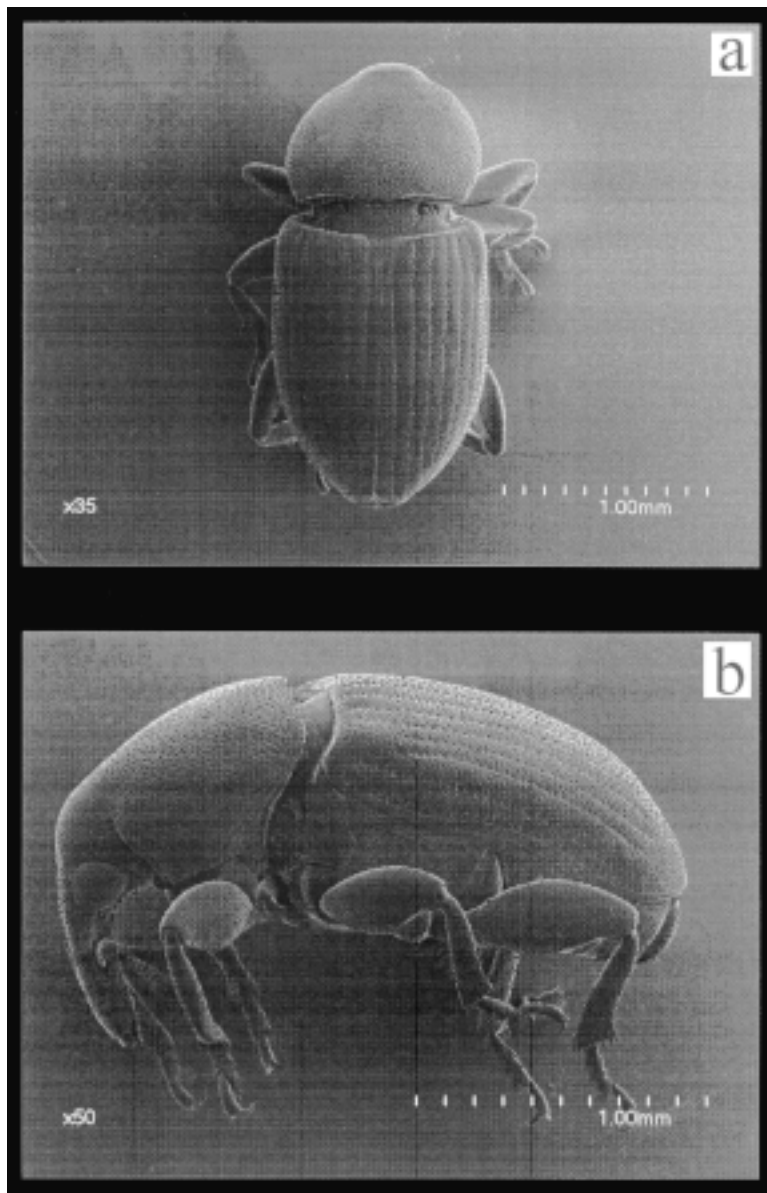


Fig. 1. *Perelleschus carludovicae*, habitus of male; a) dorsal; b) lateral. Scale bar 1.0 mm.

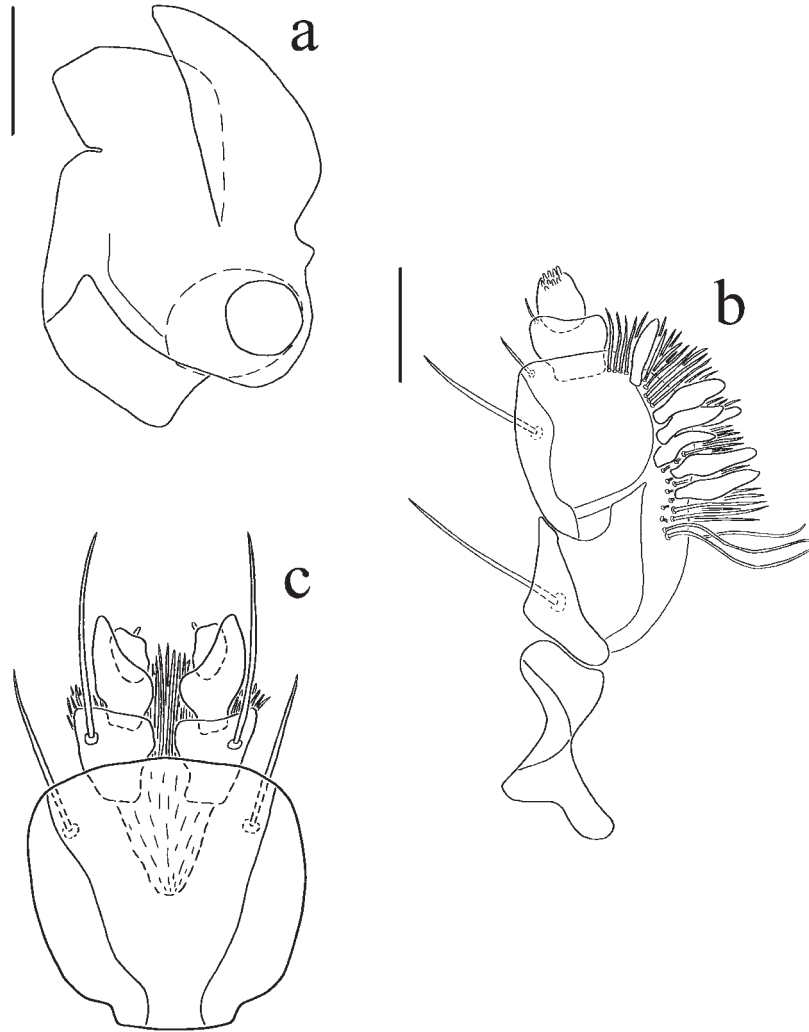


Fig. 2. *Perelleschus carludovicae*, mouthparts of male, ventral view; a) left mandible; b) right maxilla; c) labial prementum. Scale bar 0.05 mm.

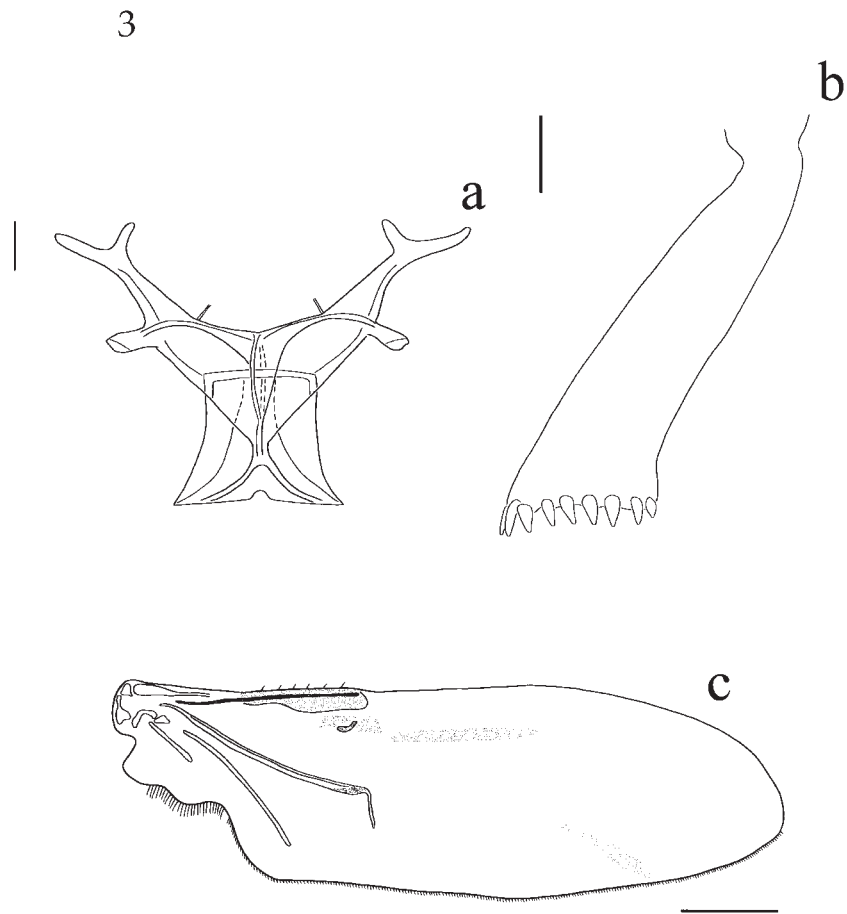


Fig. 3. *Perelleschus carludovicae*, male; a) metendosternite, posterior view; b) protibia, posterior view; c) right wing, dorsal view. Scale bar 0.1 mm (a+b), 0.5 mm (c).

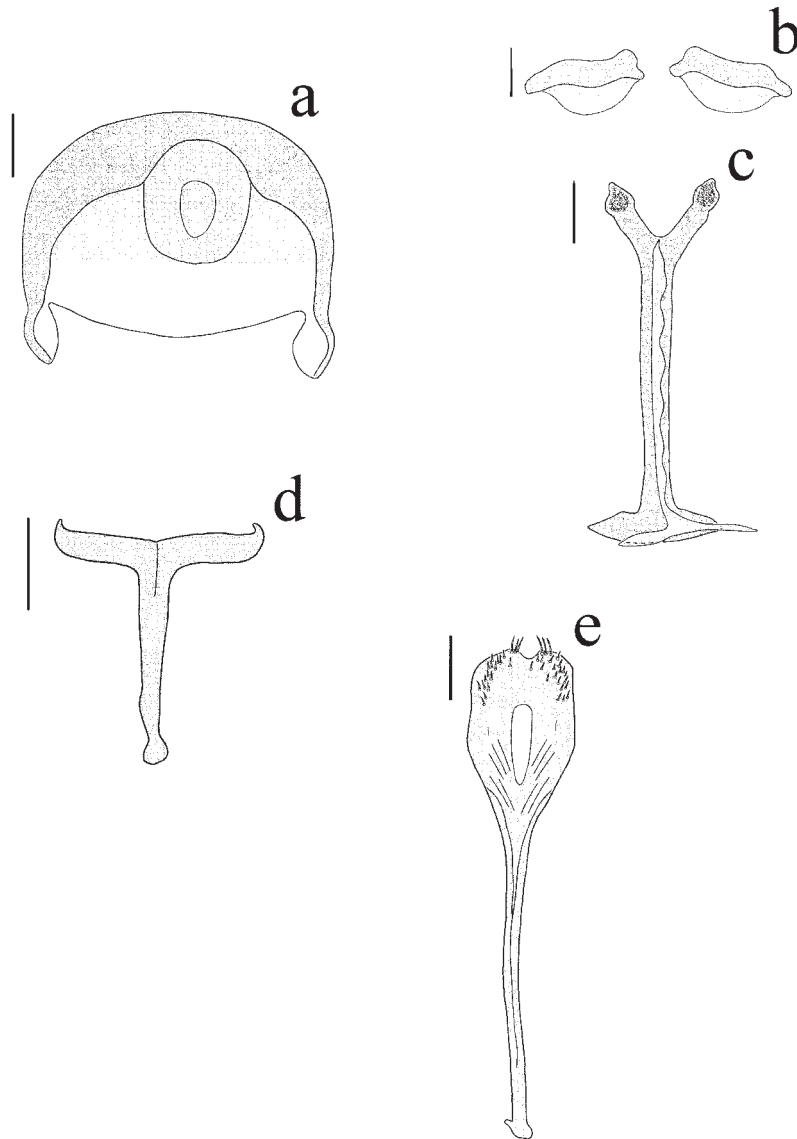


Fig. 4. *Perelleschus carludovicae*, genitalia of male and female, ventral view; a) tergum VIII of male; b) sternum VIII of male; c) spiculum gastrale of male; d) tegmen of male; e) sternum VIII of Female.— Scale bar 0.1 mm.

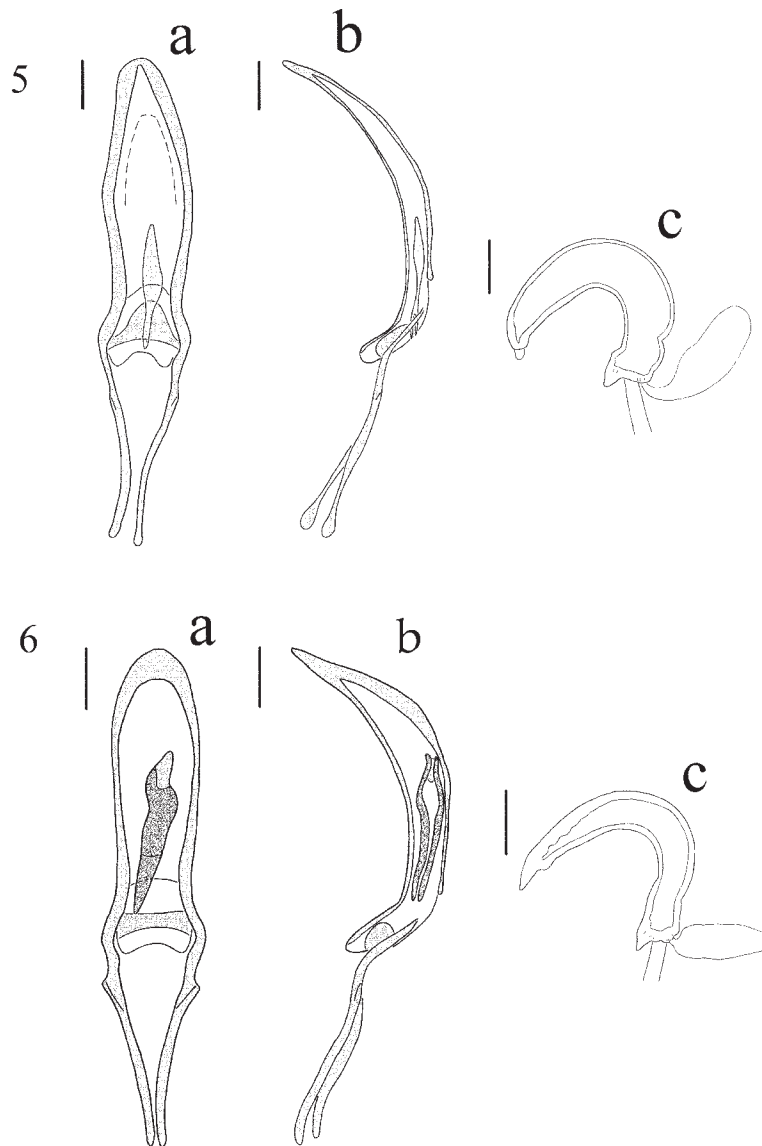


Fig. 5. *Perelleschus rectirostris*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. All genitalia illustrations are interpretative; denticulation and setation are omitted, the stippling indicates the level of sclerotization. Scale bar 0.1 mm.

Fig. 6. *Perelleschus evelynae*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

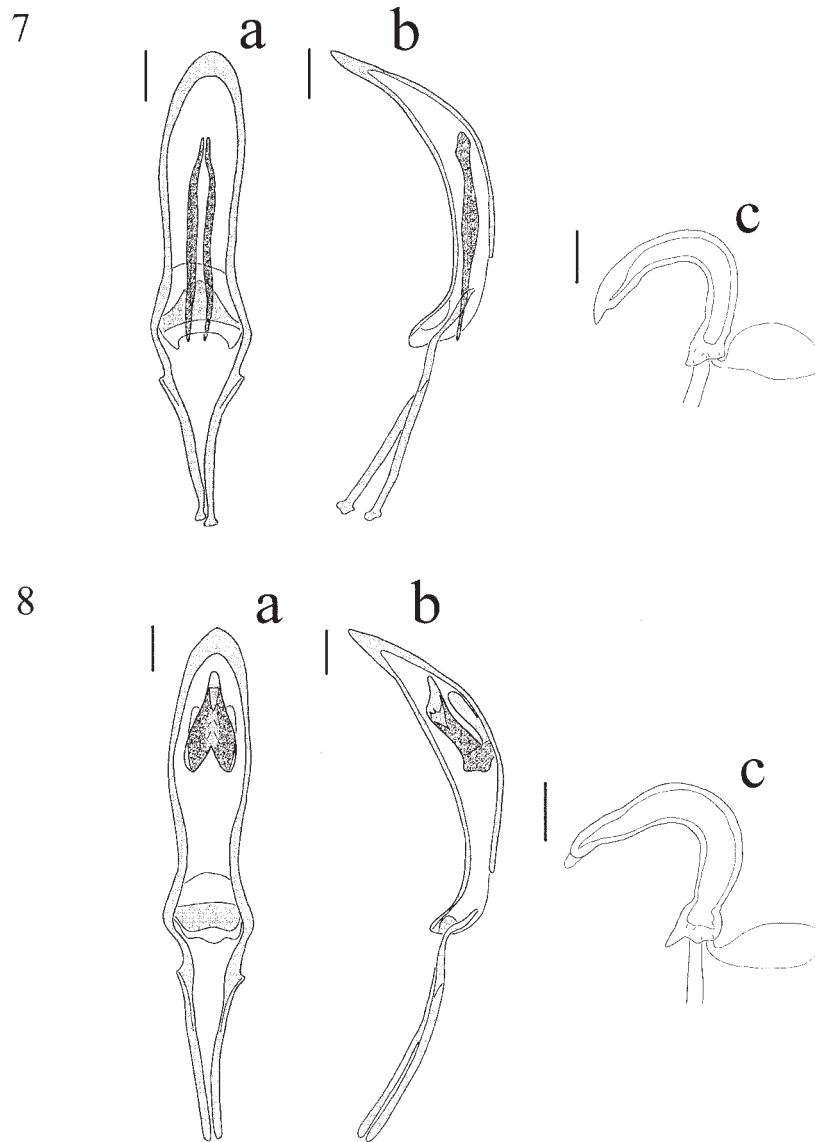


Fig. 7. *Perelleschus variabilis*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

Fig. 8. *Perelleschus biventralis*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

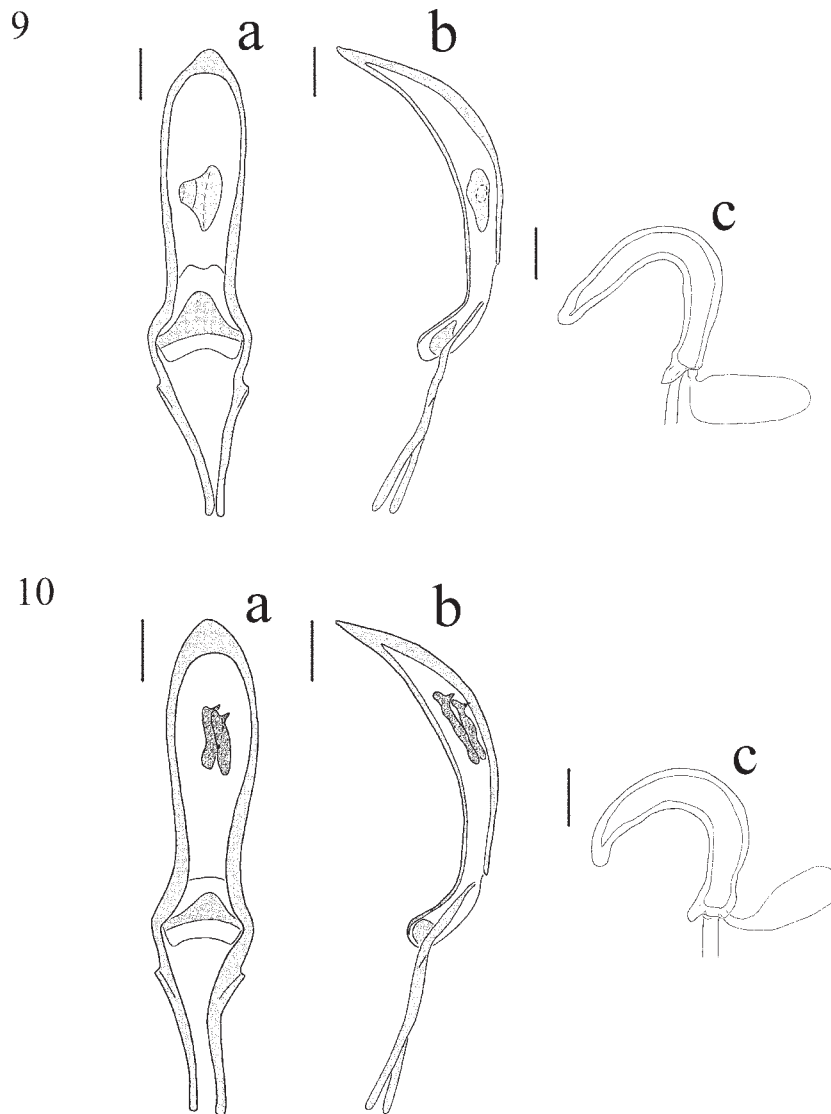


Fig. 9. *Perelleschus splendidus*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

Fig. 10. *Perelleschus pubicoxae*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

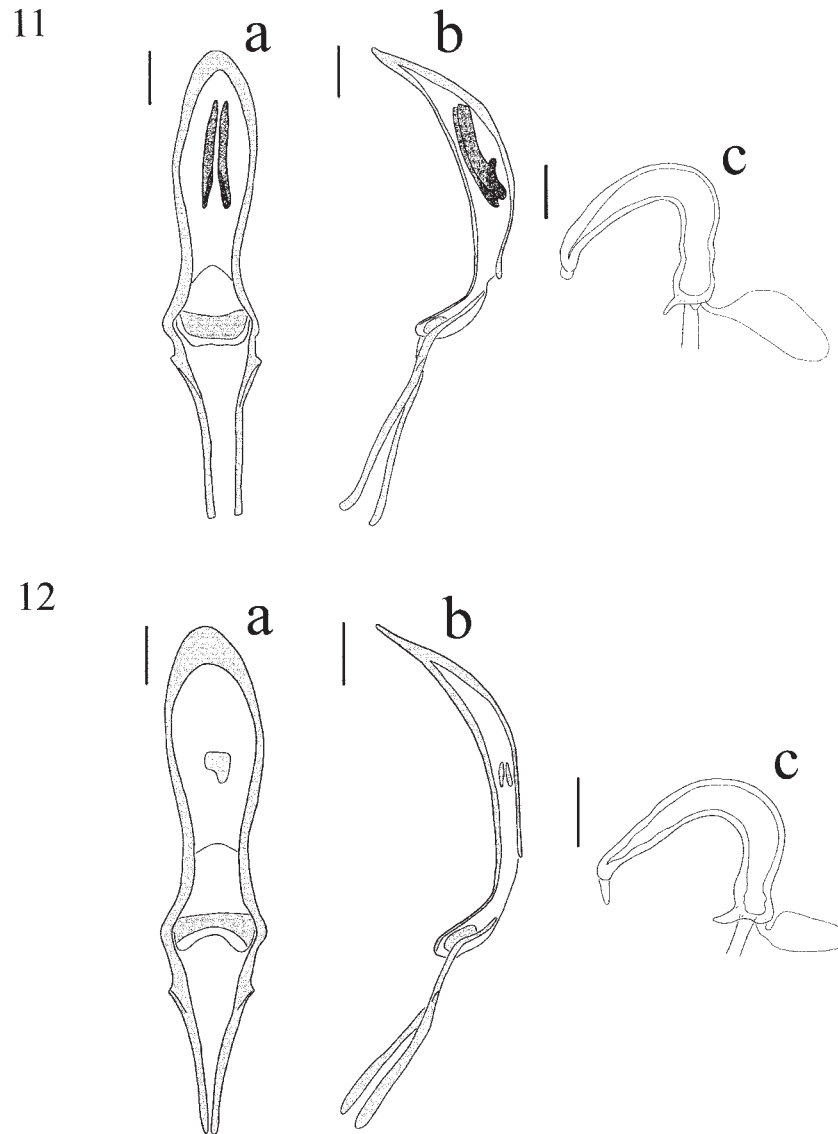


Fig. 11. *Perelleschus carludovicae*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

Fig. 12. *Perelleschus sulcatae*, genitalia of male and female; a) aedeagus, ventral view; b) aedeagus, lateral view; c) spermatheca and gland reservoir. Scale bar 0.1 mm.

13

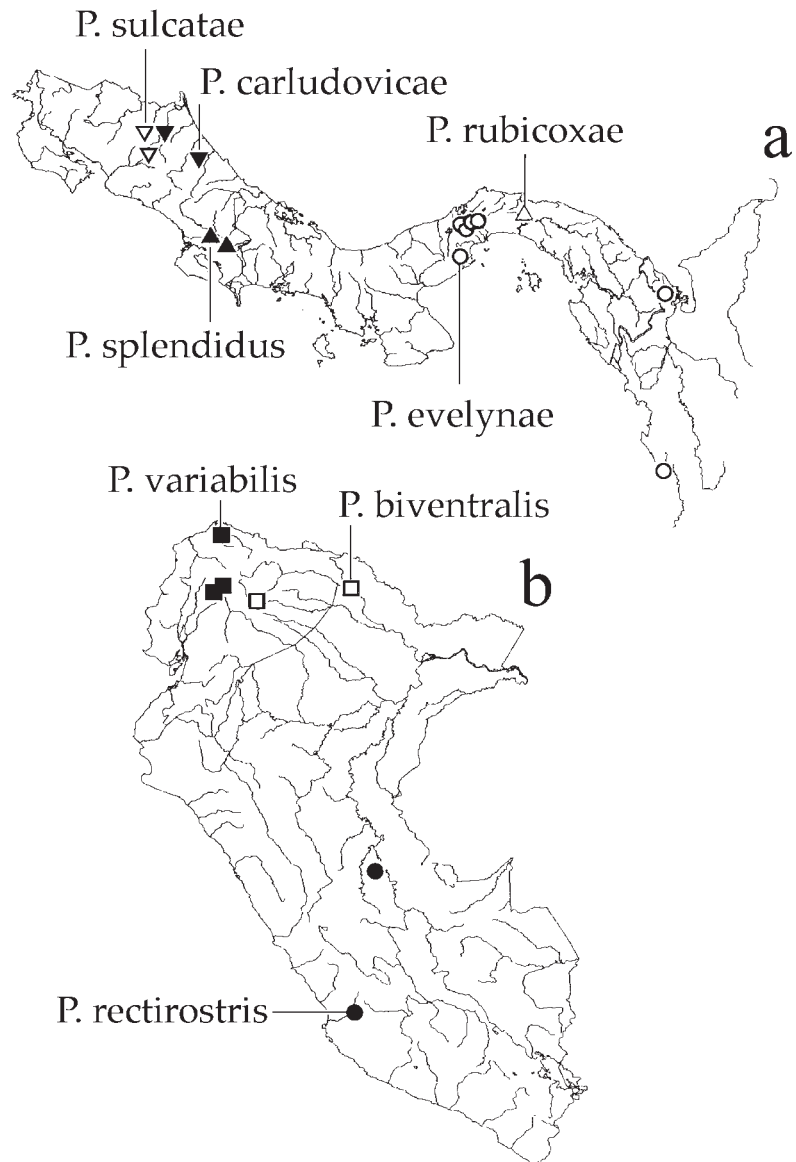


Fig. 13. Distribution of *Perelleschus*; a) Costa Rica, Panama, and Colombia; b) Ecuador and Perú.

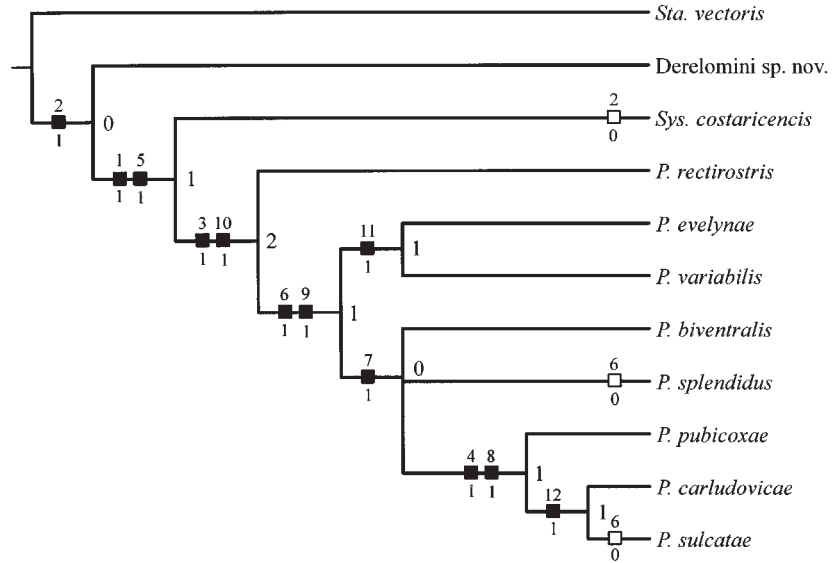


Fig. 14. Preferred cladogram of the eight species of *Perelleschus*, with *Sta. vectoris*, *Derelomini* sp. nov., and *Sys. costaricensis* as outgroup taxa. Character transformations are mapped according to ACCTRAN optimization. Nonhomoplasious characters are indicated by black rectangles, whereas homoplasious characters are indicated by white rectangles (see also discussion). Character numbers and states (Table I) are displayed above and below each rectangle, respectively, and Bremer support is indicated at the right end of each branch.