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A taxonomic revision of *Camptocerus* Dejean (Coleoptera:  
Curculionidae: Scolytinae)

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## A taxonomic revision of *Camptocerus* Dejean (Coleoptera: Curculionidae: Scolytinae)

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**Abstract.** The Neotropical ambrosia beetle genus *Camptocerus* Dejean was revised. Monophyly of the genus was tested using 66 morphological characters in a cladistic analysis. *Camptocerus* was recovered as monophyletic and 31 species were recognized. Six **new synonyms** were discovered: *C. auricomus* Blandford 1896 (= *C. striatulus* Hagedorn 1905), *C. inoblitus* (Schedl) 1939 (= *C. morio* (Schedl) 1952), *C. niger* (Fabricius) 1801 (= *C. tectus* Eggers 1943), *C. opacicollis* (Eggers) 1929 (= *C. infidelis* Wood 1969; = *C. uniseriatus* Schedl 1972), *C. suturalis* (Fabricius) 1801 (= *C. cinctus* Chapuis 1869). Two species were **removed from synonymy**: *C. charpentierae* Schedl and *C. hirtipennis* Schedl. Twelve **new species** of *Camptocerus* were described: *C. coccoformus* (Brazil, Ecuador), *C. distinctus* (Ecuador), *C. doleae* (Ecuador), *C. igniculus* (Brazil), *C. mallopterus* (Ecuador), *C. noel* (widely distributed across Amazonia), *C. petrovi* (Ecuador), *C. pilifrons* (Ecuador), *C. pseudoangustior* (widely distributed across Amazonia), *C. satyrus* (Brazil), *C. unicornus* (Brazil) and *C. zucca* (Ecuador). **Lectotypes** are here designated for the following species: *Camptocerus auricomus* Blandford, *Camptocerus squammiger* Chapuis, *Hylesinus gibbus* Fabricius, *Hylesinus suturalis* Fabricius, *Hylesinus fasciatus* Fabricius. A key, diagnosis, distribution, host records and images were provided for each species.

### Introduction

Beetles of the subfamily Scolytinae (Coleoptera: Curculionidae) are ubiquitous in forests worldwide and contribute to the decomposition of dead vegetation. More than 6,000 species (Wood and Bright 1992) specialize on plant parts, from root to fruit, as food resources for larvae and adults (Wood 1982). Scolytines, along with the closely related subfamily Platypodinae, are collectively referred to as the bark and ambrosia beetles. The Scolytinae are primarily composed of two distinct ecological feeding groups; bark beetles and ambrosia beetles. True bark beetles feed on phloem and cambium of living, declining or dead trees. Ambrosia beetles tunnel into the xylem of a declining or dead host tree and cultivate a symbiotic fungal garden on which the adults and larvae feed. This ambrosial feeding habit has evolved multiple times within the Scolytinae (Farrell et al. 2001). The primary behavior of boring under bark and into sapwood hastens decomposition via the introduction of other xylophagous organisms.

Even though South America possesses one of the most diverse groups of scolytines in the world (Wood 2007), the fauna is one of the least known (Bright 1993). Due to the fact that more than half of South American species are known from a single collecting event, Wood (2007) estimated that less than one-third of the fauna has been described. Along with under-studied species diversity, little is known about South American scolytine biology and ecology, including host tree associations (Beaver 1972). One such poorly known group is the tribe Scolytini and specifically the ambrosia beetle genus *Camptocerus* Dejean (Wood 2007). This study was undertaken to taxonomically revise and redescribe the *Camptocerus* species (Scolytinae: Scolytini). Phylogenetic analysis based on adult morphological and ecological characters were incorporated to determine monophyly of the genus, species validity, species relationships and the relationship of *Camptocerus* within the tribe Scolytini.

### Natural History

*Camptocerus* is unique among the genera in the tribe Scolytini because the larvae are xylomycetophagous (xylem and ambrosial fungus feeding) instead of phloeophagous (phloem feeding) (Beaver 1972; Wood 1972, 1982, 1986, 2007; Petrov 2007). The female creates an entrance tunnel into the cambium where the male joins her. Infestation of moribund host material can start within one day, but

typically occurs within 2-4 days and ceases after 3 to 10 days (Beaver 1972). However, observations in Peru indicate that *Camptocerus* species can continue colonization for more than 26 days (Smith 2009). In a typical gallery, the entrance tunnel runs in a transverse plane toward the center of the stem. From this tunnel, the female adds one or two circumferential branches creating a maternal gallery (Wood 2007). Females lay single eggs along the maternal gallery in wide niches cut at right angles to the gallery and on parallel sides. Niches are plugged with boring dust (Beaver 1972). Females occupy the inner galleries and males protect the gallery entrance by plugging the holes with their bodies (Beaver 1972; Smith 2009).

Larvae hatch and feed on xylem and the black mycelial growth of the ambrosia fungi lining the niche. Each larva enlarges its niche to a cradle as it grows and is capable of turning around within the cradle. The 7-10 week life cycle is longer than other xylomycetophagous scolytines and platypodines and may perhaps be due to the slow growth of the ambrosial fungus (Beaver 1972). Females probably inoculate the tree with fungal spores stored in their mycangia upon attack (Beaver 1972); however, the location of the mycangia have been previously unknown.

Several *Camptocerus* species have been known to colonize a single host tree and the species segregate themselves by trunk/branch size, with large species attacking the trunk and large branches (5- <30 cm) and small species attacking smaller branches (1- 5 cm) (Beaver 1972; Smith 2009). Depending on the site, a single host has been observed to contain between one and four (Beaver 1972) and six species of *Camptocerus* (Smith, pers. obs.).

Maturation feeding is a rare and unusual behavior for scolytines but it has been observed for some *Scolytus* species feeding on bark of twigs, and for several *Camptocerus* species feeding on leaves. *Camptocerus aeneipennis* (Fabricius) adults have been found feeding on leaves of a *Thrysoodium* species (Anacardiaceae) in the Panama Canal Zone (von Winning 1930). The beetles had chewed the leaf's central vein to form circular holes slightly larger than the width of their bodies. Each beetle was lying in a hole with its mesosternum lying between the leaf surfaces, with heads directed toward the leaf's ventral surface. Once positioned, the beetles performed window feeding (feeding only on one surface of the leaf) a few millimeters from their present hole or up to 20 mm away. It is presumed that the beetles were using the leaves for maturation feeding (von Winning 1930). This behavior has also been observed by *C. opacicollis* (Eggers), *C. noel* Smith and Cognato n. sp., *C. pseudoangustior* Smith and Cognato n. sp. (Smith 2009), *C. aeneipennis* and *C. aterrimus* in Madre de Dios Province, Peru (Smith, pers. obs.), *C. auricomus* Blandford at La Selva Biological Station, Costa Rica (Smith, pers. obs.), and by *C. suturalis* (Fabricius) in Loreto Province, Peru (Petrov, pers. comm.). Although these behaviors were not witnessed, feeding damage from *C. aeneipennis* and *C. auricomus* Blandford were also observed by SMS along Pipeline Road in the Parque Nacional Soberania, Panama Province, Panama. This locality is along the Panama Canal and in the same area from which this behavior was first reported (von Winning 1930). This method of maturation feeding is similar to that reported for *Cnemonyx minisculus* (Blandford) (von Winning 1930) and different from *Scolytus* species which typically feed in on the bases of leaf petioles (Wood 1982). Maturation feeding has not been documented for *Scolytopsis*.

*Camptocerus* exhibit a unique aggregation technique. It is apparent that *Camptocerus* also chew aggregation holes in leaves within 2 m of host tree. The behavior is similar to maturation feeding except that a hole is chewed in the leaf, but the material is not digested. In addition, there is never window-feeding damage near the hole. This behavior creates distinctive damage that is easily recognizable by perfectly formed circular holes located between two leaf veins (Smith 2009).

Host records for *Camptocerus* are limited, but *Camptocerus* have been found colonizing eleven different tree families with host records reported for half of all species. *Camptocerus* are overwhelmingly collected from members of the Burseraceae (specifically *Protium* sp.), but they can also utilize species of Chrysobalanaceae, Clusiaceae, Euphorbiaceae, Fabaceae, Lauraceae, Meliaceae, Rosaceae, and Sapindaceae to a lesser extent. *Camptocerus* have been observed to preferentially colonize *Protium* over other documented hosts (Beaver 1972) and Beaver (1989) concluded that *Camptocerus* species are host specific on *Protium* species. Host specificity is unusual for ambrosia beetles, which are typically polyphagous (Hulcr et al. 2007a).

The geographical range of *Camptocerus* extends from Veracruz, Mexico (Atkinson and Equihua-Martinez 1986) to Chaco, Argentina (Bruch 1914). To date, only four species have been found in Mexico and Central America. Of those, one is endemic to Central America, two are distributed in Central and South America, one is distributed in Mexico, Central, and South America; 27 species occur exclusively in



South America. None is known to occur in the West Indies (Bright, pers. comm.). Given this distribution pattern, Wood (1982) hypothesized that the genus originated in South America and has radiated north over time. In addition, the greatest diversity of *Camptocerus* species (90%), as well as the other Scolytini, lies in the Amazon Basin (Wood and Bright 1992; Wood 2007).

## Systematics

The tribe Scolytini is currently composed of approximately 209 species in four genera: *Camptocerus* Dejean 1821, *Cnemonyx* Eichhoff 1868, *Scolytus* Geoffroy 1762, and *Scolytopsis* Blandford 1896. The tribe likely originated in the Neotropics with all genera distributed in the New World, except for numerous Palearctic *Scolytus* (Wood 1986). All genera are phloeophagous (phloem feeding) with the exception of the xylomycetophagous *Camptocerus*. All genera are monogamous except for a few species of Neotropical *Scolytus* (Wood 1982). Members of the tribe are identified by a single apical, unarmed spine-like process that curves toward and extends beyond the process of the inner apical angle of the protibia and by a seven-segmented funicle. All display a strongly sexually dimorphic head bearing hair-like setae, with the male frons variously excavated and female frons flat to convex (excavated in *Scolytus excavatus* Wood). The eye is entire and the posterior area of head is subtruncate. The pronotum is unarmed with a costate lateral margin. In addition, the metapleural suture descends subventrally to the groove, receiving the groove on the costal margin of the elytra, then turns abruptly and parallels the groove near the metacoxal process (Wood 1978, 1982, 1986).

*Camptocerus* has historically been distinguished from the other genera of the tribe by the following characters: a large, broad, and flat scutellum that is at least 1.5 times wider than long, the absence of a notch at the elytral base for scutellar reception, the generally larger body size, the gradually ascending abdomen, the extensively excavated male frons, suture 1 of the antennal club being marked internally by a septum, the usually finely sculptured elytra, the meso- and metathoracic tibiae being acutely margined on the apical anterior edge without supplemental denticles, and the xylomycetophagous habit (Wood 1982, 1986, 2007). *Camptocerus* species show marked sexual dimorphism of the frons and epistoma; the male frons is often strongly excavated and the female frons is flat to convex. The male frons is covered by more numerous and longer setae than the female frons. The epistoma is elongated and rostrate in the male. Sexual dimorphism also occurs in the antennal scape and funicle and to various degrees in the elytral declivity. The female scape and funicle are similar to the male antenna but lack the long brush-like setae on funicle segments 2-7. It is difficult to distinguish between some members of *Camptocerus* and *Cnemonyx* due to similar morphology. They are most effectively identified by phloeophagous (*Cnemonyx*) or xylomycetophagous (*Camptocerus*) feeding habits (Wood, pers. comm.). Unfortunately, many *Camptocerus* species have only been collected by passive methods (e.g. canopy fogging). As a result, species identity of approximately half of the *Camptocerus* species has been confirmed by field observations of xylomycetophagy; feeding habits of the remaining species are unknown.

## Taxonomic History

*Camptocerus* was created without a description in the first Dejean Catalog (Dejean 1821) where it included a single species, *Hylesinus aeneipennis* Fabricius. In 1829 Latreille cited Dejean when he described the genus *Camptocerus* as “whose males have strongly bent antennae, furnished outside with long hair-like setae; which are inserted at a notable distance from the eyes, which are elliptical and oblique” (translated by SMS). Thus, authorship of *Camptocerus* has been attributed to Latreille (1829) in the majority of taxonomic literature (Erichson 1836; Laporte 1840; Lacordaire 1866; Chapuis 1869; Girard 1873; Blandford 1896; Hagedorn 1910; Blackman 1943; Blackwelder 1947; Schedl 1952, 1962; Beaver 1972; Wood 1978, 1982, 1986; Beaver 1989; Wood and Bright 1992; Petrov 2007; Wood 2007) with three exceptions that also cite Dejean (Lacordaire 1866; Beaver 1972; Wood 1972) and three that exclusively cite Dejean (Latreille 1829; Hopkins 1914, 1915). This authorship conflict was recently resolved by Alonso-Zarazaga and Lyal (2009) who restored authorship to Dejean.

The unique morphology exhibited by *Camptocerus* species has led to the creation and subsequent placement in the group (tribe) Camptocérides with the Paletropical genus *Diaperus* Erichson (Lacordaire 1866). Ferrari (1867) recognized the Camptocérides as a subtribe. Chapuis (1869) elevated the Camptocérides

back to a tribe and Blandford (1893) maintained this taxonomic position, until he later sunk the *Camptocérides* back to the level of subgroup (subtribe) (Blandford 1896). Blandford (1896) removed *Diamera* from this group and placed the genera *Cnemonyx*, *Loganius* Chapuis and *Ceratolepsis* Chapuis into the subtribe. Hopkins (1915) elevated the subtribe to the subfamily Camptocerinae. Blatchey and Leng (1916) sunk the Camptocerinae back to a subtribe, which they named Camptocerini. Costa Lima (1956) departed from this classification and followed Hopkins (1915) recognizing these genera at the subfamily level. Wood (1961) appeared to have placed the Camptocerini as a synonym of the tribe Scolytini.

Prior to Wood's 1972 anatomical revision, the tribe Scolytini consisted of two clearly defined genera (*Scolytus* and *Scolytopsis*) and five strikingly similar genera (*Camptocerus*, *Cnemonyx*, *Loganius*, *Ceratolepsis*, and *Coptosomus* Schedl). *Camptocerus*, *Ceratolepsis*, and *Coptosomus* possess meso- and metathoracic tibiae that are identical to the prothoracic tibiae, with a straight, sharp, and smooth anterior edge of the apical margin to the base of the outer apical spine. In *Cnemonyx* and *Loganius*, the surface of the tibial anterior edge of the apical margin to the base of the outer apical spine bears one or more denticles. Species with these denticles also have two to three sutures on the antennal club marked with setae, while species without denticles lack externally marked sutures but at least part of suture 1 is marked internally by a septum. Schedl (1962) noted that the characters used to distinguish these genera were inconsistent and formed a spectrum of variation. This caused him to synonymize *Ceratolepsis* with *Camptocerus*. However, Wood (1972) determined the genus *Camptocerus* was a distinct group without any synonymies; he found the characters used to identify *Ceratolepsis* (scales on antennal club), *Cnemonyx* (crenulations of elytral base), and *Coptosomus* (oddly placed antennal suture) were insufficient to clearly define species groups and transferred them to the oldest described genus, *Cnemonyx*. *Loganius* species were divided between *Cnemonyx* and *Camptocerus*.

Five *Camptocerus* species were among the first New World scolytines to be described (Illiger 1807; Blandford 1896). Since 1801, nine authors have contributed species. In 1801, Fabricius described *Hylesinus aeneipennis*, *H. fasciatus*, *H. gibbus*, *H. niger*, and *H. suturalis*. In 1821, Dejean created the genus *Camptocerus* listing only *Hylesinus aeneipennis* and the remaining species were subsequently placed in *Camptocerus* by Erichson (1836). Several taxonomists have described *Camptocerus* species including Chapuis (1869), Blandford (1896), Hagedorn (1910), Eggers (1928, 1929, 1933b, 1943), Blackman (1943), Schedl (1939, 1952, 1970, 1972, 1973), Wood (1969, 1972, 2007), and Petrov (2007). To date, only *C. boliviae* has been moved to another genus (*Cnemonyx*). However, several *Loganius* species have been transferred to *Camptocerus*, including *C. inoblitus* (Wood 1972), *C. major* (Schedl 1952), *C. morio* (Wood and Bright 1992), and *C. opacicollis* (Schedl 1952; Wood 1972). *Camptocerus terebrator* Lacordaire (1833) is a *nomen nudum*. This species does not meet the criteria outlined by the ICZN Article 12.1 (ICZN 1999), as there is no description, definition or indication of the species. Schedl (1976) also indicated that the species did not meet these requirements, but failed to recognize the name as a *nomen nudum*.

It is quite puzzling that *Camptocerus* has one of the longest taxonomic histories of American scolytines yet remains one of the least understood genera. In *Biologia Centrali-Americana*, Blandford (1896) noted that with the exception of *C. aeneipennis*, *Camptocerus* species were rare in collections and few were described. This situation persists to the present with several species represented by fewer than five individuals; *C. aeneipennis* remains common in collections. Indeed biological information exists for fewer than half of the known species with most data pertaining to *C. aeneipennis*.

Although the genus *Camptocerus* was recently reviewed by Wood (2007), an additional 12 new species have since been discovered. Examination of Terry Erwin's Ecuadorian Amazon rain forest canopy fogging samples collected between 1994 and 2006 yielded eight novel *Camptocerus* species (Erwin et al. 2005). These canopy-fogging specimens were placed in a Schmidt box and were taken by Stephanie Dole to Stephen Wood for identification. Wood examined the specimens and determined that most of them were new species (Dole, pers. comm.; Wood, pers. comm.). He later commented on page 2 of his 2007 monograph that "1 box containing about 50 specimens of *Camptocerus* (Scolytini) was examined and was found to represent about 50 different species, almost none of which were represented in the 20 species in my key of that genus." This however was not the case. The box contained specimens representing 18 *Camptocerus* species, many of which Wood had incorrectly identified as well as numerous specimens of *Cnemonyx rugulosus* (Eggers) 1929 and *Cnemonyx vestitus* (Eggers) 1929. Museum loans and recent collecting by the senior author in Guyana and Peru have also led to the discovery of an additional four new species and previously unknown females for three species, *C. charpentierae* Schedl, *C. costatus* Chapuis and *C.*

*quadridens* Blackman. Currently, the genus is composed of thirty-one species, of which nineteen are known and an additional twelve species are described herein.

### A checklist of the species of *Camptocerus* Dejean 1821

- Camptocerus aeneipennis* (Fabricius) 1801  
= *Camptocerus gibbus* (Fabricius) 1801  
*Camptocerus angustior* Eggers 1928  
*Camptocerus annectens* Wood 2007  
*Camptocerus aterrimus* Eggers 1933b  
*Camptocerus auricomus* Blandford 1896  
= *Camptocerus striatulus* Hagedorn 1905 **syn. n.**  
*Camptocerus charpentierae* Schedl 1970 **removed from synonymy**  
*Camptocerus coccoformus* Smith and Cognato **n. sp.**  
*Camptocerus costatus* Chapuis 1869  
= *Camptocerus seriatus* Eggers 1933b  
*Camptocerus distinctus* Smith and Cognato **n. sp.**  
*Camptocerus doleae* Smith and Cognato **n. sp.**  
*Camptocerus hirtipennis* Schedl 1973 **removed from synonymy**  
*Camptocerus igniculus* Smith and Cognato **n. sp.**  
*Camptocerus inoblitus* (Schedl) 1939  
= *Camptocerus morio* (Schedl) 1952 **syn. n.**  
*Camptocerus latipilis* Schedl 1973  
*Camptocerus major* Eggers 1929  
*Camptocerus mallopterus* Smith and Cognato **n. sp.**  
*Camptocerus mandelshtami* Petrov 2007  
*Camptocerus niger* (Fabricius) 1801  
= *Camptocerus squammiger* Chapuis 1869  
= *Camptocerus tectus* Eggers 1943 **syn. n.**  
*Camptocerus noel* Smith and Cognato **n. sp.**  
*Camptocerus occidentalis* Eggers 1928  
*Camptocerus opacicollis* Eggers 1929  
= *Camptocerus aquilus* Wood 1972  
= *Camptocerus infidelis* Wood 1969 **syn. n.**  
= *Camptocerus uniseriatus* Schedl 1972 **syn. n.**  
*Camptocerus orientalis* Eggers 1943  
*Camptocerus petrovi* Smith and Cognato **n. sp.**  
*Camptocerus pilifrons* Smith and Cognato **n. sp.**  
*Camptocerus pseudoangustior* Smith and Cognato **n. sp.**  
*Camptocerus quadridens* Blackman 1943  
*Camptocerus rectus* Wood 1972  
*Camptocerus satyrus* Smith and Cognato **n. sp.**  
*Camptocerus suturalis* (Fabricius) 1801  
= *Camptocerus cinctus* Chapuis 1869 **syn. n.**  
= *Camptocerus fasciatus* (Fabricius) 1801  
= *Camptocerus terebrator* Lacordaire 1833 nomen nudum  
*Camptocerus unicornus* Smith and Cognato **n. sp.**  
*Camptocerus zucca* Smith and Cognato **n. sp.**

### Materials

Approximately 1230 *Camptocerus* specimens representing all taxa from a range of locations in Mexico, Central and South America were examined for this study. Six species, *Cnemonyx* and *Scolytopsis* were

also included in the ingroup: *Cnemonyx boliviae* (Blackman), *C. errans* (Blandford) 1896, *C. insignis* Wood, 1969 *C. rugulosus* (Eggers), *C. vestitus* (Eggers) and *S. peruanus* Eggers 1937. Five *Scolytus* species were selected as the outgroup and as the root taxa: *Scolytus excavatus* Wood (Neotropical - South America), *S. multistriatus* (Marsham) (Palearctic – Europe), *S. propinquus* Blandford (Neotropical – Mexico); *S. schevyrewi* Semenov (Palearctic – Asia); *S. ventralis* LeConte (Nearctic)

The following entomological collection codens (following Arnett et al. 1993) and abbreviations are referenced in the text:

AMNH	American Museum of Natural History, New York, NY (Lee Herman)
BMNH	British Natural History Museum, London, United Kingdom (Max Barclay)
CASC	California Academy of Sciences, San Francisco, CA (Dave Kavanaugh)
CDAE	California State Collection of Arthropods, Sacramento, CA (Jacqueline Kishmirian)
FMNH	Field Museum of Natural History, Chicago, IL (James Boone)
FSCA	Florida State Collection of Arthropods, Gainesville, FL (Mike Thomas)
ISNB	Institute Royal des Sciences Naturelles de Belgique, Brussels, Belgium (Patrick Grootaert)
MECN	Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador
MIUP	Museo de Invertebrados G. B. Fairchild, Universidad de Panamá, Panamá, Panamá
MNHN	Muséum National d'Histoire Naturelle, Paris, France (Hélène Perrin)
MSUC	Albert J. Cook Arthropod Research Collection, Michigan State University, East Lansing, MI (Gary Parsons)
MUSM	Universidad Nacional Mayor de San Marcos, Lima, Peru (Gerardo Lamas)
MZSP	Museum de Zoologia, Universidad de São Paulo, São Paulo, Brazil
NHMW	Naturhistorisches Museum Wien, Vienna, Austria (Heinrich Schöhmman)
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden (Bert Viklund)
RJRC	Robert J. Rabaglia collection, MD
SDEI	Senckenberg Deutsches Entomologisches Institute, Leibniz-Zentrum für Agrarlandschaftsforschung, Müncheberg, Germany (Lothar Zerche)
SMEC	Snow Entomological Museum, Lawrence, KS (Zack Falin)
SMTD	Staatliches Museum für Tierkunde, Dresden, Germany (Olaf Jäger)
STRI	Smithsonian Tropical Research Institute Collection, Balboa, Panama (Annette Aiello)
TAMU	Texas A&M Insect Collection, College Station, TX (Ed Riley)
UCDC	Bohart Museum of Entomology, University of California, Davis, CA (Steve Heydon)
USNM	National Museum of Natural History, Smithsonian Institution, Washington, DC (Including Stephen L. Wood Collection) (Natalia Vandenberg and David Furth)
UMMZ	Museum of Zoology, University of Michigan, Ann Arbor, MI (Mark O'Brien)
UZMC	Natural History Museum of Denmark, University of Copenhagen, Zoological Museum, Copenhagen, Denmark (Alexey Solodovnikov)
ZMMU	Zoological Museum, Moscow State University, Moscow, Russia

Host plants were compiled from the following publications: Kleine 1934; Bondar 1950; Viana 1965; Beaver 1972; Atkinson and Equihua-Martinez 1986; Maes and Equihua-Martinez 1988; Wood and Bright 1992; Wood 2007; Kirkendall (pers. comm.); Petrov (pers. comm.). Distribution records were gleaned from the following sources: Chevrolat 1838; Hagedorn 1905, 1910; Kleine 1913, 1914; Bruch 1914; Nunberg 1962; Schedl 1972; Beaver 1972; Atkinson and Equihua-Martinez 1986; Maes and Equihua-Martinez 1988; Wood and Bright 1992; Bright and Skidmore 1997, 2002; Wood 2007; Petrov (pers. comm.); T. Atkinson (pers. comm.). Plant nomenclature was checked using Discover Life (discoverlife.org) and the International Plant Names Index (www.ipni.org).

Specimens were examined using a Leica MZ16 compound microscope, illuminated with a SCHOTT 150W halogen light source (model ACE ®1). Images were taken with a Leica DFC 320 and montage images were assembled using Helicon Focus 3.50.5 (HeliconSoft). Following the protocol used by Wood (1982, 2007), measurements were made using an ocular micrometer on the same microscope and with the same light source as above calibrated with ROK 150 mm digital calipers (model DC-122A). Measurements were made perpendicular to the specimen's dorsal surface. Length was measured from the anterior margin of the pronotum to the apex of the elytra, excluding the head. Width was measured at the widest part



of the pronotum, the base. Proportions are the ratio of the length to the width. A maximum of 20 individuals were selected for each species and encompassed the known species distribution.

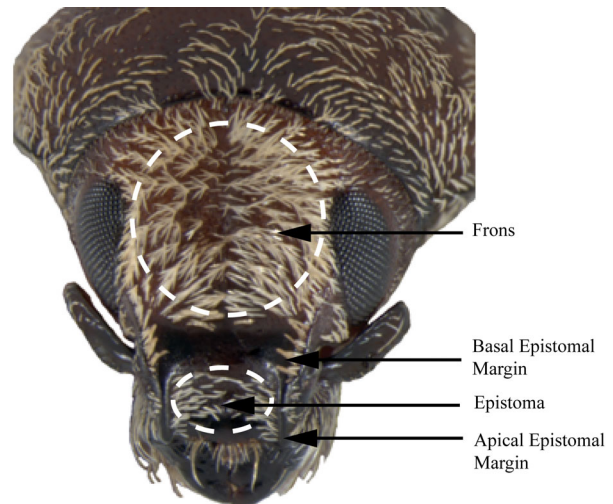
Holotypes and lectotypes were designated with red labels. Paratypes were designated with yellow labels. Sex is denoted in the text by a 'M' or 'F' for males and females respectively. If important locality data, such as states or provinces was missing from specimen labels, the information was inserted between square brackets in the material examined.

### Methods - Morphological Characters

Traditional bark beetle generic and species level morphological characters were employed in this study (Hopkins 1915; Wood 1978; Knízek and Beaver 2004). Characters were taken from generic descriptions (Hagedorn 1910; Wood 1982, 1986, 2007), species descriptions, and personal examination of specimens. *Camptocerus aeneipennis* was used to determine intraspecific variation within a character due to its abundance in museum collections and wide geographic range. All characters were based on adult morphology and feeding habit. External anatomical terminology followed Hopkins (1909), subsequently used by Schedl (1931) and by Wood (1982, 1986, 2007). Sculpture terminology followed Torre-Bueno (1989). The elongated epistoma of male *Camptocerus* differed significantly from other bark beetles and we created new terminology to accommodate this structure. The epistoma was defined as the area extending from the mandibular margin (here termed the apical epistomal margin) to the level of antennal insertion (Wood 1982, 2007) (here termed the basal epistomal margin). The frons was considered the region of the head originating at the basal epistomal margin and terminating at the vertex (Fig. 1). Sternites 1 and 2 are internal and are not visible (Hopkins 1909) so, only visible sternites are referred to in the text. The third and fourth sternites are respectively referred to as the first and second sternites, etc.

Genitalia dissections were performed on male specimens of 37 of 42 taxa. Dissections were not performed for species not represented by males (only females are known for *C. annectens* and *C. major*), for species known only from a short series or only from the holotype. Dissections were performed after soaking a specimen in 70% ethanol for ten minutes. In small species, a hooked #2 stainless steel insect pin was placed in the coxal cavity and was used to pry back the sternites up to tergite 6. The genitalia were then removed and placed in 20% potassium hydroxide until cleared, usually after 5-7 days and neutralized in 20% glacial acetic acid and washed with water. For larger species, preparation was the same and the genitalia were removed by inserting a hooked pin into the genital opening between the seventh sternite and eighth tergite. The genitalia were removed with the hook and cleared using the same methods as above. Genitalia were stored in glass genitalia vials filled with glycerin or by placing them on mounting cards in the manner recommended by the loaning institution.

Characters were scored from both sexes unless otherwise noted. *Camptocerus* exhibit strong sexual dimorphism; males display a wide spectrum of morphological features while females have conserved morphology. As a necessary consequence, characters were predominately male based. Characters were scored for all taxa except for *C. annectens* Wood, and *C. major* (Eggers), which are only known from females. As a result these species were excluded from the phylogenetic analysis (60% of characters scored). Characters and character state numbers corresponded to data coded in the data matrix for each taxon. The characters matrix (Table 1) was constructed and edited from the online database MX (Yoder et al. 2006). Character transformations were evaluated using MacClade 4.0 PPC (Maddison and Maddison 2000) and homology of characters and definitions of character states were re-examined and modified if necessary.



**Figure 1.** Male *Camptocerus suturalis* head illustrating terminology used for the epistoma and frons.



A total of 66 characters (24 binary and 42 multistate) were used in this study. Twenty-two characters were coded from the head including the antennae, 11 characters from the prothorax, 26 characters from the abdomen including the elytra and scutellum, 1 character from the mesosternum, 5 characters from male genitalia and 1 character based on feeding habit. Consistency and retention index values generated from MacClade 4.0 are listed next to each character.

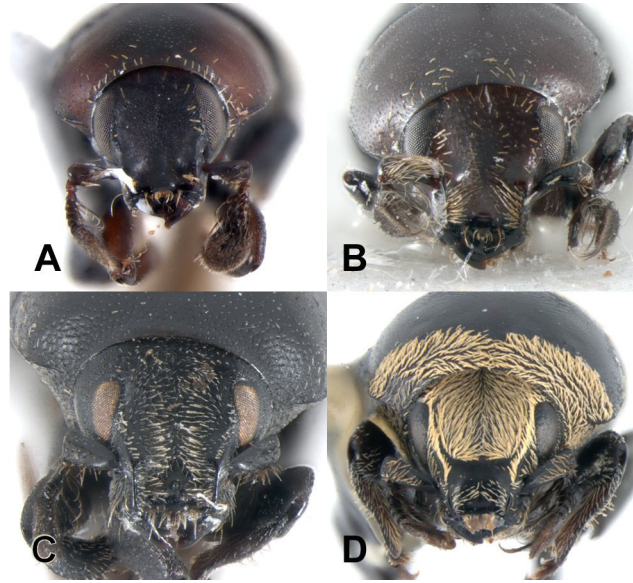
Characters, states are as follows:

1. *Antennal club sutures* (ci = 1.00; ri = 1.00) (0) 0; (1) 1; (2) 2; (3) 3.
2. *Female apical epistoma emarginate at median line* (ci = 1.00; ri = 1.00) (0) normal (Fig. 41e,f); (1) emarginate.
3. *Male apical epistoma emarginate at median line* (ci = 1.00; ri = 1.00) (0) normal (Fig. 41c, d); (1) emarginate.
4. *Relative epistoma size compared to frons* (ci = 0.14; ri = 0.65) (0) less than one-fourth (Fig. 21c); (1) greater than or equal to one-fourth (Fig. 37a).
5. *Vestiture on lateral margin of epistoma* (ci = 0.60; ri = 0.50) (0) setae entire (Fig. 32c,d); (1) setae on lower half (Fig. 27c,d); (2) middle (Fig. 31c,d); (3) glabrous.
6. *Male apical epistomal margin* (ci = 0.50; ri = 0.67) (0) unarmed (Fig. 35c,d); (1) short, transverse carina (Fig. 33c,d); (2) tubercle (Fig. 48c,d); (3) large tubercle extending length of epistoma (Fig. 20c); (4) median lobe.
7. *Male basal epistomal margin* (ci = 0.60; ri = 0.83) (Fig. 2) (0) transverse, concave carina; (1) tumid above scape insertion; (2) strongly developed transverse carina; (3) weakly developed transverse carina; (4) no demarcation; (5) transverse carina with strongly developed lateral areas; (6) short, transverse carina.
8. *Excavation of male frons* (ci = 0.40; ri = 0.57) (0) weak/feeble (Fig. 28c,d); (1) strong (Fig. 41c,d); (2) flat.
9. *Male gena* (ci = 0.17; ri = 0.00) (0) triangular structure absent (Fig. 41c); (1) triangular structure present (Fig. 28c).
10. *Lateral margin of male epistoma* (ci = 0.57; ri = 0.86) (0) arcuate costa pointing distally (Fig. 46c); (1) arcuate costa pointing proximally (Fig. 36a); (2) vertical costa (Fig. 44c); (3) costa angled inward (Fig. 24c); (4) costa absent.
11. *Male frons excavation size* (ci = 0.40; ri = 0.67) (0) excavation does not border ocular margin (Fig. 28c,d); (1) excavation touches ocular margin (Fig. 31a,b); (2) excavation absent.
12. *Male frons armature* (ci = 1.00; ri = 1.00) (0) unarmed (Fig. 40c,d); (1) tubercle.
13. *Male frontal setae in two bands* (ci = 0.25; ri = 0.57) (0) absent (Fig. 40c,d); (1) present (Fig. 22c,d).
14. *Male frons vestiture on excavated area* (ci = 0.27; ri = 0.38) (Fig. 3) (0) glabrous; (1) few setae (less than 20); frons clearly visible; (2) moderate setae (frons largely covered by setae); surface obscured but visible; (3) dense setae; frons surface not visible.
15. *Male scape* (ci = 0.80; ri = 0.96) (0) elongate and narrowly rounded distally (Fig. 21c); (1) elongate and narrow (Fig. 47c); (2) elongate and expanded distally (Fig. 46a); (3) short and round; (4) elongate and broadly rounded distally (Fig. 40c).
16. *Antennal club setae* (ci = 1.00; ri = 1.00) (0) palmately divided; (1) one filament (Fig. 33c).
17. *Female epistoma* (ci = 0.50; ri = 0.50) (0) unarmed (Fig. 41e,f); (1) median lobe.



**Figure 2.** Character 7: Male basal epistomal margin (A) transverse, concave carina (state 0; *Camptocerus aeneipennis*); (B) tumid above scape insertion (state 1; *C. latipilis*); (C) strongly developed transverse carina (state 2; *C. opacicollis*); (D) weakly developed transverse carina (state 3; *C. niger*); (E) no demarcation (state 4; *Scolytus schevyrewi* Semenov); (F) transverse carina with strongly developed lateral areas (state 5; *C. occidentalis*); (G) short, transverse carina (state 6; *C. costatus*).

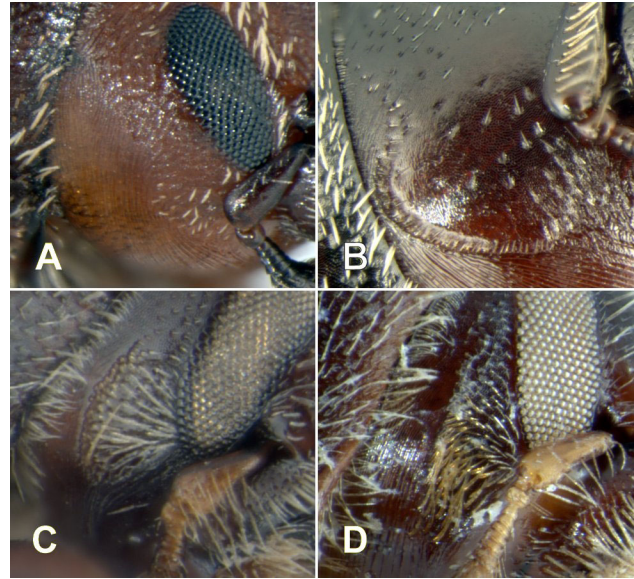
18. *Female frons* (ci = 0.43; ri = 0.56) (0) flat (Fig. 36c,d); (1) weakly impressed; (2) weakly convex (Fig. 19e,f); (3) excavated.
19. *Armed female frons* (ci = 0.33; ri = 0.0) (0) absent (Fig. 39c,d); (1) carina (Fig. 44e,f).
20. *Medial area of female frons* (ci = 0.33; ri = 0.56) (0) flat (Fig. 36c,d); (1) carina (Fig. 49e,f); (2) impressed (Fig. 22e,f); (3) carina and impression (Fig. 41e,f); (4) groove.
21. *Female genal mycangium* (ci = 0.60; ri = 0.91) (Fig. 4) (0) absent; (1) crescent shaped; (2) oval shaped; (3) triangular shaped.
22. *Pars stridens* (ci = 0.11; ri = 0.33) (0) extends to dorsal margin of eye; (1) extends to level of scape insertion.
23. *Setae on apical margin of female pronotum between eyes* (ci = 0.29; ri = 0.64) (0) absent (Fig. 36c,d); (1) scales (Fig. 41e,f); (2) bifid/trifid (Fig. 49e,f).
24. *Setae on apical margin of male pronotum between eyes* (ci = 0.25; ri = 0.68) (0) absent (Fig. 31a,b); (1) scales (Fig. 21c,d); (2) bifid/trifid (Fig. 49c,d).
25. *Male apical pronotal margin* (ci = 0.75; ri = 0.90) (Fig. 5) (0) rounded; (1) partially sulcate; (2) entirely sulcate; (3) transversely impressed.
26. *Female apical pronotal margin* (ci = 1.00; ri = 1.00) (Fig. 6) (0) rounded; (1) weakly sulcate; (2) transversely impressed.
27. *Emarginate anterior pronotum* (ci = 0.50; ri = 0.50) (0) absent; (1) present.
28. *Transverse medial groove on male pronotal base* (ci = 0.33; ri = 0.50) (0) absent (Fig. 47b); (1) present (Fig. 29b).
29. *Male pronotum sculpturing* (ci = 0.67; ri = 0.86) (0) smooth to granulate (Fig. 30b); (1) rugose (Fig. 47b); (2) strigulate (Fig. 21b); (3) aciculate; (4) anterior half strigulate, posterior punctate (Fig. 23b).
30. *Carina on lateral pronotal margin* (ci = 1.00; ri = 1.00) (Fig. 7) (0) type A; (1) type B; (2) type C; (3) type D; (4) type E; (5) type F; (6) type G; (7) type H; (8) type I.
31. *Pronotal base* (ci = 0.33; ri = 0.70) (Fig. 8) (0) straight; (1) recurved; (2) bisinuate; (3) broadly emarginate along medial half.
32. *Pronotum apex* (ci = 0.50; ri = 0.67) (0) narrower than base; (1) equal width of base (Fig. 30b).
33. *Pronotum vestiture* (ci = 0.50; ri = 0.47) (0) glabrous (Fig. 44a,b); (1) anterior and lateral areas (Fig. 19a,b); (2) anterior margin and angle (Fig. 41a,b); (3) diagonally extending from anterior margin to median area (Fig. 45a,b); (4) anterior area (Fig. 35a,b); (5) entire (Fig. 21a,b); (6) anterior third (Fig. 17a,b); (7) anterior margin (Fig. 30a,b); (8) entire except for median section of dorsal area; (9) margins; (A) lateral margin (Fig. 43a,b).
34. *Metepisternal setae* (ci = 0.40; ri = 0.79) (0) bifid or trifid (Fig. 47a); (1) palmately divided into four or more filaments (Fig. 28a); (2) variable (scales, single setae and palmately divided seta).
35. *Metepisternum shape* (ci = 1.00; ri = 1.00) (Fig. 9) (0) type A; (1) type B; (2) type C; (3) type D; (4) type E; (5) type F; (6) type G; (7) type H; (8) type I; (9) type J; (A) type K; (B) type L; (C) type M; (D) type N; (E) type O; (F) type P; (G) type Q; (H) type R.
36. *Mesosternum shape* (ci = 0.94; ri = 0.94) (Fig. 10) (0) type A; (1) type B; (2) type C; (3) type D; (4) type E; (5) type F; (6) type G; (7) type H; (8) type I; (9) type J; (A) type K; (B) type L; (C) type M; (D) type N; (E) type O; (F) type P.
37. *Basal margin of elytra* (ci = 0.27; ri = 0.58) (Fig. 11) (0) flat; (1) faint carina; (2) carina extending to scutellar apex; (3) crenulations.



**Figure 3.** Character 14: Male frons vestiture on impressed area (A) absent (state 0; *Camptocerus coccoformus*); (B) few setae, less than 20 on impressed area, frons clearly visible (state 1; *C. charpentierae*); (C) moderate setae; frons largely covered by setae, but surface visible (state 2; *C. distinctus*); (D) dense, frons surface not visible (state 3; *C. hirtipennis*).

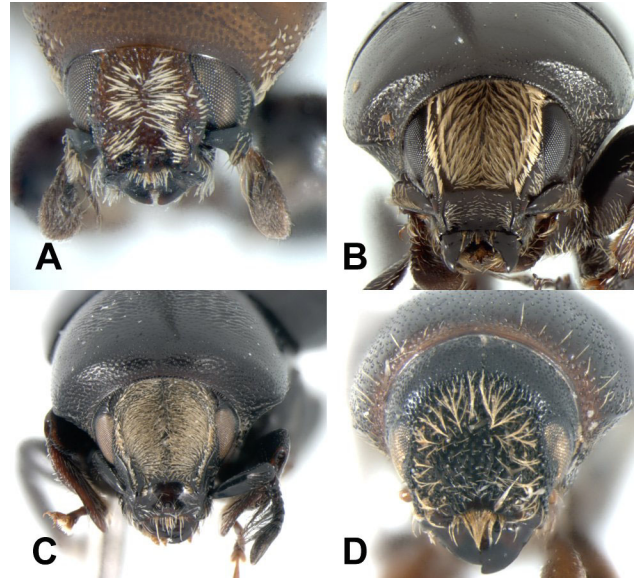


38. *Scutellum shape* (ci = 1.00; ri = 1.00) (Fig. 12) (0) type A; (1) type B; (2) type C; (3) type D; (4) type E; (5) type F; (6) type G; (7) type H; (8) type I; (9) type J; (A) type K; (B) type L; (C) type M; (D) type N; (E) type O; (F) type P.
39. *Scutellum* (ci = 0.50; ri = 0.83) (0) depressed; (1) level of elytra (Fig. 21b).
40. *Elytral base tumid from interstriae 7-9* (ci = 0.20; ri = 0.56) (0) absent (Fig. 30b); (1) present (Fig. 18b).
41. *Discal interstriae punctures* (ci = 0.10; ri = 0.36) (0) normal (Fig. 41b); (1) confused (Fig. 32b).
42. *Disk sculpturing* (ci = 0.33; ri = 0.65) (0) smooth (Fig. 41); (1) rugose (Fig. 35); (2) shallow rugosities (Fig. 30); (3) disk absent.
43. *Discal interstriae 1 and 2 ending in a large spine* (ci = 1.00; ri = 0.0) (0) absent (Fig. 40); (1) present (Fig. 38).
44. *Strial punctures* (ci = 0.33; ri = 0.33) (0) larger than interstriae (Fig. 63b); (1) equal to interstriae (Fig. 16b); (2) smaller than interstriae.
45. *Carinate costa originating on eighth interstria of male elytra* (ci = 1.00; ri = 1.00) (0) absent (Fig. 41a); (1) present (Fig. 35a).
46. *Carina originating at base of the tenth interstria* (ci = 0.50; ri = 0.84) (0) absent (Fig. 19a); (1) shorter than metepisternum (Fig. 45a); (2) longer than metepisternum (Fig. 48a) (3) encompasses elytra (Fig. 27a).
47. *Rugae on interior margin of elytra* (ci = 1.00; ri = 0.00) (0) absent; (1) present (Fig. 44b).
48. *Elytra* (ci = 0.50; ri = 0.50) (0) non-metallic (Fig. 48a); (1) metallic (Fig. 47a).
49. *Maximum rows of setae on third discal interstria* (ci = 0.33; ri = 0.67) (0) glabrous (Fig. 41b); (1) one row (Fig. 35b); (2) two rows (Fig. 29b); (3) three rows (Fig. 45b); (4) four rows.
50. *Setae of interstriae* (ci = 0.33; ri = 0.63) (0) scales (Fig. 21a,b); (1) hair-like (Fig. 49a,b); (2) glabrous (Fig. 47a,b); (3) scales and hair-like setae (Fig. 38a).
51. *Female strial impression* (ci = 0.25; ri = 0.54) (0) not impressed (Fig. 30c,d); (1) weakly impressed (Fig. 35d); (2) strongly impressed.
52. *Density of elytral setae* (ci = 0.23; ri = 0.58) (Fig. 13) (0) glabrous; (1) light; (2) moderate; (3) dense, elytra surface not visible.
53. *Elytra vestiture coloration* (ci = 0.50; ri = 0.82) (0) monochrome (Fig. 49); (1) variegated bicolor (Fig. 21); (2) vestiture absent (Fig. 41).
54. *Declivity sculpturing* (ci = 0.33; ri = 0.00) (0) smooth (Fig. 41); (1) recumbent asperities (Fig. 35).
55. *Male declivity setae* (ci = 0.29; ri = 0.50) (0) less than 3 times longer than disk (Fig. 49a,b); (1) greater than 3 times longer than disk (Fig. 38a,b); (2) absent (Fig. 41a,b).
56. *Apex of declivital margin* (ci = 1.00; ri = 1.00) (0) smooth (Fig. 41a,b); (1) serrate (Fig. 19a,b).
57. *Abdomen profile* (ci = 1.00; ri = 1.00) (0) gradually ascending to elytra (Fig. 41a); (1) abruptly flexed upward at posterior margin of segment 2; (2) abruptly flexed upward at anterior margin of segment 2.
58. *Male 2<sup>nd</sup> sternite* (ci = 0.67; ri = 0.86) (0) not different from other sternites (Fig. 41a); (1) convex and protuberant at the middle and distally distended (Fig. 33e); (2) rapidly ascending/vertical.
59. *Body coloration pattern (including head and pronotum)* (ci = 0.20; ri = 0.56) (0) monochrome (Fig. 43); (1) bicolored (Fig. 46); (2) tricolored (Fig. 49).
60. *Male stria 1 impression* (ci = 0.23; ri = 0.29) (0) not impressed; (Fig. 47b) (1) slightly impressed (Fig. 41b); (2) moderately impressed (Fig. 35b); (3) strongly impressed.
61. *Apical orifice* (ci = 0.50; ri = 0.75) (0) fleshy pore absent (Fig. 57); (1) fleshy pore (Fig. 61).
62. *Sensory claspers* (ci = 0.25; ri = 0.57) (0) absent (Fig. 54); (1) present (Fig. 74).



**Figure 4.** Character 21: Mycangia on female gena (A) absent (state 0; *Camptocerus suturalis*); (B) crescent (state 1; *C. aeneipennis*); (C) circular (state 2; *C. costatus*); (D) triangular (state 3; *C. auricomus*).

63. *Lateral folds of median lobe* (ci = 0.75; ri = 0.69) (0) folds thick and uniformly arcuate (Fig. 74); (1) one fold with an apical curved extension that folds under other fold (Fig. 53); (2) folds almost join on basal third (Fig. 63); (3) forming a broad point on apical third (Fig. 71); (4) thin and arcuate distally on basal half (Fig. 62); (5) folds form an acute point on basal quarter (Fig. 58); (6) narrow, forming a thicker subacute point in middle (Fig. 69); (7) thin and straight (Fig. 66); (8) lateral folds thick, nearly touching; (9) broadest and nearly touching on apical third; (A) deep and wrinkled; (B) folds contiguous on apical third (Fig. 61); (C) folds contiguous on apical two-thirds (Fig. 64).
64. *Apex of median lobe* (ci = 0.31; ri = 0.40) (0) flat (Fig. 66); (1) rounded with flat lateral margins (Fig. 74); (2) mushroom shaped (Fig. 68); (3) broadly pointed (Fig. 53); (4) round (Fig. 57).
65. *Relative length of median strut (length until lateral folds start)* (ci = 0.18; ri = 0.53) (0) less than 1/4 (Fig. 66); (1) 1/4-1/3 (Fig. 68); (2) greater than 1/3 (Fig. 71).
66. *Feeding habit* (ci = 1.00; ri = 1.00) (0) phloeophagous; (1) xylomycetophagous.



**Figure 5.** Character 25: Male apical pronotal margin (A) rounded (state 0; *Camptocerus doleae*); (B) partially sulcate (state 1; *C. aeneipennis*); (C) entirely sulcate (state 2; *C. pseudoangustior*); (D) transversely impressed (state 3; *Scolytus schevyrewi*).

## Methods- Phylogenetic Analysis

The phylogeny was reconstructed using the criteria of parsimony implemented in PAUP\* 4.0 b10 PPC (Swofford 2002). A heuristic search was performed with 1,000 stepwise random additions with tree bisection-reconnection (TBR) for 40 taxa (35 ingroup, 5 outgroup). Characters were equally weighted. Bootstrap values were calculated by performing 1,000 pseudoreplicates with simple additions in PAUP\*. Bremer support values were calculated by creating a constraint tree in TreeRot v.2 (Sorenson 1999) and analyzed in PAUP\* with a heuristic search using 100 addition-sequence replicates.

## Methods- Species Concept

Variation among populations could not be assessed for eleven species because they are known from a single locality. Species were defined using the phylogenetic species concept of Wheeler and Platnick (2000), which recognizes species as the smallest aggregation of sexual populations diagnosable by a unique combination of character states. This concept is based on observable (morphological) characters and “is compatible with phylogenetic study because speciation is associated with character transformation” (Wheeler and Platnick 2000).

## Results – Phylogenetic Analysis

*Camptocerus* was recovered as monophyletic, but is weakly supported with 51% bootstrap support and a Bremer support value of 3. Phylogenetic analysis produced 141 most parsimonious trees with a length of 428 steps (Fig. 14) and 64 of 66 characters were parsimony informative. There was a moderate amount of homoplasy (CI = 0.474, RI = 0.693) and roughly half the characters were consistent with the cladogram. Moderate support was observed for terminal nodes while most deeper relationships among



clades within the genus were poorly supported (Fig. 14). Two *Cnemonyx* species, originally described as *Ceratolepsis* (*C. boliviae* (Blackman), and *C. insignis* Wood), formed a clade, and received the strongest support in the phylogeny (99 bootstrap / 6 Bremer).

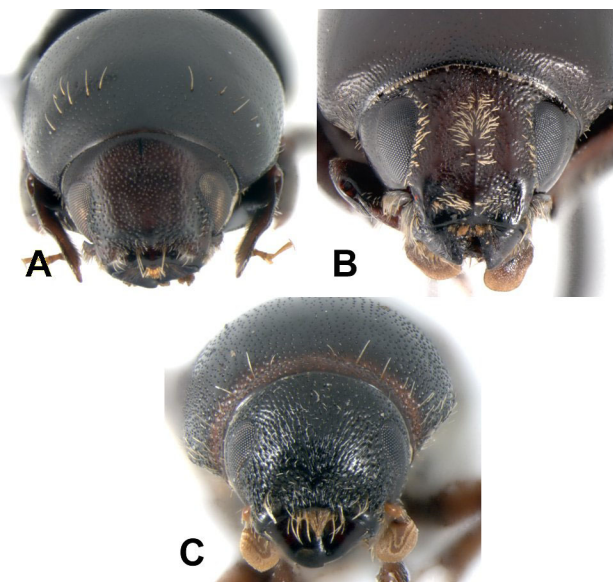
## Discussion

Examination of specimens revealed that several characters previously used to delimit *Camptocerus* from *Cnemonyx* are homoplastic (Wood 1982, 1986, 2007). These characters include a scutellum that is at least 1.5 times wider than long, and suture 1 of antennal club marked internally by a septum. The strength of the *Ceratolepsis* clade and general lack of support for *Cnemonyx* suggest that *Cnemonyx* is in need of revision. *Camptocerus* is comprised of five morphologically distinctive clades (opacicollis, auricomus, latipilis, aeneipennis, and costatus).

The opacicollis clade (*Camptocerus annectens*, *C. inoblitus*, *C. major*, *C. opacicollis*, and *C. unicornus* n. sp.; Fig. 16-20) includes three former *Loganius* species. All superficially resemble *Cnemonyx* species with their small size (2.2 - 3.6 mm), elongate bodies (2.0 - 2.4 times as long as wide) and light brown to black coloration. They are identified by the following characters: the male apical epistomal margin is unarmed (large tubercle in *C. unicornus*); basal epistomal margin armed with a strongly developed transverse carina (Fig. 2c); male frons strongly excavated and bearing a few, erect, golden setae lateral to median line; setae do not form bands (except *C. unicornus*) and male antennal scape elongate and narrowly rounded distally. The apical pronotal margin is rounded and the area between the eyes bears scales in both sexes; lateral margin of type E (Fig. 7e) (type H in *C. unicornus*; Fig. 7h); base weakly bisinuate (Fig. 8c) (*C. unicornus* broadly emarginate along medial half; Fig. 8d). The scutellum shape is type E (Fig. 12e) (type P in *C. unicornus*; Fig. 12p). The elytral base tumid from interstriae 7-9; carina originating at base of the tenth interstria shorter than metepisternum (absent in *C. unicornus*) and the elytral apex serrate. The metepisternum shape is type D (Fig. 9d), bearing setae palmately divided into four or more filaments. The female frons is flat to weakly convex, often with the medial area of frons slightly impressed and unarmed; epistoma is weakly impressed and each gena has a circular mycangium (Fig. 4c).

The auricomus clade (*Camptocerus auricomus*, *C. niger*, *C. occidentalis*, *C. orientalis*, and *C. rectus*; Fig. 21-25) is the most distinctive clade in *Camptocerus* with species readily distinguished by their dense, variegated, spatulate setae or scales on the elytra interstriae, by the strongly bisinuate pronotal base (Fig. 8c) and by two thick bands of setae on the male frons. Unfortunately, older specimens tend to have abraded elytral and pronotal vestiture, which can make identification difficult. Males also possess a carina on the basal epistomal margin; the lateral margins of the epistoma are angled proximally and the antennal scape is elongate and narrowly rounded distally (except elongate and narrow in *C. occidentalis*). They are also distinguished by the following characters: the apical pronotal margin is rounded and the area between the eyes bears scales in both sexes. The scutellum shape is type C (Fig. 12c). By the lack of a carina originating at the base of the tenth elytral interstria; the base never with a tumescence from interstriae 7-9 and the elytral apex is smooth. The metepisternum is shape type G (Fig. 9g), bearing setae palmately divided into four or more filaments. The mesosternum is shape type C (Fig. 10c). The female frons is always flat and unarmed and each gena has a triangular mycangium (Fig. 4d).

The latipilis clade (*Camptocerus charpentierae*, *C. coccoformus* n. sp., *C. doleae* n. sp., *C. igniculus* n. sp., *C. latipilis*, *C. mallopterus* n. sp., *C. petrovi* n. sp. and *C. satyrus* n. sp.; Fig. 26-34) contains

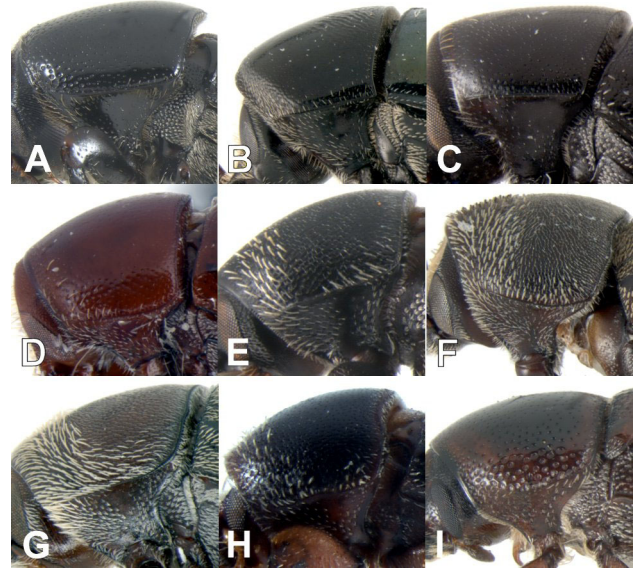


**Figure 6.** Character 26: Female apical pronotal margin (A) rounded (state 0; *Camptocerus costatus*); (B) partially sulcate (state 1; *C. aeneipennis*); (C) transversely impressed (state 3; *Scolytus schevyrewi*).



several closely related and morphologically similar species. All species are stout- (1.6 to 2.0 times as long as wide) except *C. doleae*, which is elongate (2.1-2.3 times as long as wide) and vary in color from orange to black. They are identified by the following characters: the male apical epistomal margin is armed with a short rectangular carina (short rounded tubercle in *C. doleae*); the lateral margin of the epistoma bears a vertical costa; the basal epistomal margin is tumid at scape insertion (Fig. 2b); the male frons is strongly excavated with the excavation bordering the ocular margin (moderately excavated and excavation not bordering the ocular margin in *C. doleae*); the frons bears 2-7 golden setae lateral to the median line with setose lateral edges; the frons is sparsely to moderately covered by erect setae and the male scape is elongate and expanded distally. The apical pronotal margin is rounded in both sexes and the area between the eyes glabrous or bearing scales; the surface is smooth to granulate; the lateral margin is type C (Fig. 7c); the base is weakly recurved (Fig. 8b) (weakly bisinuate in *C. charpentierae*; Fig. 8c). The scutellum shape is type B (Fig. 12b) (*C. doleae* type D; Fig. 12d). The elytral base never tumid from interstriae 7-9; the disk is covered with shallow rugosities; the carina originating at base of the tenth interstria encompasses the elytra; the interstriae bear white to yellow scales and the elytral apex is smooth. The metepisternum is shape type C (Fig. 9c) (type R in *C. doleae*; Fig. 9r). The mesosternum is shape type E (Fig. 10e) (type D in *C. coccoformus* and *C. mallopterus*; Fig. 10d). The second sternite is convex or protuberant at the middle, if protuberant, then noticeably smaller in the female (convex in *C. charpentierae*, *C. doleae* and *C. igniculus*, and *C. saytrus*). The female frons is flat, often with medial area slightly impressed and unarmed and each gena has a circular mycangium (Fig. 4c) (triangular in *C. doleae*; Fig. 4d).

Species of the costatus clade (*Camptocerus costatus*, *C. pilifrons* n. sp., *C. quadridens*, and *C. zucca* n. sp.; Fig. 35-40) share numerous synapomorphies. The clade exhibits remarkable sexual dimorphism of the elytra. Male *C. costatus* and *C. quadridens* possess a carinate costa originating on the eighth interstria. *Camptocerus costatus* also has deeply impressed striae and setae originating from recumbent asperities on the interstriae. *Camptocerus quadridens* has two spines originating from the first and second discal interstriae that extend over the declivity. These characters are distinctly male and are not displayed by females. This clade is distinguished by the following characters: the male apical epistomal margin is unarmed; the lateral margins bear an arcuate costa pointing proximally and is entirely bearing setae; the basal epistomal margin has a short, rectangular, transverse carina (Fig. 2g) (except unarmed in *C. zucca*; Fig. 2e); the male frons is strongly excavated and covered by long, dense and erect, yellow to white hair-like setae and the male scape is elongate and broadly rounded distally. The apical pronotal margin is rounded and the area between the eyes is glabrous in both sexes; the lateral margin is type D (Fig. 7d) and the pronotal base recurved (Fig. 8b). The scutellum is shape type I (Fig. 12i). The elytra are never metallic; the basal margin bears a weak carina extending to scutellar apex (Fig. 11c); base never tumid from interstriae 7-9; the carina originating at base of the tenth interstria is shorter than the metepisternum; declivital interstitial setae uniseriate and the elytral apex is smooth. The female frons is always flat and unarmed; short, sparse, setae are present only on lateral margins; setae present on the epistoma and each gena has a circular mycangium (Fig. 4c).



**Figure 7.** Character 30: Carina on lateral pronotal margin (A) type A (state 0; *Scolytus excavatus* Wood); (B) type B (state 1; *Camptocerus noel*); (C) type C (state 2; *C. latipilis*); (D) type D (state 3; *C. quadridens*); (E) type E (state 4; *C. opacicollis*); (F) type F (state 5; *C. rectus*); (G) type G (state 6; *Cnemonyx vestitus*); (H) type H (state 7; *Camptocerus unicornus*); (I) type I (state 8; *Scolytopsis peruanus* Eggers).

The aeneipennis clade (*Camptocerus aeneipennis*, *C. angustior*, *C. aterrimus*, *C. distinctus* n. sp., *C. hirtipennis*, *C. mandelshtami*, *C. noel* n. sp., *C. pseudoangustior* n. sp., and *C. suturalis*; Fig. 41-49) is the most speciose clade in the genus. Species are large (3.1 - 7.1 mm) and vary in color from metallic bronze, green and blue to non-metallic black, red and orange. Species possess a sundry of synapomorphies and are identified by the following characters: the male apical epistomal margin is unarmed or armed by a medial tubercle; the lateral margin of the epistoma bears an arcuate costa pointing distally (vertical costa in *C. distinctus*); the basal epistomal margin is armed with a transverse, concave carina (Fig. 2a) (tumid above scape insertion in *C. distinctus*; Fig. 2b); the male frons is strongly excavated and densely covered with long, white to yellow hair-like setae (moderate in *C. distinctus*) and the male scape is elongate and narrow. The male apical pronotal margin is partially to entirely sulcate (Fig. 5b,c) (round in *C. distinctus*; Fig. 5a) and round to partially sulcate in females (Fig. 6a,b); the area between the eyes bears scales or bifid setae in females or with bifid/ trifid setae or scales in males (glabrous in both sexes of *C. distinctus*); the base is straight (Fig. 8a) (recurved in *C. distinctus*; Fig. 8b) and the lateral margin is type B (Fig. 7b). The scutellum is shape type A (Fig. 12a) (*C. distinctus* type H; Fig. 12h). The elytra are metallic (*C. aeneipennis*, *C. angustior*, *C. noel*) or not; base never tumid from interstriae 7-9; the interstriae are glabrous (hair-like setae on *C. hirtipennis* and *C. suturalis*); the elytra are smooth (*C. distinctus* with rugae in the sutural interstriae) and the elytral apex is also smooth. The metepisternum is shape type B (Fig. 9b) and bearing bifid setae. The mesosternum is shape type A (Fig. 10a). The female frons is always flat; the medial area often with an impressed area and with a shallow carina originating on the median line between the eyes and terminating at the epistoma; the surface bears fewer setae than that of the male and each gena has a crescent shaped mycangium (Fig. 4b) (absent in *C. suturalis*; Fig. 4a).

Several novel characters were used in this study, specifically the presence and type of mycangia, the shape of the metepisternum, (including the pleural suture and exposed triangular plate of postepimerum), the lateral margin of the pronotum and process of the mesosternum. Each of these characters was informative at the species level. Although previously noted as a potential reliable character (Hulcr et al. 2007b), this is the first time that presence and type of mycangia have been used for scolytines.

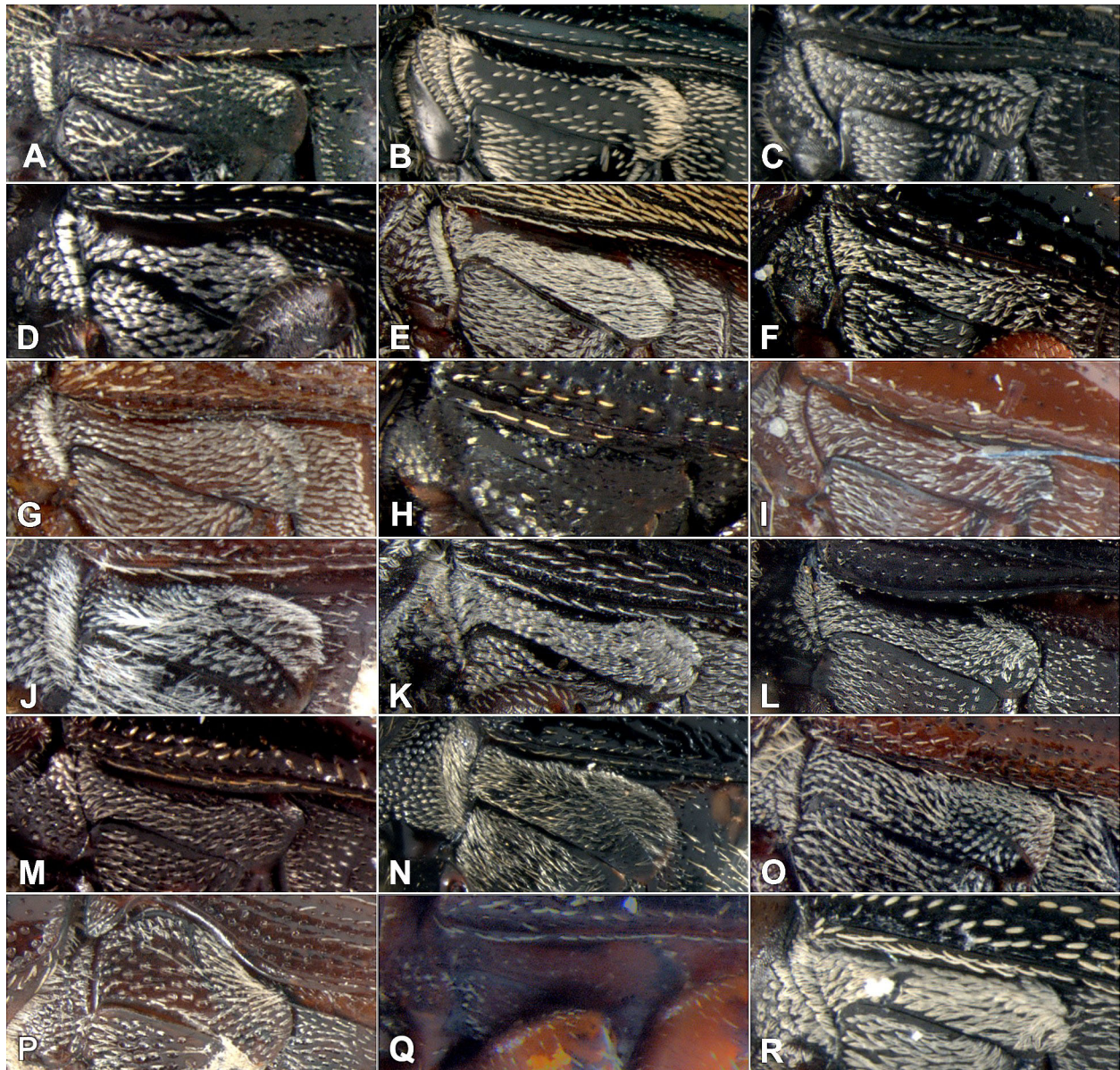
*Camptocerus* mycangia are semi-circular to triangular structures on the female gena (nonglandular brush mycangium as in Six 2003) (Fig. 4) and enlarged punctures on the female vertex under the apical pronotal margin (nonglandular pit mycangium as in Six 2003) (Fig. 15). Both structures are present in males, but are greatly reduced in size. Despite adherence to softening protocols used for closely related taxa (Livingston and Berryman 1972), attempts to verify these structures by cross-sectioning of female beetle heads were unsuccessful due to the rigidity of the cuticle. These structures are similar in position to those found on *Scolytus ventralis* LeConte (Livingston and Berryman 1972) and are present on all *Camptocerus* species except *C. suturalis*. Loss of these structures appears associated with its ambrosia fungus-stealing habit, termed mycocleptism (Hulcr 2009).

There are three types of genal mycangia in *Camptocerus*: crescent shaped (Fig. 4b), circular (Fig. 4c), and triangular (Fig. 4d). Crescent-shaped mycangium are found in all species of the aeneipennis clade, except *C. suturalis*. The mycangium consists of a crescent shaped groove in the cuticle on the apical margin of the gular striations extending from the level of the ventral aspect of the mandible to the level of scape insertion. The groove gradually deepens from the anterior margin until it reaches the posterior margin and abruptly ascends. The groove's posterior margin bears short, thick setae that cover the groove. This type of mycangium is often obscured by the pronotum, but is easily visible when the head is



**Figure 8.** Character 31: Pronotal base (A) straight (state 0; *Camptocerus aterrimus*); (B) recurved (state 1; *C. costatus*); (C) bisinuate (state 2; *C. auricomus*); (D) broadly emarginated along medial half (state 3; *C. unicornus*).

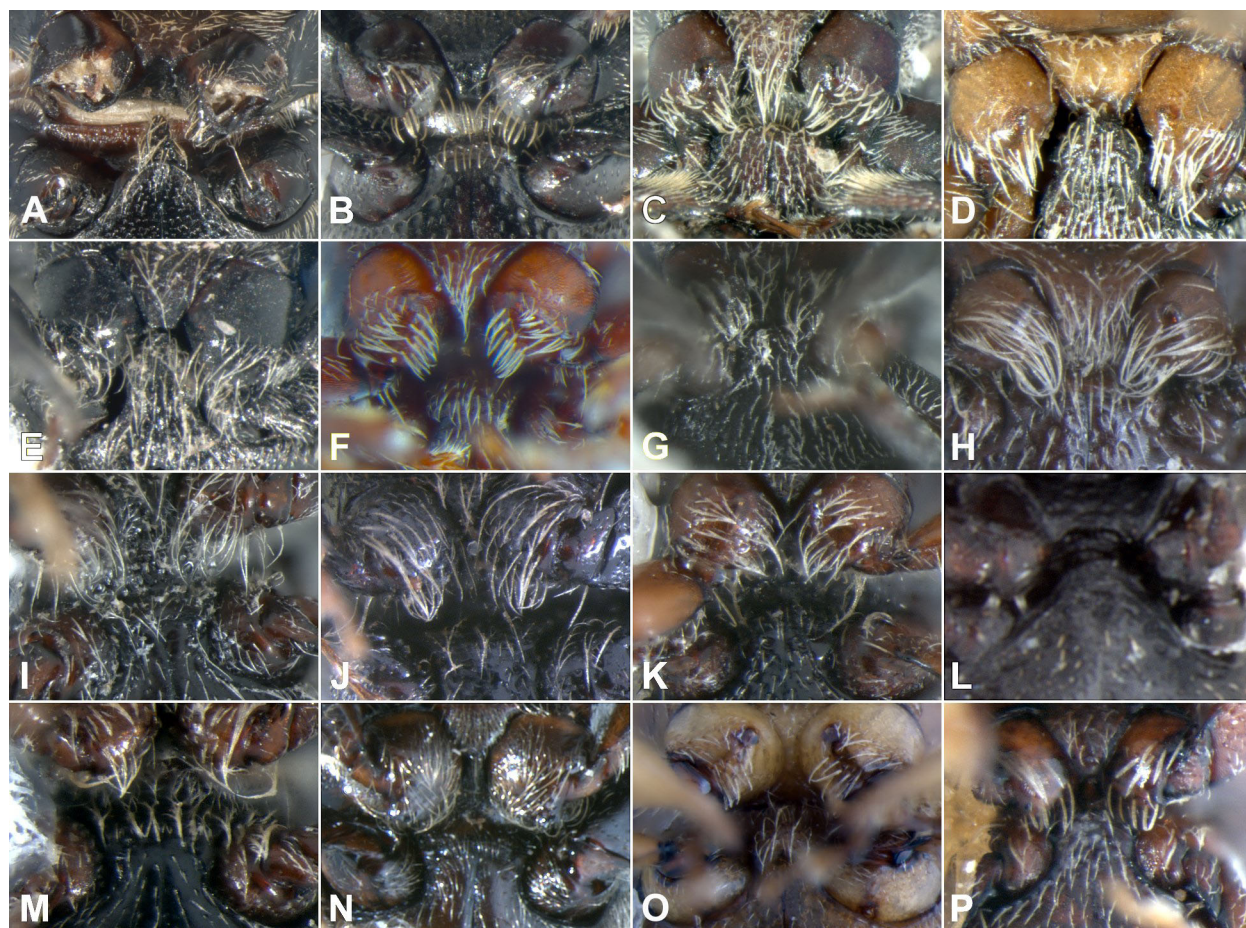




**Figure 9.** Character 35: Metepisternum shape (A) type A (state 0; *Scolytus ventralis*); (B) type B (state 1; *Camptocerus noel*); (C) type C (state 2; *C. latipilis*); (D) type D (state 3; *C. opacicollis*); (E) type E (state 4; *Cnemonyx vestitus*); (F) type F (state 5; *Camptocerus pilifrons*); (G) type G (state 6; *C. auricomus*); (H) type H (state 7; *Cnemonyx errans* (Blandford)); (I) type I (state 8; *Camptocerus quadridens*); (J) type J (state 9; *Scolytus propinquus* Blandford); (K) type K (state A; *Cnemonyx boliviae*); (L) type L (state B; *C. insignis*); (M) type M (state C; *Camptocerus costatus*); (N) type N (state D; *Scolytus excavatus*); (O) type O (state E; *S. schevyrewi*); (P) type P (state F; *Scolytopsis peruanus*); (Q) type Q (state G; *Camptocerus unicornus*); (R) type R (state H; *C. doleae*).

either turned or extended. Oval shaped mycangium are found in all species of the opacicollis, latipilis and costatus clades. The mycangium is an oval shaped impression extending from the posteroventral margin of the eye and pars stridens to a posterior margin lined bearing dense, short, thick setae. Short setae arise from the ocular and gular striation margins and are directed toward the center of the impression. Two to three rows of long setae originate in the impression and are directed toward the point where the eye meets the gular striations. In the opacicollis clade, the posterior margin of the mycangium bears short, sparse setae. Triangular mycangium are found in all species of the auricomus clade and *C. doleae*. The position is identical to that of the oval-shaped mycangium. The gular striation margin and posteroventral margin





**Figure 10.** Character 36: Mesosternum shape (A) type A (state 0; *Camptocerus aeneipennis*); (B) type B (state 1; *C. costatus*); (C) type C (state 2; *C. rectus*); (D) type D (state 3; *C. mallopterus*); (E) type E (state 4; *C. latipilis*); (F) type F (state 5; *Cnemonyx vestitus*); (G) type G (state 6; *C. boliviae*); (H) type H (state 7; *Scolytopsis peruanus*); (I) type I (state 8; *Scolytus propinquus*); (J) type J (state 9; *S. ventralis* LeConte); (K) type K (state A; *S. multistriatus* (Marsham)); (L) type L (state B; *Cnemonyx errans*); (M) type M (state C; *Scolytus schevyrewi*); (N) type N (state D; *S. excavatus*); (O) type O (state E; *Camptocerus zucca*); (P) type P (state F; *C. unicornus*).

bear four rows of long, thick setae (twice the width of other setae) covering roughly the ventral half of the mycangium. Setae are oriented toward center of the impression. The anterodorsal margin is lined by short, sparse setae. Four rows of long setae originate in the impression and are directed toward the point where the eye meets the gula striations.

The enlarged punctures on the female vertex under the anterior margin of the pronotum are present on all species. Each pit has a short bristle-like seta arising from the posterior margin; these pits are 3-5 times the diameter of other punctures and 3-10 times as deep.

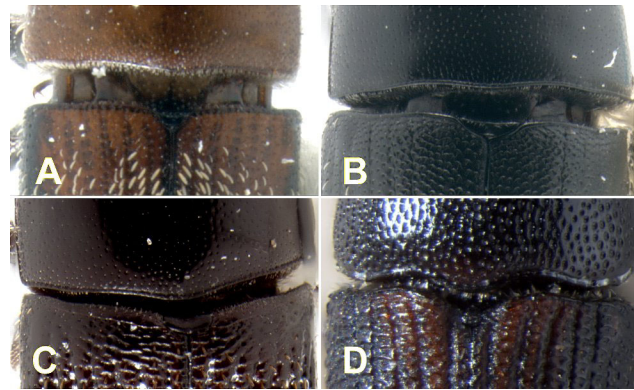
Interspecific variation in structures (ex. carinae, tubercles), degree and extent of excavation in the male frons, frons vestiture, elytra vestiture and sculpturing are extremely useful for classification of *Camptocerus*. Characters such as the type of mycangia, shape of the metepisternum, the lateral margin of the pronotum and process of the mesosternum typically distinguish clades within *Camptocerus*.

### Key to species of *Camptocerus* Dejean

Several *Camptocerus* species are known from individuals of a single sex. Couplet 1 separates the sexes. Note that males are unknown for *Camptocerus annectens* and *C. major*; females are unknown for *C. petrovi*, *C. satyrus* and *C. unicornus*. Due to morphological conservation of females within clades,

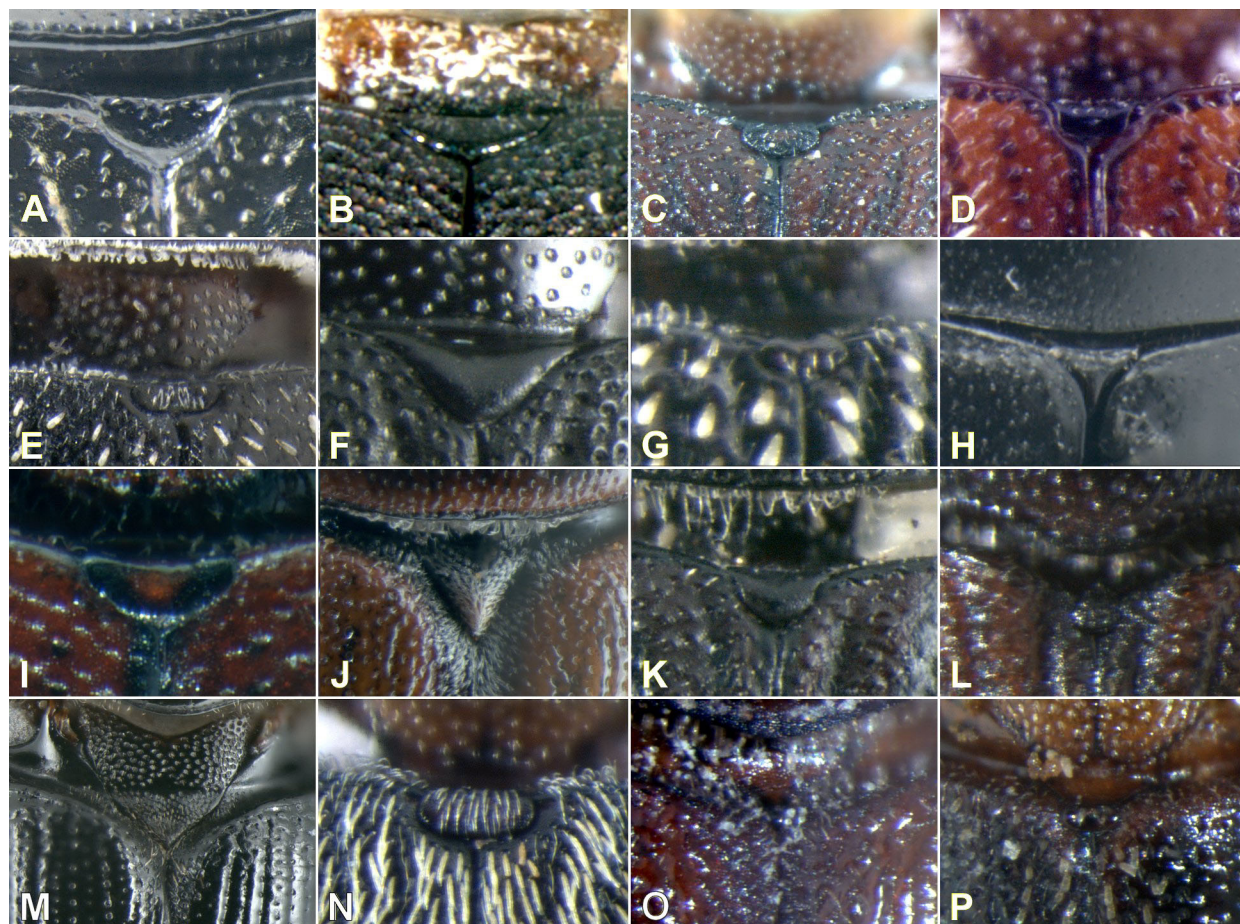
there is a paucity of reliable diagnostic characters. As a result, the female couplets often rely on size ranges and geographical distributions (ex. high-land vs. lowland forest) to diagnose species.

1. Frons excavated; epistoma rostrate; antennal funicle with long brush-like setae on segments 2-7 (males) ..... 2
- Frons flat to convex; epistoma short; antennal funicle without long brush-like setae on segments 2-7 (females) ... 30
  
- 2(1). Metepisternal setae bifid or trifid ..... 3
- Most metepisternal setae palmately divided into 4 or more filaments ..... 13
  
- 3(2). Elytra metallic or with metallic luster, glabrous ..... 4
- Elytra never metallic, may be glabrous or densely covered with setae ..... 6
  
- 4(3). Apical epistomal margin armed with a conical median tubercle (Fig. 42b,c); apical pronotal margin declivous, not sulcate; basal half of pronotum weakly rugose; pronotal punctures larger, deeper; striae punctures shallow; elytra metallic bronze. Andes Mountains from Colombia to Bolivia, 1000-3000 m; length 5.0- 5.8 mm ..... ***C. angustior* Eggers (p. 64)**
- Apical epistomal margin unarmed; apical pronotal declivity sulcate, especially towards sides. Basal half of pronotum strongly rugose; pronotal punctures smaller, shallower; striae punctures variable. Elytra with metallic luster ..... 5
  
- 5(4). First discal striae weakly impressed (Fig. 41b); striae punctures deeper, larger; lateral declivity on anterior pronotal margin extending two-thirds of distance to median line; elytra metallic bronze to black with a metallic luster. Costa Rica to northern Argentina; length 4.4- 5.9 mm ..... ***C. aeneipennis* (Fabricius) (p. 62)**
- Elytral disk smooth, striae punctures shallow, minute (Fig. 47b); lateral declivity on the anterior margin of the pronotum extending to median line; elytra metallic bronze, green or blue. Bolivia and Peru to Colombia and Suriname; length 6.0-7.1 mm ..... ***C. noel*, n. sp. (p. 73)**
  
- 6(3). Elytra glabrous, smooth, shining (some setae may be present laterally); median tubercle on apical epistomal margin (Fig. 46c,d) ..... 7
- Elytra with setae present at least on interstriae; apical epistomal margin unarmed or with a conical tubercle (*C. distinctus*) ..... 9
  
- 7(6). Pronotum bicolored (posterior fifth to two-fifth's orange, remainder black), profemur and prothoracic legs red orange, remaining legs black; thorax, abdomen and elytra black (Fig. 46). Peru and Ecuador; length 5.9-6.5 mm ..... ***C. mandelshtami* Petrov (p. 71)**
- Body uniformly black ..... 8
  
- 8(7). Apical pronotal declivity weakly sulcate (Fig. 43c,d). Peru to French Guiana; length 3.1-4.5 mm ..... ***C. aterrimus* Eggers (p. 66)**
- Apical pronotal declivity entirely sulcate (Fig. 48c,d). Brazil, Peru and Ecuador; length 4.5-5.4 mm ..... ***C. pseudoangustior*, n. sp. (p. 76)**
  
- 9(6). Pronotal base recurved (Fig. 8b); elytral base bears a carina extending to scutellar apex (Fig. 11c) ..... 10
- Pronotal base straight (Fig. 8a); elytral base flat (Fig. 11a) or with a faint carina (Fig. 11b) 11



**Figure 11.** Character 37: Basal margin of elytra (A) flat (state 0; *Camptocerus doleae*); (B) faint carina (state 1; *C. latipilis*); (C) faint carina extending to scutellar apex (state 2; *C. costatus*); (D) crenulations (state 3; *Cnemonyx errans*).





**Figure 12.** Character 38: Scutellum shape (A) type A (state 0; *Camptocerus aeneipennis*); (B) type B (state 1; *C. latipilis*); (C) type C (state 2; *C. rectus*); (D) type D (state 3; *C. doleae*); (E) type E (state 4; *C. opacicollis*); (F) type F (state 5; *Cnemonyx boliviae*); (G) type G (state 6; *C. rugulosus*); (H) type H (state 7; *Camptocerus distinctus*); (I) type I (state 8; *C. quadridens*); (J) type J (state 9; *Scolytus schevyrewi*); (K) type K (state A; *Cnemonyx insignis*); (L) type L (state B; *C. errans*); (M) type M (state C; *Scolytus excavatus*); (N) type N (state D; *Cnemonyx vestitus*); (O) type O (state E; *Scolytopsis peruanus*); (P) type P (state F; *Camptocerus unicornus*).

- 10(9). Short, transverse carina at basal epistomal margin; each elytron with 2 discal spines arising from the first to fifth striae, with a sharp spine on the first striae and a blunt spine on the second extending over the declivity, and the declivity originating in the recess formed by the spines (Fig. 38). Color red brown. Panama; length 3.4-3.7 mm ..... *C. quadridens* Blackman (p. 58)
- Carina on the basal epistomal margin absent; elytral spines absent. (Fig. 40). Color black and orange. Ecuador; length 4.0-4.1 mm ..... *C. zucca*, n. sp. (p. 60)
- 11(9). Each elytron with 8 rugae on the discal sutural interspace to second interstria, each rugae with a single setae arising from the center (Fig. 44b); conical median tubercle on the apical epistomal margin; basal epistomal margin tumid above scape insertion (Fig. 44c,d). Ecuador; length 5.3 mm ..... *C. distinctus*, n. sp. (p. 68)
- Elytra without rugae, finely sculptured; long, yellow, recumbent setae present on both striae and interstriae (often abraded in older specimens). Apical epistomal margin unarmed; basal epistomal margin armed with a glabrous, transverse, concave carina ..... 12

- 12(11). Body uniformly black, densely covered with recumbent setae, surface barely visible. Apical pronotal declivity densely covered with long, yellow, recumbent hair-like setae; anterior margin between eyes bearing bifid setae; basal medial area of pronotum rugose; vestiture emarginate at median line; setae diagonally extend along the lateral margin from the anterolateral margin (Fig. 45). Brazil, Ecuador; length 4.9-5.6 mm .....

..... *C. hirtipennis* Schedl (p. 69)

- Head, antennae, thorax, pronotum, legs red-orange to red, abdomen black; elytra covered with fewer setae, surface largely visible; elytra black, each elytron with an orange oval spot extending from the lateral margin of the sutural interstriae to the tenth interstria and from the basal fifth of elytra to the of apical four-fifths (Fig. 49) basal medial area of pronotum smooth; vestiture not emarginate at median line; setae on apical half of pronotum. Peru, Brazil and the Guianas; length 3.6-5.0 mm .....

..... *C. suturalis* (Fabricius) (p. 78)

- 13(2). Frontal setae in 2 dense, distinct longitudinal bands near middle (Fig. 22c), sometimes merging distally .....

- Frontal setae never in 2 bands; frons may be glabrous, with sparse setae or with setae denser or longer towards the sides .....

- 14(13). Apical epistomal margin with a median tubercle (Fig. 21c) .....

- Apical epistomal margin unarmed, with or without trace of carina on basal epistomal margin .

- 15(14). Body stout; frontal setae in 2 thick bands, which lie flat against the frons; apical epistomal tubercle small, rounded; carina on basal epistomal margin weakly developed; pronotal base bisinuate (Fig. 8c); elytra covered in variegated spatulate setae (often abraded in older specimens). Mexico to Venezuela and Trinidad; length 3.5-4.1 mm .....

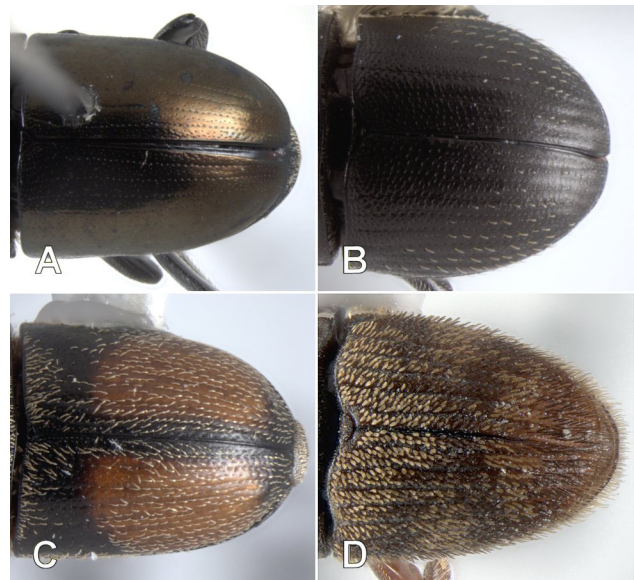
- Body elongate; frontal setae in 2 thin arcuate bands above the frons and combine on the median line between the eyes; apical epistomal tubercle large and broad, carina on basal epistomal margin strongly developed and connecting medially with large tubercle (Fig. 20c); pronotal base broadly emarginate along medial half (Fig. 8d); elytra covered in spatulate setae. Brazil; length 2.5 mm .....

- 16(14). Transverse carina on basal epistomal margin faint or obsolete (Fig. 22c,d). Bolivia and Brazil to Colombia and the Guianas; length 2.8-4.1 mm .....

- Transverse carina on basal epistomal margin moderately to strongly developed (Fig. 24c,d) .

- 17(16). Carina on basal epistomal margin arcuate, height uniform (Fig. 24c,d). Brazil and Peru; length 3.2-3.7 mm .....

- Carina on basal epistomal margin straight, height not uniform .....



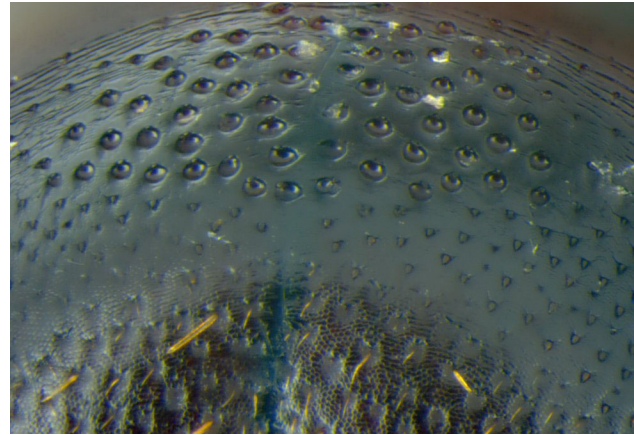
**Figure 13.** Character 52: Density of elytral setae (A) glabrous (state 0; *Camptocerus aeneipennis*); (B) light (state 1; *C. latipilis*); (C) moderate (state 2; *C. suturalis*); (D) dense, elytral surface not visible (state 3; *C. auricomus*).





**Figure 14.** Phylogeny of *Camptocerus*. Phylogram of one of 26 most parsimonious trees (432 steps; consistency index, 0.474; retention index, 0.693) generated for 40 taxa with 66 characters from a heuristic search of 1000 stepwise random additions with TBR in PAUP\*. Numbers above the node indicate bootstrap values (>50) based on 1000 pseudoreplicates. Bremer support values are generated from a heuristic search of 100 random addition sequence replicates.

- 18(17). Carina on basal epistomal carina highest at the middle, nearly tuberculate (Fig. 25c,d). Elytra covered in small, stout, variegated, spatulate setae (often abraded in older specimens); striae black, distinct, interstriae reddish. Ecuador to Venezuela; length 3.5-4.3 mm ..... ***C. rectus* Wood (p. 40)**
- Carina on basal epistomal margin straight, highest above antennal insertion, lowest at the middle (Fig. 23c,d). Elytra black, covered in yellow, elongate, spatulate setae (often abraded in older specimens) (Fig. 23); striae obscured. Bolivia and Peru; length 4.0-4.5 mm ..... ***C. occidentalis* Eggers (p. 37)**
- 19(13). Basal epistomal margin armed by either a complete, transverse or short, rectangular carina; apical epistomal margin unarmed; scape elongate and narrowly rounded distally (Fig. 19c,d) ..... **20**
- Basal epistomal margin unarmed; apical epistomal margin with a medial, rectangular carina or unarmed; scape elongate and expanded distally (Fig. 31a,b) ..... **23**
- 20(19). Basal epistomal margin armed by an arcuate, transverse carina (Fig. 19c,d); pronotal base straight to weakly bisinuate; elytral base smooth around scutellum ..... **21**
- Basal epistomal margin armed by a short, rectangular carina (Fig. 36a); pronotal base recurved (Fig. 8b); elytra with subbasal, transverse carina extending to scutellar apex and transverse rugosities around scutellum (Fig. 11c) ..... **22**
- 21(20). Uniseriate narrow scales on the elytra interstriae, minute hair-like setae on striae; strial and interstitial punctures equal size (Fig. 19). Argentina and Bolivia to Ecuador to Costa Rica; length 2.2-3.6 mm ..... ***C. opacicollis* (Eggers) (p. 29)**
- Very fine and minute hair-like setae on both striae and interstriae; strial punctures 2-3 times larger than punctures on interstriae (Fig. 18). Argentina and Brazil; length 2.4-3.4 mm ..... ***C. inoblitus* (Schedl) (p. 26)**
- 22(20). Elytral declivity strongly impressed below level of disk, occupying apical 4/5 of elytra; carinate costa on eighth interstriae from basal fifth and extending around apex to sutural margin; striae moderately impressed; bristling brown setae originating from recumbent asperities on the interstriae (Fig. 35). Peru and Ecuador to Brazil, Guyana and Trinidad; length 3.5-3.9 mm .. ***C. costatus* Chapuis (p. 54)**
- Elytral declivity and striae unimpressed; carinate costa absent on the eighth interstria; elytra smooth, striae indistinct, interstriae bearing short scales (Fig. 37). Ecuador; length 2.6-3.1 mm ..... ***C. pilifrons*, n. sp. (p. 56)**
- 23(19). Second sternite convex and distally distended or protuberant at the middle (Fig. 33e) ..... **24**
- Second sternite not convex and distally distended or protuberant at the middle ..... **27**
- 24(23). Elytra densely covered in pale, recumbent scales, surface largely covered; head and pronotum orange, elytra and abdomen black (Fig. 32). Ecuador; length 3.8-3.9 mm ..... ***C. mallopterus*, n. sp. (p. 50)**
- Elytral interstriae bearing small, colorless to pale, yellow scales, elytra surface clearly visible; head and pronotum red to black, elytra and abdomen black ..... **25**



**Figure 15.** Pit mycangia on female *C. aeneipennis* vertex. Pits are 3-5 times the diameter of other punctures and 3-10 times as deep.

- 25(24). Lateral margin of epistoma bearing a tuft of setae on apical third (Fig. 27c,d); head dark red, nearly black, pronotum dark red; abdomen and elytra black; second sternite less strongly convex, scarcely protuberant below level of sternite 1 (Fig. 27a). Brazil and Ecuador; length 2.7 mm .  
..... *C. coccoformus*, n. sp. (p. 43)
- Lateral margin of epistoma bearing a tuft of setae on apical half; body uniformly black; second sternite strongly convex and protuberant ..... 26
- 26(25). Frontal excavation devoid of setae; 10-12 setae on lateral and dorsal margins combined (Fig. 31c,d); second sternite strongly convex and protuberant, height of declivity behind much less than length of sternite 3 (Fig. 30a,b). Brazil and Ecuador; length 2.7-3.3 mm .....  
..... *C. latipilis* Schedl (p. 48)
- Frontal excavation with 1-2 setae lateral to median line, 15-20 setae on lateral and dorsal margins combined (Fig. 33c,d); second sternite strongly convex and protuberant, height of declivity behind greater than length of sternite 3 (Fig. 33e). Ecuador; length 4.0 mm .....  
..... *C. petrovi*, n. sp. (p. 52)
- 27(23). Frons with 6-7 golden setae lateral to median line; frontal excavation does not touch ocular margin; elytra black with an orange patch covering basal third from the suture to eighth interstriae (Fig. 28). Ecuador; length 3.1-3.5 mm ..... *C. doleae*, n. sp. (p. 45)
- Frons with 1-3 golden setae lateral to median line; frontal excavation borders the ocular margin; elytra color uniform ..... 28
- 28(27). Pronotum red or black; elytra black; elytral interstitial scales sparse, semi-recumbent, shorter, and pale yellow-brown; declivital interstitial setae uniseriate (Fig. 26). Brazil to French Guiana; length 3.8-4.5 mm ..... *C. charpentierae* Schedl (p. 42)
- Body red; elytral interstitial scales semi-recumbent to recumbent, overlapping, yellow to golden; declivital interstitial setae bi- to triseriate (several interstriae may be uniseriate in *C. igniculus*) ..... 29
- 29(28). Length 4.0 mm. Elytral interstriae with recumbent, overlapping pale yellow scales. Interstitial setae bi- and triseriate on disk (Fig. 34). Brazil ..... *C. satyrus*, n. sp. (p. 53)
- Length 2.5- 2.8 mm. Elytral interstriae with longer, semi-recumbent, overlapping, golden scales. Interstitial setae uni- and biseriate on disk (Fig. 29). Brazil ..... *C. igniculus*, n. sp. (p. 47)
- 30(1). Metepisternal setae bifid or trifid ..... 31
- Most metepisternal setae palmately divided into 4 or more filaments ..... 43
- 31(30). Genal mycangium setose and circular (Fig. 1c); elytra with subbasal, transverse carina extending to scutellar apex and transverse rugosities on the disk (Fig. 11c) ..... 32
- Genal mycangium glabrous and crescent-shaped (Fig. 1b) or absent (Fig. 1a); elytral base flat (Fig. 11a) or with a faint carina (Fig. 11b) ..... 35
- 32(31). Distinct orange and black color pattern, pronotum orange with a black, mid-dorsal, triangle extending from the apex to the basal third of the pronotum; elytra black with each elytron with an orange oval spot encompassing the area from the basal margin of the disk and to the basal fifth of the elytra and from the sutural interstriae to the eighth interstriae; ventral surface of thorax and abdomen black (male, Fig. 40). Ecuador; length 4.0-4.1 mm .....  
..... *C. zucca*, n. sp. (p. 60)
- Color uniform red-brown to black, or with indistinct color pattern not as above ..... 33
- 33(32). Head, thorax, abdomen, elytra, antennae and legs red-brown; pronotum with a black patch extending from the apical pronotal margin and forming a point on the posterior third of the pronotum along the median line; elytra with an oval-shaped black patch extending from the base to the



- posterior margin of the first sternite and from the lateral margin to interstria 7 (male, Fig. 37). Ecuador; length 2.6-3.1 mm ..... *C. pilifrons*, n. sp. (p. 56)
- Larger species, 3.4-3.9 mm. Color uniform or red brown with dark brown striae ..... 34
- 34(33). Color uniform, typically black; striae more strongly impressed (Fig. 35b). Peru and Ecuador to Brazil, Guyana and Trinidad; length 3.5-3.9 mm ..... *C. costatus* Chapuis (p. 54)
- Color red brown, often with dark brown striae; striae less strongly impressed (Fig. 38b). Panama, typically in the Canal Zone; length 3.4-3.7 mm ..... *C. quadridens* Blackman (p. 58)
- 35(31). Elytra metallic or with a metallic luster; mycangium always present ..... 36
- Elytra not metallic, mycangium usually present (absent in *C. suturalis*) ..... 38
- 36(35). Elytra metallic bronze. Highland forests of the Andes from Colombia to Bolivia, 1000-3000 m; length 5.0-5.8 mm ..... *C. angustior* Eggers (p. 64)
- Elytra metallic bronze to blue. Lowland forests from Costa Rica to Bolivia and Brazil ..... 37
- 37(36). First discal striae impressed; elytra metallic bronze. Costa Rica to northern Argentina; length 4.4-5.9 mm ..... *C. aeneipennis* (Fabricius) (p. 62)
- First discal striae not impressed; elytra metallic bronze, green or blue. Bolivia and Peru to Colombia and Suriname; length 6.0-7.1 mm ..... *C. noel*, n. sp. (p. 73)
- 38(35). Elytra densely covered in golden recumbent hair-like setae (often abraded) ..... 39
- Elytra glabrous ..... 40
- 39(38). Mycangium absent (Fig. 4a); head, antennae, thorax, pronotum, legs red-orange to red, abdomen black, elytra black, each elytron with an orange oval spot extending from the lateral margin of the sutural interstriae to the tenth interstria and from the basal fifth of elytra to the apical four-fifths (male, Fig. 80). Peru, Brazil and the Guianas; length 3.6-5.0 mm ..... *C. suturalis* (Fabricius) (p. 78)
- Groove mycangium present (Fig. 4b); head, antennae, thorax, pronotum, legs and abdomen black, elytra solid black (male, Fig. 45). Brazil, Ecuador; length 4.9-5.6 mm ..... *C. hirtipennis* Schedl (p. 69)
- 40(38). Pronotum bicolored (posterior 1/5-2/5 orange, remainder black), profemur and prothoracic legs red orange, remaining legs black; thorax, abdomen and elytra black (male, Fig. 46). Peru and Ecuador; length 5.9-6.5 mm ..... *C. mandelshtami* Petrov (p. 71)
- Body uniformly black ..... 41
- 41(40). Elytra black; each elytron with 8 shallow rugae on the discal sutural interstriae to second interstriae, each rugae with a single setae arising from the center (male, Fig. 44b). Ecuador; length 5.3 mm ..... *C. distinctus*, n. sp. (p. 68)
- Elytra unarmed by rugae, glabrous ..... 42
- 42(41). Length 3.1-4.5 mm, typically 3.9 mm. Peru to French Guiana ... *C. aterrimus* Eggers (p. 66)
- Length 4.5-5.4 mm, typically 5.1 mm. Brazil, Peru and Ecuador ..... *C. pseudoangustior*, n. sp. (p. 76)
- 43(30). Genal mycangium setose and circular (Fig. 4c) ..... 44
- Genal mycangium setose and triangular (Fig. 4d) ..... 53
- 44(43). Elytral base tumid from interstriae 7-9 (Fig. 18); elytral apex serrate (Fig. 19) ..... 45
- Elytral base never tumid from interstriae 7-9 (Fig. 30); elytral apex smooth (Fig. 30) ..... 48
- 45(44). Elytral interstriae bearing short, fine, hair-like setae (Fig. 18) ..... 46

- Elytral interstriae bearing long, narrow scales (Fig. 19) ..... 47
- 46(45). Very fine and minute hair-like setae on both striae and interstriae; (male, Fig. 17). Argentina and Brazil; length 2.4-3.4 mm ..... *C. inoblitus* (Schedl) (p. 26)
- Each declivital interstriae bearing short, fine setae and striae bearing shorter, thinner setae (Fig. 18). Peru; length 3.4 mm ..... *C. major* (Eggers) (p. 28)
- 47(45). Discal interstitial punctures with their bases weakly to moderately elevated (Fig. 16). Brazil; length 3.5 mm ..... *C. annectens* Wood (p. 25)
- Discal interstitial punctures with their bases flat, never elevated (male, Fig. 19). Argentina and Bolivia to Ecuador to Costa Rica; length 2.2-3.6 mm ..... *C. opacicollis* (Eggers) (p. 29)
- 48(44). Discal interstriae bearing 1-4 rows of overlapping yellow to golden scales (Fig. 32) ..... 49
- Discal interstriae bearing, short, overlapping, colorless to pale yellow, uniseriate, spatulate scales, those never overlap (Fig. 30) ..... 51
- 49(48). Elytra densely covered in pale, recumbent setae, with their apices pointed; surface largely covered (Fig. 32). Ecuador; length 3.8-3.9 mm ..... *C. mallopterus*, n. sp. (p. 50)
- Elytra moderately covered in semi-recumbent to recumbent, yellow to golden, interstitial scales with their apices flattened or rounded ..... 50
- 50(49). Elytra black with an orange patch covering basal third from the suture to eighth interstriae (male, Fig. 28). Ecuador; length 3.1-3.5 mm, 2.1-2.3 times as long as wide ..... *C. doleae*, n. sp. (p. 45)
- Body uniformly red-brown (male, Fig. 29). Brazil; length 2.5-2.8 mm, 1.7-2.0 times as long as wide ..... *C. igniculus*, n. sp. (p. 47)
- 51(48). Length 3.8-4.5 mm, Frons flat; second sternite convex. Brazil to French Guiana ..... *C. charpentierae* Schedl (p. 42)
- Length 2.7-3.3 mm. Frons flat with a faint medial impression; second sternite ventrally convex and distally distended (Fig. 30c) ..... 52
- 52(51). Black, medial area of the frons more strongly impressed (Fig. 31c,d). Brazil and Ecuador; length 2.7-3.3 mm ..... *C. latipilis* Schedl (p. 48)
- Black with dark red head and pronotum; medial area of the frons weakly impressed (Fig. 27e,f). Brazil and Ecuador; length 2.7 mm ..... *C. coccoformus* n. sp. (p. 43)
- 53(43). Apical quarter of declivity with interstriae bearing uniseriate, thinner and pointed setae (male, Fig. 21). Mexico to Venezuela and Trinidad; length 3.5-4.1 mm ..... *C. auricomus* Blandford (p. 32)
- Declivity bearing spatulate setae to apex ..... 54
- 54(53). Frons with a weak medial impression extending from epistoma to upper level of eyes (Fig. 24e,f); Brazil and Peru; length 3.2-3.7 mm ..... *C. orientalis* Eggers (p. 38)
- Frons without a medial impression (Fig. 25e,f) ..... 55
- 55(54). Highland forests of the Andes from Bolivia and Peru, above 1000m elevation (Fig. 23); length 4.0-4.5 mm ..... *C. occidentalis* Eggers (p. 37)
- Lowland forests. [Differences between species are not evident, male identification and association is required.] ..... 56
- 56(55). Length 2.8-4.1 mm (Fig. 22). Bolivia and Brazil to Colombia and the Guianas ..... *C. niger* (Fabricius) (p. 34)
- Length 3.5-4.3 mm (Fig. 25). Ecuador to Venezuela ..... *C. rectus* Wood (p. 40)

## Taxonomy

### Genus *Camptocerus* Dejean

*Camptocerus* Dejean 1821: 100. Type species: *Hylesinus aeneipennis* Fabricius, by monotypy.

**Diagnosis.** *Camptocerus* is distinguished from other Scolytini genera by the mycangia present on the female gena (present in all species except *C. suturalis* (Fabricius), by the xylomycetophagous habit, by the gradually ascending abdominal profile, by the scutellum being flush with the elytral surface, by the more strongly excavated male frons, with the excavation extending from the epistoma to just below the vertex and laterally from eye to eye (except *C. doleae*), by the male antennal funicle segments 2-7 bearing long setae which form the appearance of a dense brush on the distal edge, by the setae which are 1 to 2 times longer than the funicle, by the absence of crenulations on the elytral base, by the generally larger body size (2.2-7.1 mm long), by the female frons which is flat to convex, and by the lack of supplemental denticles on the apical anterior edge of the meso- and metathoracic tibiae.

## Species Descriptions

Previously described species are redescribed and new species are described according to the phylogenetic placement of clades beginning with the opacicollis clade and followed respectively by the auricomus, latipilis, costatus and aeneipennis clades. Species are treated alphabetically within each clade.

### Opacicollis Clade

Species in the opacicollis clade are distinguished by the male basal epistomal margin armed with a strongly developed carina and by the elongate and narrowly rounded distally male antennal scape. In addition, the apical margin of the pronotum is rounded and the area between the eyes lined with scales, the metepisternum is shape type D (Fig. 9d), with setae palmately divided into 4 or more filaments. The elytral base tumid from interstriae 7-9 and the elytral apex is serrate. The clade contains five species, four species are redescribed and one species is described.

### *Camptocerus annectens* Wood

(Fig. 16)

*Camptocerus annectens* Wood 2007: 210. Holotype: female, BRAZIL: *Serra de Baturite*: Ceara, (*L. Gounelle*), Strohmeyer Collection (SDEI).

**Diagnosis.** This species is characterized by the strigulate anterior third of the pronotum, by the basal two thirds of the pronotum shining with small punctures, by the declivital interstriae bearing uniseriate stout scales, by the discal interstitial punctures as large as those in striae, and by the discal interstitial punctures with their bases weakly to moderately elevated.

**Redescription (female).** 3.5 mm long (mean = 3.5 mm; n = 1); 2.2 times as long as wide. Head, antennae, thorax, abdomen, elytra black legs dark brown.

Epistoma impressed, less than a quarter length of head, unarmed; surface shagreened; punctures large, deeply impressed, separated by a distance 1-3 times diameter of punctures; 2-5 rows of setae lateral to the median line (sometimes abraded). Frons weakly convex, slightly impressed medially; unarmed; surface glabrous, surface shagreened, with large, deeply impressed punctures similar to those on epistoma. Each gena with a circular mycangium (Fig. 4c). Antennal scape elongate and narrowly rounded distally; segments 5-7 of funicle bearing setae on dorsal margin, these less than length of 4 funicular segments; anterior face of the club setose with a partial septum.



Apical pronotal margin broadly rounded (Fig. 6a), area between eyes bearing scales; apical third strigulate; basal two-thirds smooth, shining with minute, shallow punctures; apical fourth bearing stout setae (sometimes abraded); base weakly bisinuate (Fig. 8c); carina on lateral margin type E (Fig. 7e).

Scutellum shape type E (Fig. 12e).

Elytral sides parallel, narrowing to a serrate apex; base tumid from interstriae 7-9; discal interstriae with punctures as large as stria punctures, bases of punctures weakly to moderately elevated. Declivity with each interstriae bearing a row of uniseriate, stout, yellow-brown scales (sometimes abraded). Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type D (Fig. 9d); setae palmately divided into 4 or more filaments.

**Male.** Unknown.

**Specimens examined.** (0M, 1F)

*Type material.* Holotype *Camptocerus annectens*, F (SDEI).

**Distribution.** Brazil (Ceara).

**Hosts.** Unknown.

**Biology.** Unknown.

***Camptocerus inoblitus* (Schedl)**

(Fig. 18 – 19, 81)

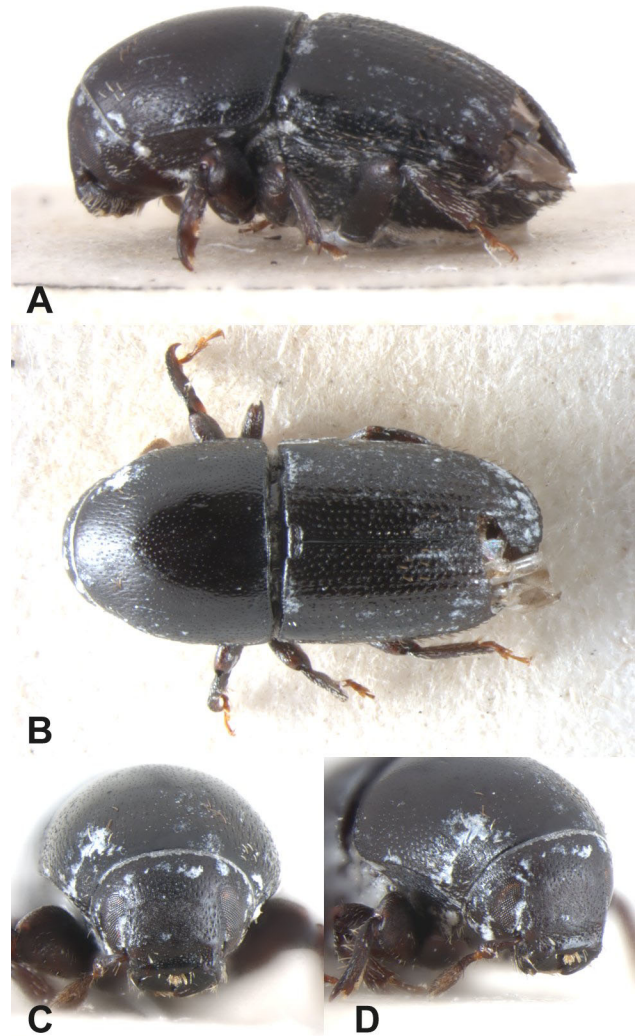
*Camptocerus inoblitus* (Schedl) 1939: 722 (*Loganius*). Holotype: male, BRAZIL: Santa Catarina: viii.1940, (F. Plaumann), Schedl Collection (NHMW).

*Camptocerus morio* (Schedl) 1952: 348 (*Loganius*). Holotype: male, BRAZIL: Santa Catarina, Schedl Collection (NHMW). **New synonymy.**

**Diagnosis.** Adults of this species are recognized by the brown color, by the declivital striae and interstriae 1-6 bearing minute, very fine, hair-like setae and by the stria punctures 2-3 times larger than those of interstriae.

**Redescription (male).** 2.4-3.4 mm long (mean = 3.1 mm; n = 20); 2.1-2.4 times as long as wide. Color uniformly light to dark brown.

Epistoma impressed, expanded to greater than quarter length of head, unarmed; surface shagreened; lateral margins with a vertical sub-acute carina, bearing 3-4 rows of setae along the lateral margins; basal epistomal margin armed with a strongly developed, sub-acute, arcuate carina (Fig. 2c). Frons strongly excavated, with excavation bordering the ocular margin; surface shagreened; 3-4 rows of erect pale setae lateral to the median line. Antennal scape elongate and narrowly rounded distally, setae on distal third, these equal to half length of scape; segments 2-7 of funicle bearing brushes of setae these



**Figure 16.** *Camptocerus annectens*, 3.5 mm, female holotype. Lateral (A), dorsal (B); head anterior (C), anterior oblique (D).

equal to the length of scape; segments 1-7 of funicle bearing setae on dorsal margin, these less than length of 4 segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes bearing scales; apical third strigulate; basal two-thirds smooth, shining with minute, shallow punctures; apical fourth bearing stout setae; base weakly bisinuate (Fig. 8c); carina on lateral margin type E (Fig. 7e).

Scutellum shape type E (Fig. 12e).

Elytral sides parallel, narrowing to a serrate apex; base tumescence from interstriae 7-9; discal striae with punctures 1.5-2 times larger than those of interstriae and 2-3 times deeper; striae with uniseriate rows of minute, very fine hair-like setae. Declivity with each interstriae bearing a row of uniseriate, very fine, minute, pale, hair-like setae. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type D (Fig. 9d); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

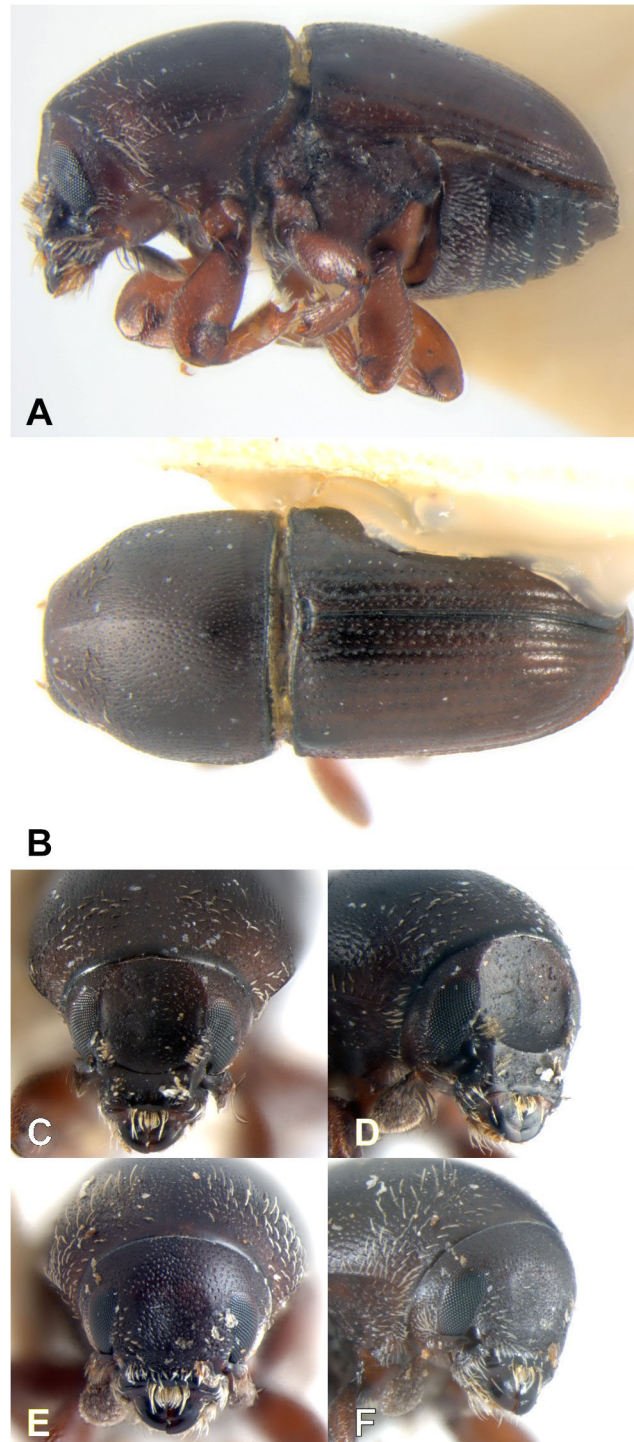
Male genitalia. Median lobe flat, lateral and apical margins with more sclerotization, apex round, apical orifice membranous. Lateral margins folded dorsally, each forming a triangle with an apex just below the apical third of median lobe; thin and arcuate distally on basal half. Median struts narrow, laterally compressed and broader basally, a third of body length. Internal sac membranous to moderately sclerotized, membranous apically and composed of 2 more heavily sclerotized narrowly elongate and curved projections on basal half (Fig. 50). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head, unarmed; minutely punctate; 3 horizontal rows of setae. Frons flat, unarmed, minutely punctate, glabrous, with the median area slightly impressed; 3 rows of setae on lateral margins. Each gena with a circular mycangium (Fig. 4c). Segments 4-7 of funicle bearing setae on dorsal margins; segments 3-7 bearing setae on ventral margins, these less than length of 5 segments.

#### Specimens examined. (21M, 34F)

*Type Material.* Holotype, *Camptocerus inoblitus*, M (NHMW); Allotype *Camptocerus inoblitus*, F (NHMW); Holotype *Camptocerus morio*, M (NHMW).

*Other material.* BRAZIL: Santa Catarina: Nova Teutonia, xi.1938 (Fr. Plaumann), 1F (NHRS); 27°11'S, 52°23'W (on most labels), 300-500 ft, viii.1940, (F. Plaumann), 6M, 5F (FMNH); xi.1940, 3M



**Figure 17.** *Camptocerus inoblitus*, 2.4 – 3.4 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



(FMNH); 1949, 4M (FMNH); ex. Sapindaceae sp. 88, 14.x.1949, 2F (FMNH); 4.ii.1950, 1M, 7F (FMNH), 2M, 1F (MSUC); ex. 'trockenes Reisig' [= dry brushwood], 7.ii.1950, 3F (FMNH); 1.iii.1950, 3F (FMNH), 1M, 2F (MSUC); ex. 'trockenes Reisig' [= dry brushwood], 10.ii.1950, 2F (FMNH); 7.iii.1950, 1M, 7F (FMNH), 1M (MSUC).

**Discussion.** Wood (2007) recognized *C. morio* as a separate species. The holotypes of *C. inoblitus* and *C. morio* are identical, except that the holotype of *C. morio* is colored slightly darker brown. *Camptocerus morio* is here placed in synonymy.

**Distribution.** Argentina (Misiones), Brazil (Santa Catarina).

**Hosts.** *Myrocarpus frondosus* Fr. Allem (Fabaceae), Sapindaceae sp.

**Biology.** Unknown.

***Camptocerus major* (Eggers)**  
(Fig. 18)

*Camptocerus major* (Eggers) 1929: 60 (*Loganius*).  
Holotype: female, PERU: [Junín]:  
Chanchamajo, Eggers Collection (NHMW).

**Diagnosis.** The female is distinguished by the strigulate apical third of pronotum and punctate posterior two-thirds; by the declivital interstriae bearing short, fine setae and by the striae bearing shorter, thinner setae.

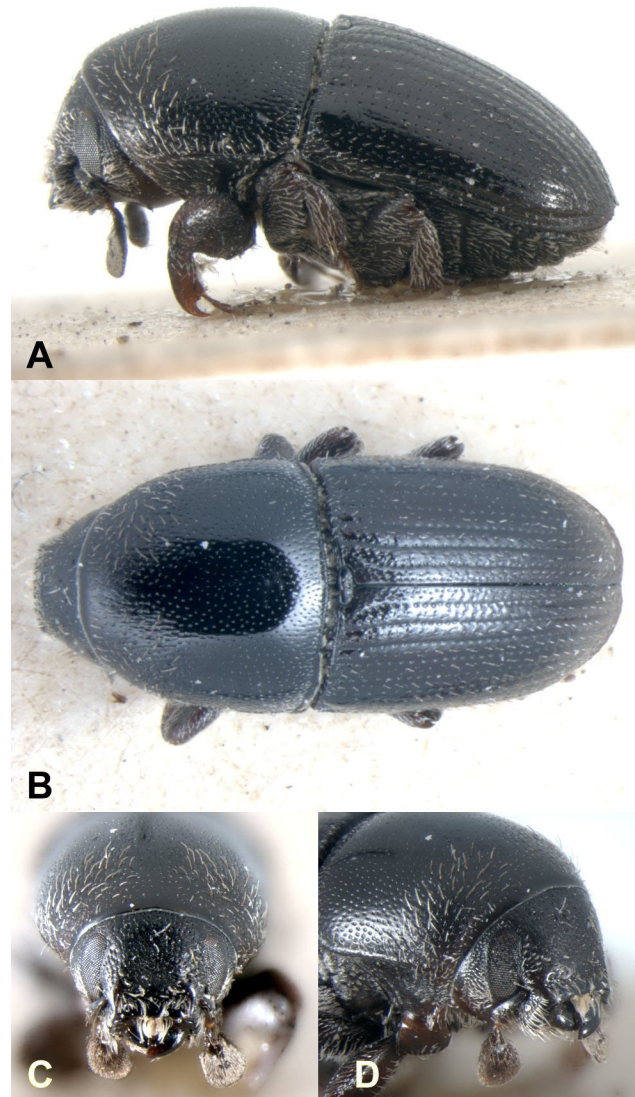
**Redescription (female).** 3.4 mm long (mean = 3.4 mm; n = 1); 2.3 times as long as wide. Color uniformly dark brown, nearly black.

Epistoma impressed, less than a quarter length of head, unarmed; surface shagreened, covered with 4-5 rows of setae. Frons unarmed and flat, with the median area slightly impressed; surface shagreened, punctures separated by a distance of 1-3 times diameter of punctures, those on lateral margins larger and deeper; 4-5 rows of setae lateral to the median line. Each gena with a circular mycangium (Fig. 4c). Antennal scape elongate and narrowly rounded distally; segments 5-7 of funicle bearing setae on dorsal margin and segments 3-7 of funicle bearing setae on ventral margins, these less than length of 5 segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 6a), area between eyes bearing scales; apical third strigulate; basal two-thirds smooth, shining with minute, shallow punctures; apical fourth bearing stout setae (sometimes abraded); base weakly bisinuate (Fig. 8c); carina on lateral margin type E (Fig. 7e).

Scutellum shape type E (Fig. 12e).

Elytral sides parallel, narrowing to a serrate apex; base tumid from interstriae 7-9; surface smooth. Declivital with each interstriae bearing a row of uniseriate, minute, pale setae, these 2-3 times length of



**Figure 18.** *Camptocerus major*, 3.4 mm, holotype female. Lateral (A), dorsal (B); head anterior (C), anterior oblique (D).



those of striae and twice as thick; each striae bearing a row of uniseriate, minute, hair-like setae; stria punctures larger than those of interstriae and 2-3 times deeper. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type D (Fig. 9d); setae palmately divided into 4 or more filaments.

**Male.** Unknown.

**Specimens examined.** (0M, 1F)

*Type Material.* Holotype *Loganius major*, F (NHMW).

**Discussion.** Wood (2007) examined a male and 3 females of *Camptocerus major* from the SDEI and from them, described the male of *Camptocerus major*. However, after comparing these specimens to the holotypes of both *C. major* and *C. opacicollis*, it was determined that they were specimens of *C. opacicollis*. The male of *C. major* remains unknown. Wood (2007) also lists *C. uniseriatus* as a synonym of *C. major*. After comparison with the holotypes, *C. uniseriatus* was placed as a synonym to *C. opacicollis*.

**Distribution.** Brazil, Peru (Huanuco, Junín).

**Hosts.** Unknown liana.

**Biology.** Unknown.

***Camptocerus opacicollis* (Eggers)**  
(Fig. 19, 51)

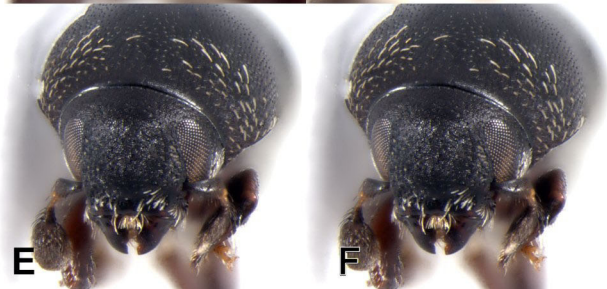
*Camptocerus opacicollis* (Eggers) 1929: 61 (*Loganius*). Holotype: male, BOLIVIA: [Cercado]: Cochabamba, Eggers Collection (NHMW).

*Camptocerus aquilus* Wood 1972: 244. Holotype: male, BRAZIL: Goiás: near Aldeia Caraya, on or near the Rio Araguaia: 12°49'S 51°46'W (BMNH). Synonymy: Wood 1985: 266.

*Camptocerus infidelis* Wood 1969: 11. Holotype: female, COSTA RICA: Peralta: Cartago, 1500 ft, 10.iii.1964, (S.L. Wood), ex. unknown vine (USNM). **New synonymy.**

*Camptocerus uniseriatus* Schedl 1972: 54. Holotype: male, BRAZIL: Guanabara [= *Rio de Janeiro*]: Corcovado, x.1969, (Alvarenga & Seabra) (NHMW). **New synonymy.**

**Diagnosis.** Adults of both sexes are recognized by the larger, deeper pronotal punctures, by the stria and interstitial punctures equal in size and with their bases flat, never elevated and by the declivital interstriae bearing uniseriate, narrow scales.



**Figure 19.** *Camptocerus opacicollis*, 2.2 – 3.6 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

**Redescription (male).** 2.2-3.6 mm long (mean = 2.9 mm; n = 17); 2.0-2.4 times as long as wide. Head, antennae, thorax, and elytra dark brown to black. Gena, abdomen and legs light to dark brown.

Epistoma impressed, expanded to greater than quarter length of head, unarmed; surface shagreened; lateral margins with a vertical sub-acute carina; 4-5 rows of setae lateral to the median line; basal epistomal margin armed with a strongly developed, sub-acute, arcuate carina (Fig. 2c). Frons strongly excavated, with the excavation bordering the ocular margin; surface shagreened; 5-6 rows of erect pale setae lateral to the median line. Antennal scape elongate and narrowly rounded distally, bearing setae on distal two-thirds, those equal to length of scape; segments 2-7 of funicle bearing brushes of setae 1.5 times the length of scape; segments 1-7 of funicle bearing setae on dorsal margin less than length of 6 segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes bearing scales; strigulate; shining with dense, shallow punctures; apical fourth bearing stout setae (sometimes abraded); base weakly bisinuate (Fig. 8c); carina on lateral margin type E (Fig. 7e).

Scutellum shape type E (Fig. 12e).

Elytral sides parallel, narrowing to a serrate apex; base tumid from interstriae 7-9; surface smooth, shining. Declivity with each interstriae bearing a uniseriate row of narrow scales; punctures equal diameter and depth of those of striae; stria punctures each with a hair-like seta arising from the basal margin, those covering puncture. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type D (Fig. 9d); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

Male genitalia. Median lobe flat, lateral and apical margins with more sclerotization, apex round, apical orifice membranous; lateral margins folded dorsally, each forming a triangle with an apex just below the apical third of median lobe; thin and arcuate distally on basal half. Median struts narrow, broader and laterally compressed basally, a third of body length. Internal sac membranous to moderately sclerotized, membranous apically and composed of 2 more heavily sclerotized narrowly elongate and curved projections on basal half (Fig. 51). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head, unarmed; minutely punctate; 3 rows of setae lateral to the median line. Frons weakly convex, unarmed, minutely punctate, glabrous, with the median area slightly impressed; 4 rows of setae on lateral margins. Each gena with a circular mycangium (Fig. 4c). Segments 4-7 of funicle bearing setae on dorsal margins; segments 5-7 bearing setae on ventral margins, these less than length of 4 segments.

#### Specimens examined. (36M, 50F)

*Type Material.* Holotype *Camptocerus opacicollis*, M (NHMW). Allotype *Camptocerus opacicollis* BOLIVIA: Cochabamba: (Germain), 1907, (*H. Donckier*) F (NHMW). Holotype *Camptocerus aquilus* M (BMNH). Paratypes *Camptocerus aquilus* BRAZIL: [Mato Grosso]: 12° 31'S, 51° 46'W, RS-RGS, 12-18.xi.1968, (*R.A. Beaver*), 1M, 1F (USNM); Holotype *Camptocerus uniseriatus*, M (NHMW). COSTA RICA: Holotype *Camptocerus infidelis*, F (USNM); Paratype *Camptocerus infidelis* Peralta: Cartago, 1500 ft, ex. unknown vine 10.iii.1964, (*S.L. Wood*), 1F (USNM). Holotype *Camptocerus uniseriatus*, M (NHMW).

*Other material.* BOLIVIA: [Santa Cruz]: Oquiriquia forest, Tierra Prometida, N.E. Bolivia, ex. *Xylopia sercea* (Annonaceae) fogging, 1.viii.1997, (*J.G. Davies*), 2F (BMNH); 2.viii.1997, 1F (BMNH). BRAZIL: Amazonas: 69 km N Manaus, (*G. Stevens*), 3M, 3F (USNM); Reserva Ducke, 26 km NE Manaus, ex. malaise trap, i.1996, (*M.G.V. Barbosa*), 1F (BMNH); Bahia: 'Bahia', (*Fry*), 1F (BMNH); Goyas [= Goiás]: Jatahy, ix-xi.1897, 1M, 3F (SDEI). ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (*T.L. Erwin et al.*), lot 610, 1F (USNM); Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, ii.1999, (*T.L. Erwin et al.*), lot 2034, 1F (USNM); lot 2053, 1M (USNM). PERU: Madre de Dios: Los Amigos Biological Station, -12.56916, -70.100114, 250 m, ex. *Protium amazonicum*, 17-25.v.2008, (*Smith, Hulcr*), 7M, 6F (MSUC); 26-27.v.2008, 19M, 26F (MSUC); Tampopata, 15 km NE Puerto Maldonado, Maldonado Reserva Cuzco Amazonico, 12°33'S 69°03'W, 200 m, ex. flight intercept trap, 15.vi.1989, (*J. S. Ashe, A. Leschen*), 1F (SMEC).



**Discussion.** Wood (2007) recognized both *C. infidelis* and *C. uniseriatus* as separate species. The holotypes of these species were found to be identical to the *C. opacicollis* holotype and are placed in synonymy.

**Distribution.** Argentina, Bolivia (Cercado, Santa Cruz), Brazil (Amazonas, Bahia, Goiás, Mato Grosso, Rio de Janeiro), Costa Rica, Ecuador (Napó), Peru (Madre de Dios).

**Hosts.** *Hirtella* sp. (Chrysobalanaceae), *Protium* sp. (Burseraceae) (= “Almesca branca” [Brazil], “Almesca vermelha” [Brazil], “Breu branco” [Brazil]) (Beaver 1972), *Protium amazonicum* Swart, unknown 1 cm diameter tree sapling (Wood 1969).

**Biology.** Beaver (1972) provides a detailed account of life history information for *C. aquilus* and Wood (1969) describes the gallery of *C. infidelis*, both are synonyms for *C. opacicollis*. *Camptocerus auricomus* aggregate in leaves around host trees and perform maturation feeding on *Protium* leaves (Smith, pers. obs.)

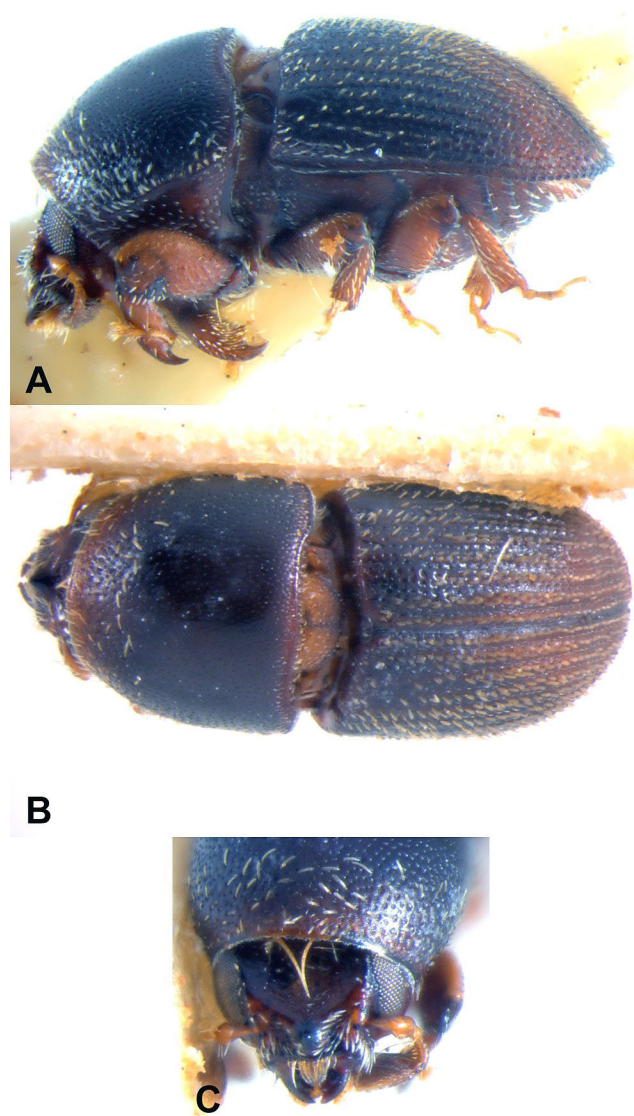
***Camptocerus unicornus* Smith and Cognato, new species**  
(Fig. 20)

**Type Material.** Holotype: male, BRAZIL: Amazonas: 010BR Chplac, km 31, 18.vi.1976, (E. Rufino) (USNM).

**Diagnosis.** The male is distinguished by the large and broad tubercle on the distal epistomal margin medially connecting with the carina on basal epistomal margin, by the frontal setae in 2 thin arcuate bands above the frons which combine on the median line between the eyes, by the broadly emarginate pronotal base along the medial half and by the interstriae bearing uni- and biseriata, spatulate setae.

**Description (male).** 2.5 mm long ( $n = 1$ ); 2.1 times as long as wide. Color uniformly light to dark red brown.

Epistomal weakly impressed, not greater than a quarter length of head, apical epistomal margin with a large and broad medial tubercle, its height equal to width at base; surface shagreened, bearing 6 diagonal rows of setae from apical epistomal margin to tubercle; lateral margins with a faint costa angled proximally; basal epistomal margin armed with a strongly developed carina (Fig. 2c) connecting medially with epistomal tubercle. Frons strongly excavated, with the excavation bordering the ocular margin; surface shagreened; 7-8 rows of small and fine and long thick erect golden setae lateral to median line and 2 narrow bands of long yellow setae arising above the dorsolateral margin of the eyes and curve above the frons combining on the median line between the eyes. Antennal scape elongate and narrowly rounded distally, setae on distal third, those less than half length of scape; segments 2-7 of funicle bearing brushes



**Figure 20.** *Camptocerus unicornus*, 2.5 mm, holotype male. Lateral (A), dorsal (B); head anterior (C).



of setae 1.5 times the length of scape; segment 7 of funicle bearing setae on dorsal margin less than length of 2 segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes bearing scales; surface with dense, minute, shallow punctures; apical fourth bearing stout setae (sometimes abraded); base broadly emarginate along medial half (Fig. 8d); carina on lateral margin type H (Fig. 7h).

Scutellum shape type P (Fig. 12p).

Elytral sides parallel, narrowing to a serrate apex; base tumid from interstriae 7-9. Declivity with each interstriae bearing granules from which uni- and biseriate spatulate setae arise, densely covering surface; stria punctures each with a hair-like seta arising from the basal margin, covering puncture. Tenth interstriae without a carina. Metepisternum shape type D (Fig. 9d); setae palmately divided into 4 or more filaments. Mesosternum shape type P (Fig. 10p).

Male genitalia not examined.

**Female.** Unknown.

**Specimens examined.** (1M, 0F)

**Distribution.** Brazil (Amazonas).

**Hosts.** Unknown.

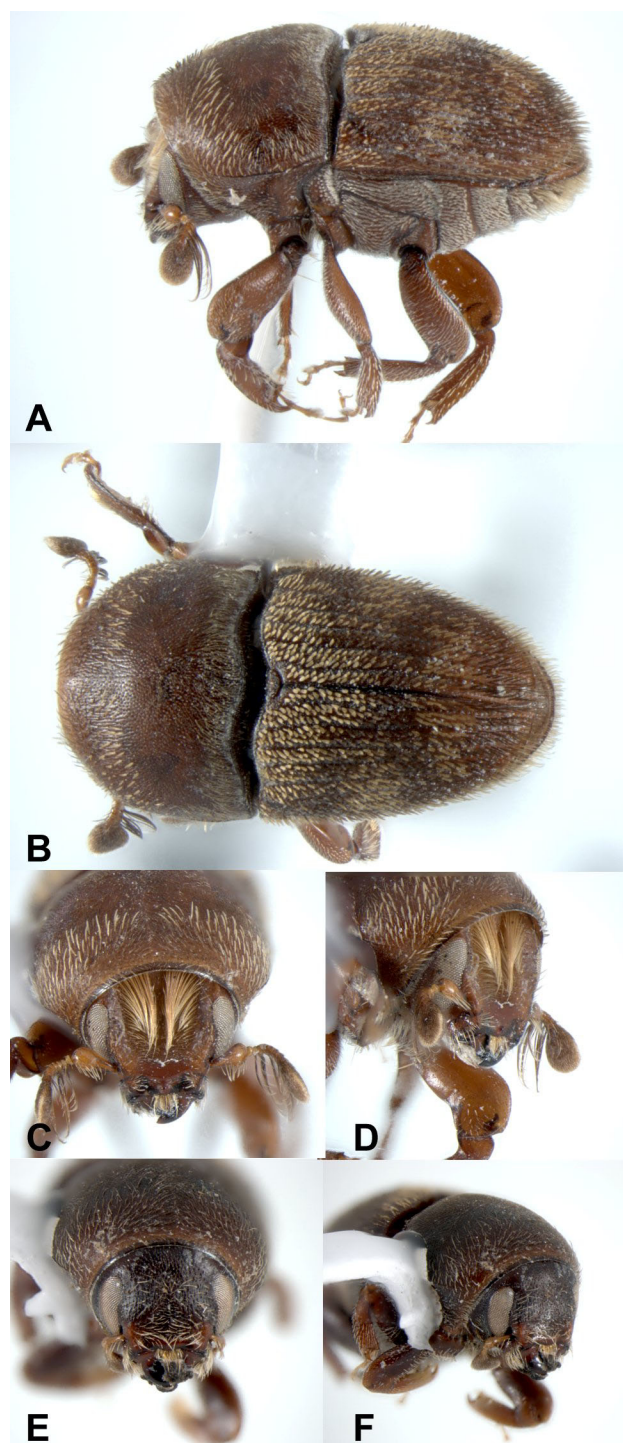
**Biology.** Unknown.

**Etymology.** *Uni-* (L) = one, *-cornus* (L) = horn. In reference to the large tubercle on the distal epistomal margin.

### Auricomus Clade

The auricomus clade is the most distinctive clade in *Camptocerus* with species readily distinguished by their characteristic dense, variegated scales or spatulate setae on the elytral interstriae, by the strongly bisinuate pronotal base (Fig. 8c) and by 2 thick bands of setae on the male frons. In addition, the scutellum shape type C (Fig. 12c), the lack of a carina originating at the base of the tenth interstria, the metepisternum shape type G (Fig. 9g) and mesosternum shape type C (Fig. 10c) distinguish this clade. Five species are redescribed.

***Camptocerus auricomus* Blandford**  
(Fig. 21, 52)



**Figure 21.** *Camptocerus auricomus*, 3.5–4.1 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

*Camptocerus auricomus* Blandford 1896: 125. **Lectotype (here designated):** male, PANAMA: Chiriqui: Volcan de Chiriqui, below 4000 ft. (*Champion*) (BMNH).

*Camptocerus striatulus* Hagedorn 1905: 547. Holotype: female, FRENCH GUIANA: Camopi, 1900, (*F. Geay*) (MNHN). **New synonymy.**

**Diagnosis.** The male is distinguished by a small median rounded tubercle on the apical epistomal margin half as high as basal width, by a sub-acute, recurved carina on the basal epistomal margin (Fig. 2d), by the frons bearing 2 thick bands of setae which lie flat against the frons, by the elytral interstriae covered in 2 - 3 rows of uniseriate, variegated scales (often abraded in older specimens), and by the thinner and pointed setae on apical quarter of the declivity.

The female is distinguished from that of *C. niger* by the hair-like setae on the apical quarter of the declivity and from that of *C. orientalis* by the presence of a circular, weakly impressed region between upper level of eyes.

**Redescription (male).** 3.5-4.1 mm long (mean = 3.9 mm; n = 20); 1.8-2.0 times as long as wide. Color uniformly light orange to black. Elytral interstriae bearing tan and dark brown scales often forming a 'X' shape. Occasionally, the sides of the 'X' are filled with dark brown scales forming a triangle on each elytron.

Epistoma weakly excavated, expanded to less than quarter length of head, apical epistomal margin bearing a small rounded tubercle half as high as base width; surface shagreened; lateral margins angled proximally, bearing a single row of setae; basal epistomal margin bearing a sub-acute, transverse and recurved carina (Fig. 2d). Frons strongly excavated, with the dorsolateral margin of the eyes on the excavation; surface shagreened, lateral fifths and medial fifth glabrous, remaining surface densely covered by 2 thick bands of long, yellow-brown setae, those clearly divided between the median line; single row of setae lining the lateral margins; ventral margin elevated above epistoma; lateral and dorsal margins rounded. Antennal scape elongate and narrowly rounded distally, with a lateral row of setae on ventral margin, those less than half length of scape; segments 2-7 of funicle bearing brushes of setae 1.5 times the length of scape; segments 5-7 of funicle bearing setae on dorsal margin, these less than length of 4 segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; strigulate; smooth with dense, deep, minute punctures; punctures and vestiture on median line; anterior third bearing long bristles; base and disk bearing short, fine hair-like setae; 2 - 3 rows of short bristles above lateral carinae; base strongly bisinuate (Fig. 8c); carina on lateral margin type F (Fig. 7f).

Scutellum shape type C (Fig. 12c).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with each interstriae bearing 3 rows of semi-erect, spatulate setae and 2 rows on declivity; interstriae 3 times the width of striae; interstrial punctures strongly confused. Declivity occupying apical half of elytra; each interstriae bearing 2 rows of semi-erect, spatulate setae, those transition to uniseriate thinner and pointed setae on apical quarter; striae weakly impressed, punctures each with a hair-like seta arising from the basal margin, those covering puncture. Tenth interstriae without a carina. Metepisternum shape type G (Fig. 9g); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

Male genitalia. Median lobe flat, lateral margins with more sclerotization, proximal third parallel-sided, apex broadly acute, apical orifice lightly sclerotized; left side folded dorsally, narrow, weakly arcuate, reaching under right side; right side laterally folded under body. Median struts stout, a quarter of body length. Internal sac central area lightly sclerotized, an accessory of the seminal valve with more sclerotization and upside-down "U" shaped (Fig. 52). Tegmen semi-circular, ventral side elongated proximally. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head, unarmed; covered by 5 rows of setae. Frons flat, with a circular, weakly impressed region between upper level of eyes; 3-4 rows of setae lateral to the median line. Each gena with a triangular mycangium (Fig. 4d). Segments 2-7 of funicle bearing setae less than length of 6 segments. Pronotal anterior third covered with long, dense hair-like setae on anterolateral areas; long bristles absent; base and disk covered with short, fine hair-like setae.

**Specimens examined.** (37M, 24F)

*Type Material.* Lectotype *Camptocerus auricomus*, M (BMNH); Paralectotypes (here designated) *Camptocerus auricomus* 2M, 1F Panama: Chiriqui, Volcan de Chiriqui, below 4000 ft. (*Champion*) (BMNH). Holotype *Camptocerus striatulus*, F (MNHN).

*Other material.* COSTA RICA: *Limon*: Reventazon Ebene, Hamburgfarm, 24.ii.1937, (*F. Nevermann*), 3M (SDEI); *Peralta*: Cartago, 500 m, 4" limb, 10.iii.1964, (*S.L. Wood*), 5M, 5F (MSUC); *Puntarenas*: Gromaco, Rio Colo Brus, quarter inch trail cutting, 23.vii.1963, (*S.L. Wood*), 1M, 1F (MSUC); *No specific locality*: 'Rio Damites', 200m, 18.ii.1964, (*S.L. Wood*), 1M, 1F (MSUC). ECUADOR: *Cotopaxi*: Pujili Mangulia, vii.1969, (*A. Burchardt*), 2F, (NHRS). GUATEMALA: *Petén*: Tikal, 100m, at light at camp, 10.iv.1956, (*T.H. Hubbell, I.J. Cantrall*), 1M (UMMZ). MEXICO: *Veracruz*: Uxpanapa (Hidalgotitlan), 27.iv.1982, ex. *Protium copalifera* [likely *Protium copal*], (*T.H. Atkinson*), 1M, 1F (CASC). PANAMA: *Canal Zone*: Barro Colorado Island, ex. trap, 17.ii.1978, (*Henk Wolda*), 1M (STRI); Madden Forest, 3" limb, 2.i.1964, (*S.L. Wood*), 1M, 1F (MSUC); *Chiriqui*: Volcan de Chiriqui, below 4000 ft. (*Champion*), 3M (BMNH); *Panama*: Parque Nacional Soberania, Pipeline Rd, 9.166667, -79.75, 95 m, 3.ix.2008, (*S.M. Smith, A.D. Smith, A.R. Gillogly*), 6M, 6F (MSUC), 4M, 4F (MIUP). VENEZUELA: *Mérida*: 20 km SW Vigia, 50 m, ex. limb, 21.xi.1970, (*S.L. Wood*), 7M, 6F (MSUC).

**Discussion.** Wood (2007) listed *Camptocerus striatulus* as a synonym of *C. niger*. *C. striatulus* is here recognized as a synonym of *C. auricomus* due to the presence of thinner and pointed setae on apical third of declivity, a character not present in *C. niger*.

**Distribution.** Costa Rica, Ecuador (Cotopaxi), French Guiana, Guatemala, Mexico (Veracruz), Nicaragua, Panama, Trinidad, Venezuela (Mérida).

**Hosts.** *Cedrela* sp. (Meliaceae), *Protium copal* (Schltdl. and Cham.) Engl. (Burseraceae), *Protium* sp., *Protium glabrum* (Rose) Engl., *Protium panamense* (Rose) I.M. Johnst., *Rheedia edulis* [= *Garcinia intermedia* (Pittier), Hammel] (Clusiaceae).

**Biology.** Atkinson and Equihua-Martinez (1986) provide a detailed account of host use and gallery description. Females of *Camptocerus auricomus* excavate a short circumferential gallery below the bark on both sides of the entrance tunnel. Males use these galleries and the entrance tunnel to turn around without leaving the gallery (Smith, pers. obs.). *Camptocerus auricomus* aggregate in leaves around host trees and perform maturation feeding on *Protium* leaves (Smith, pers. obs.)

***Camptocerus niger* (Fabricius)**

(Fig. 22, 53)

*Camptocerus niger* (Fabricius) 1801: 393 (*Hylesinus*). Lectotype: male, [GUYANA]: 'Essequibo' [River] (ZMUC). Lectotype designated Wood 1982: 415.

*Camptocerus squammiger* Chapuis 1869: 259. **Lectotype (here designated):** male, [FRENCH GUIANA]: 'Cayenne' (ISNB). Synonymy: Eggers 1934: 27.

*Camptocerus tectus* Eggers 1943: 245. Holotype: male, BRAZIL: *Pernambuco*: Serra da Bernada, 5.vi.1894, (*Duhant*), Strohmeier Collection (SDEI). **New synonymy.**

**Diagnosis.** This species is distinguished by the unarmed (may have a very faint carina) apical epistomal margin, by the faintly impressed epistoma, by the nearly indistinct recurved carina on the basal epistomal margin (Fig. 2d) and by the 2 thick bands of setae on the male frons.

The female is distinguished from that of *C. auricomus* by the absence of pointed setae on declivital interstriae.

**Redescription (male).** 2.8-4.1 mm long (mean = 3.5 mm; n = 19); 1.8-2.1 times as long as wide. Color uniformly light orange to dark brown. Elytral interstriae bearing tan and dark brown scales creating a



variable pattern, often forming a 'X' shape (often abraded in older specimens). Occasionally, the sides of the 'X' are filled with brown scales forming a triangle on each elytron.

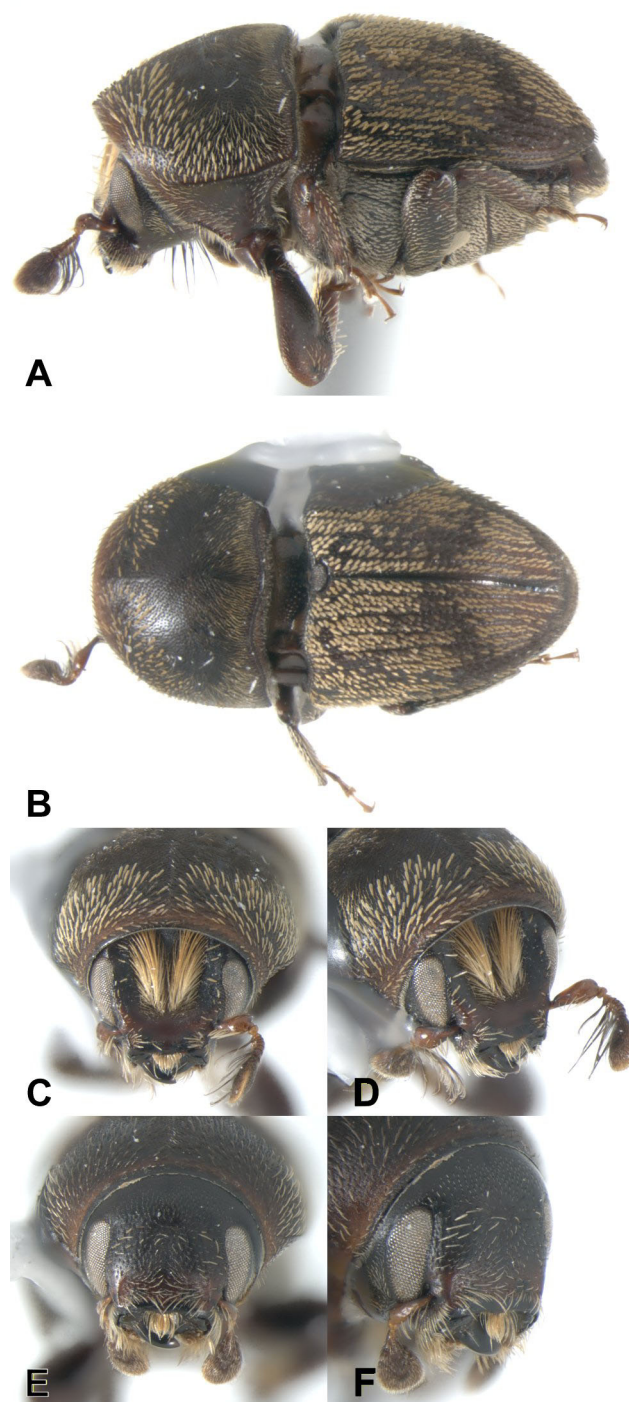
Epistoma weakly excavated, expanded to less than quarter length of head, apical epistomal margin unarmed; surface shagreened; lateral margins angled proximally, bearing a single row of setae; basal epistomal margin bearing a nearly indistinct (may be absent) sub-acute, transverse and recurved carina (Fig. 2d). Frons strongly excavated, with the dorsolateral margin of the eyes on the excavation; surface shagreened, lateral fifths glabrous, remaining surface densely covered by 2 thick bands of long, yellow setae, those clearly divided between the median line and extend to proximal epistomal margin; single row of setae lining the lateral margins; ventral margin elevated above epistoma; lateral and dorsal margins rounded. Antennal scape elongate and narrowly rounded distally, with a row of setae on ventral margin; segments 2-7 of funicle bearing brushes of setae 1.5 times the length of scape on ventral margin; dorsal margin bearing setae, those less than 4 funicle segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; apical third strigulate; basal two-thirds smooth with dense, deep, minute punctures; punctures and vestiture on median line; anterior third bearing long bristles; base and disk bearing short, fine hair-like setae; 2 rows of short bristles above lateral carinae; base strongly bisinuate (Fig. 8c); carina on lateral margin type F (Fig. 7f).

Scutellum shape type C (Fig. 12c).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with each interstriae bearing 3 rows of semi-erect, spatulate setae and 1-2 rows on declivity; interstriae 3 times the width of striae; interstitial punctures strongly confused. Declivity occupying apical half of elytra; each interstriae bearing 2 rows of semi-erect, spatulate setae; striae weakly impressed, punctures each with a hair-like seta arising from the basal margin, those covering puncture. Tenth interstriae without a carina. Metepisternum shape type G (Fig. 9g); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

Male genitalia. Median lobe flat, lateral and apical margins with more sclerotization, proximal third parallel-sided, apex broadly acute, apical orifice lightly sclerotized; left side folded dorsally, narrow and strongly arcuate, reaching under right side; right side laterally folded under body and left side projecting above right margin of median lobe. Median struts stout, a quarter of body length. Internal sac central



**Figure 22.** *Camptocerus niger*, 2.8-4.1 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

area lightly sclerotized, an accessory of the seminal value with more sclerotization and upside-down “V” shaped (Fig. 53). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head, unarmed; covered by 5 rows of setae. Frons flat; 3-4 rows of setae lateral to the median line; lateral margins sometimes strigulate. Each gena with a triangular mycangium (Fig. 4d). Pronotal anterior third covered with long, dense hair-like setae on anterolateral areas; long bristles absent; base and disk covered with short, fine hair-like setae.

**Specimens examined.** (36M, 31F, 1 unknown sex)

*Type Material.* Lectotype *Camptocerus niger*, M (MZMC); Paralectotypes *Camptocerus niger*, NO LOCALITY: 3F, 1 unknown sex (MZMC); Lectotype *Camptocerus squammiger*, M (ISNB); Paralectotypes (**here designated**) *Camptocerus squammiger*, 1F FRENCH GUIANA: Cayenne (ISNB); ‘South America’, 1M, 1v (ISNB); ‘Patria’, 1M (ISNB); Holotype *Camptocerus tectus*, M (SDEI); Paratypes, *Camptocerus tectus* BRAZIL: Pernambuco: Serra da Bernada, 5.vi.1894, (*Duhant*), 2M (SDEI).

*Other material.* BOLIVIA: Beni: Cosincho Region, (*G.L. Harrington*), 1M (USNM); *No specific locality* ‘Aragua’, 1F (NHMW); Santa Cruz: Buena Vista vic., Flora & Fauna Hotel, 22-26.x.[20]02, (*Morris/Wappes*), 1F (FSCA). BRAZIL: Amazonas: Amazonas Parque, 30 km E Manaus, Amazon River, 110 ft, 17.ii.1981, (*Chen-wen Young*), 1M, 1F (RJRC), 1F (MSUC); AM 010 km 26, Reserva Ducke, ex. malaise trap, 21.ii.1978, (*Jorge Arias*), 1M, 1F (USNM); Goyas [= Goiás]: Jatahy, x.1897-i.1898, 1F (MNHN); [Pará]: Belem, no. 144, xi.1974, (*John F. Reinert*), 1F (FSCA); Altamira, no. 96, xi.1974, (*John F. Reinert*), 1M (FSCA); Santa Catarina: Corupa (Hansa Humboldt), xi.1945, (*A. Maller*), 1M (AMNH). COLOMBIA: Cauca: 10 km SE Tambo, ex. ‘Anime’ [= local name of *Protium* sp.], 9.vii.1970, (*S.L. Wood*), 7M, 10F (MSUC); Putumayo: Mocoa, 26.vi.1974, (*M. Cooper*), B.M. 1964-548, 1F (BMNH). ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1995, (*T.L. Erwin et al.*), lot 996, 1M (USNM); x.1995, lot 1226, 1M, 1F (USNM); vii.1995, lot 1548, 1F (USNM); Pastaza: Cononaco, -1.55, -75.583333, ex. malaise trap, 29.v.1976, (*J. Cohen*), 2M (USNM). FRENCH GUIANA: Hwy D6 to Kaw, 33.5 km SE of Roura 10.ii.[19]86, (*G. Tavakilian*), 1F (TAMU); *No specific locality*: ‘Cayenne’, 1M (BMNH). GUYANA: *No specific locality*: ‘Essequibo’ [River] [= Guyana], 2M (MZMC). PERU: Loreto: 1.5 km N Teniente Lopez, -2.583333, -76.1, 210-240 m, ex. flight intercept trap, 9-22.vii.1993, (*R. Leschen*), 1F (USNM); 70 km SSW from Iquitos to Nauta, 150 m, 5.iii.2008, (*A. Petrov*), 6M, (MSUC). SURINAME: Commewijne: Akintosoela, 32 km SE Suriname River bridge, road to Redi Doti, 5.271389, -70.2517, 40 m, ex. flight intercept trap, 29.vi.-3.vii.1999, (*Z.H. Falin, B. DeDijn, A. Gangagin*), 1M (SMEC); *No specific locality*: ‘Surinam’, 4F (MZMC). VENEZUELA: Aragua: Rancho Grande, 1500-1900m, 8.v.1970, (*O’Brien, Marshall*), 1M (CASC). NO SPECIFIC LOCALITY: ‘America meridionali’ [= South America], 2M (ISNB).

**Discussion.** *Camptocerus tectus* is here designated as a synonym of *C. niger* based on lack of a transverse carinae on the male frons and identical male genitalia. When Eggers described *C. tectus*, only specimens of *C. auricomus* were examined for comparison and not *C. niger* (Eggers 1943).

**Distribution.** Bolivia (Beni, Santa Cruz), Brazil (Amazonas, Mato Grosso, Pará, Pernambuco, Santa Catarina), Colombia (Cauca, Putumayo), Ecuador (Napo, Pastaza), French Guiana, Guyana, Peru (Loreto), Suriname, Venezuela (Aragua).

**Hosts.** *Hirtella* sp., (Chrysobalanaceae), “Iratinga” (Beaver 1972), *Licania kunthiana* Hook. f. (Chrysobalanaceae), *Protium* spp. (Burseraceae) (= “Almesca branca” [Brazil], “Almesca vermelha” [Brazil], “Breu branco” [Brazil]) (Beaver 1972).

**Biology.** Beaver (1972) provides a detailed life history. *Camptocerus niger* females excavate a short circumferential gallery below the bark on both sides of the entrance tunnel, and are identical to those produced by *C. auricomus* (S. M. Smith, pers. obs.) and *C. rectus* (Beaver 1972 referencing a pers. comm. with S.L. Wood). Males of *Camptocerus niger* were also reported to partially block their entrance tunnels



with boring dust, a potential defense against predators (Beaver 1972), which can cause significant *Camptocerus* mortality (Smith 2009).

***Camptocerus occidentalis* Eggers**  
(Fig. 23, 54)

*Camptocerus occidentalis* Eggers 1928: 91. Lectotype: male, BOLIVIA (USNM). Lectotype designated Anderson and Anderson 1971: 23.

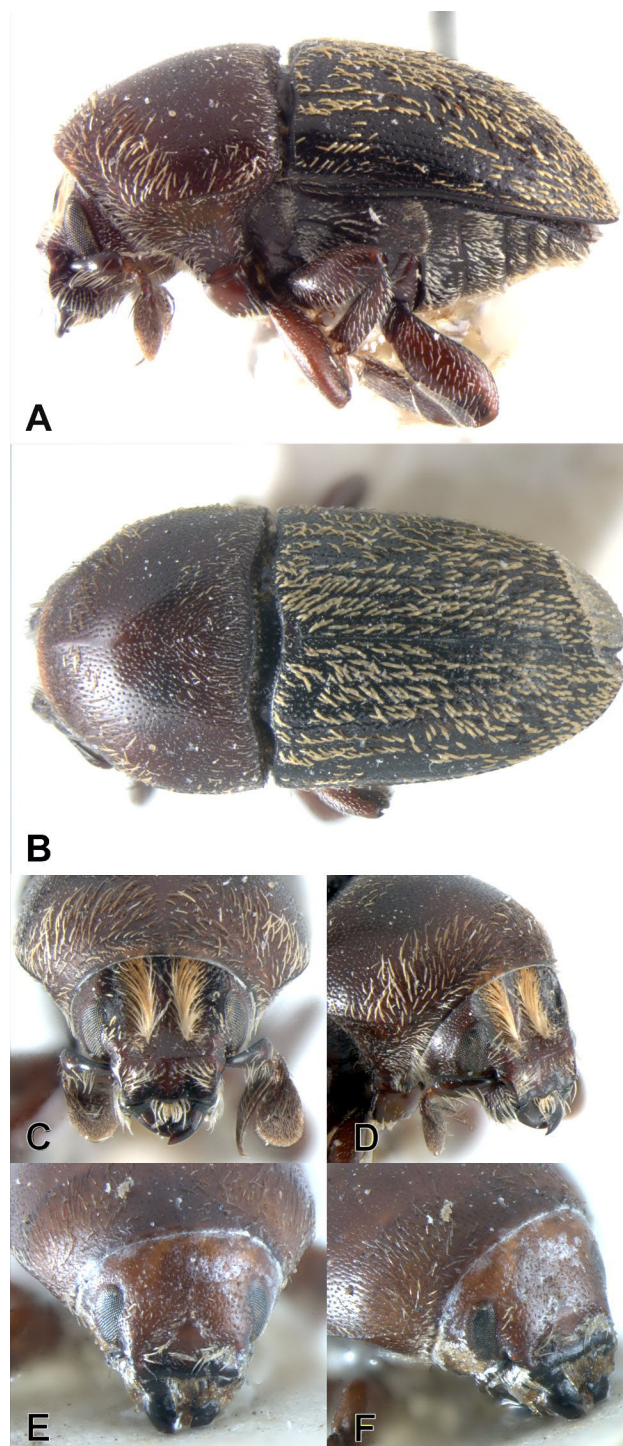
**Diagnosis.** The male is distinguished by the lateral epistomal margins bearing an arcuate costa angled distally, by the basal epistomal margin with a straight carina that is highest laterally above scape insertion and lowest medially (Fig. 2f), and by the elongate and narrow scape.

The female is distinguished by the elongate and narrow scape.

**Redescription (male).** 4.0-4.5 mm long (mean = 4.3 mm; n = 5); 2.0-2.1 times as long as wide. Head, antennae, pronotum, thorax, abdomen, and legs red-brown to dark brown, elytra orange-red to black. Elytral interstriae bearing yellow to brown, elongate, spatulate setae.

Epistoma strongly excavated, expanded to greater than a quarter length of head, apical epistomal margin unarmed; surface shagreened; lateral margins angled distally, bearing 6 rows of setae lateral to the median line; basal epistomal margin bearing a straight carina that is highest above the point of scape insertion and lowest medially (Fig. 2f). Frons strongly excavated, with the excavation bordering the ocular margin and the posterior margin of the basal epistomal carina; dorsolateral margin of eyes not impressed; surface shagreened, lateral quarters and medial fifth glabrous, remaining surface densely covered with 2 thick bands of long pale yellow setae, those clearly divided by the median line; 2-3 rows of long setae lining lateral margins; single row of setae lining the lateral margins; ventral margin elevated above epistoma; lateral margins sub-acute. Antennal scape elongate and narrow; with a row of long setae on ventral margin; ventral margin of funicular segments 2-7 bearing brushes of setae twice the length of funicle; segments 1-7 of funicle bearing setae on posterior margin, these less than length of 4 segments; setae on both ventral and dorsal margins equal in thickness; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; apical third strigulate; basal two-thirds smooth with dense, deep, minute punctures; punctures and vestiture on



**Figure 23.** *Camptocerus occidentalis*, 4.0–4.5 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



median line; anterior third bearing long, slender bristles; base and disk bearing short, fine hair-like setae; 2 rows of short bristles above lateral carinae; base strongly bisinuate (Fig. 8c); carina on lateral margin type F (Fig. 7f).

Scutellum shape type C (Fig. 12c).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with each interstriae bearing 3 rows of semi-erect, thin, spatulate setae and 1-2 rows on declivity; interstriae 3-5 times the width of striae; interstrial punctures strongly confused. Declivity occupying apical half of elytra; each interstriae bearing 2 rows of semi-erect, spatulate setae; first interstria with uniseriate spatulate setae on apical third; striae weakly impressed, punctures each with a hair-like seta arising from the basal margin, those covering puncture and terminating at basal margin of apical puncture. Tenth interstriae without a carina. Metepisternum shape type G (Fig. 9g); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

Male genitalia. Median lobe arcuate, lateral and apical margins with more sclerotization, apex acute; apical orifice lightly sclerotized; lateral margins folded dorsally, each forming a triangle with an apex at the midpoint of median lobe. Median struts broad, stout, a third of body length; apical orifice membranous. Internal sac lightly sclerotized, apically divided into 2 dorsoventrally flattened lobes, ventral lobe slightly reniform, arcuate laterally; dorsal lobe projecting above ventral lobe, flat; basal half composed of 2 narrowly elongated projections densely bearing long hair-like setae (Fig. 54). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma, moderately impressed, less than a quarter length of head, unarmed; covered by 4 rows of setae. Frons flat, with 5-7 rows of setae lateral to the median line. Each gena with a triangular mycangium (Fig. 4d). Unable to examine antennae due to an excessive amount of glue. Pronotal anterior third covered with dense, long slender hair-like setae on anterolateral areas; long bristles absent.

#### **Specimens examined.** (6M, 2F)

*Type Material.* Lectotype *Camptocerus occidentalis*, M (USNM); Paralectotypes BOLIVIA: *No specific locality*, 'Bolivia', 1M (BMNH), 2F (USNM).

*Other material.* PERU: *Junín*: Tarma: Utcuyacu & Agua Dulce, iii.1948, (*F. Woytkowski*), 1M (AMNH); *No specific locality*: 'Peru', (*W. Muller Vermacht*), 1909, 1M (USNM), 2M (SMTD).

**Distribution.** Bolivia, Peru (Junín).

**Hosts.** Unknown.

**Biology.** Unknown.

#### ***Camptocerus orientalis* Eggers** (Fig. 24, 55)

*Camptocerus orientalis* Eggers 1943: 244. Holotype: male, BRAZIL: *Bahia*: Salobro, 6.vii.1885 (*L. Gounelle*), Strohmeier Collection (SDEI).

**Diagnosis.** The male is distinguished by the unarmed apical epistomal margin, by a transverse, moderately developed, arcuate carina on the basal epistomal margin, and by the elytral declivital interstriae covered with spatulate setae to the apex (often abraded in older specimens).

The female is distinguished by the declivity with spatulate setae to apex and by the frons with a weak medial impression extending from the epistoma to the upper level of the eyes.

**Redescription (male).** 3.2-3.7 mm long (mean = 3.6 mm; n = 8); 1.8-2.0 times as long as wide. Color uniformly red-brown. Elytral interstriae bearing variegated tan and dark brown spatulate setae forming highly variable patterns.

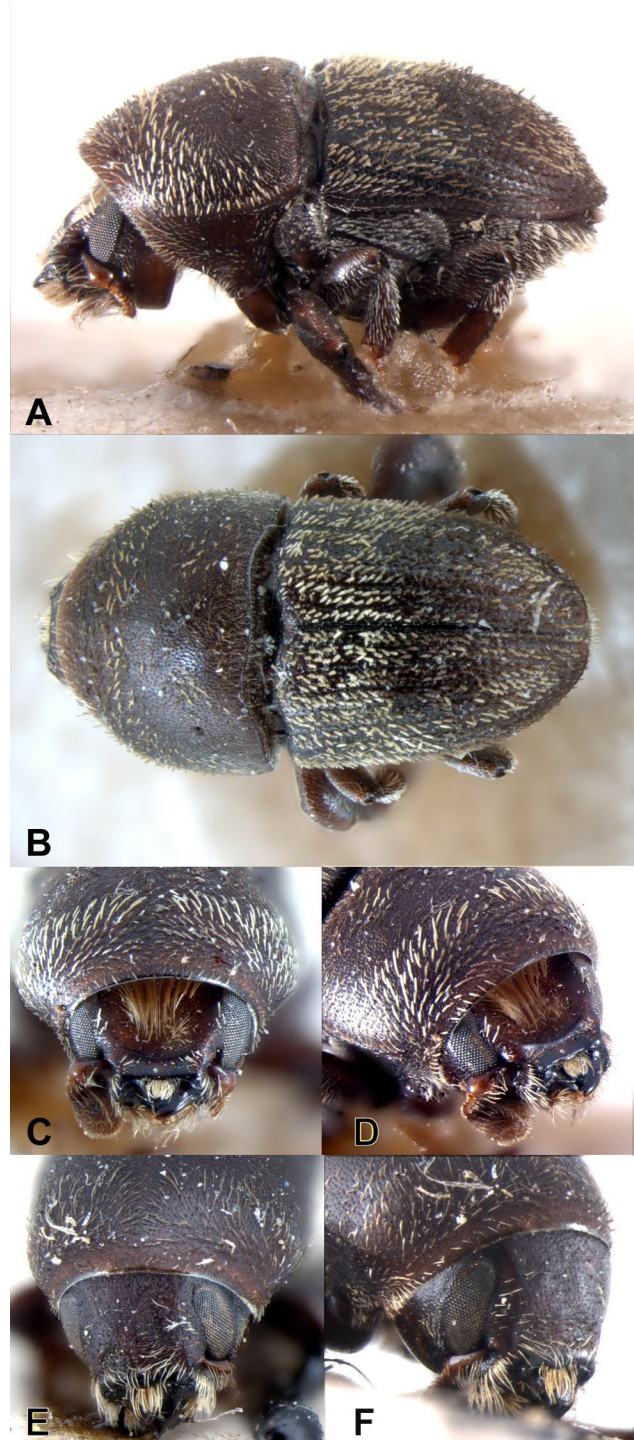
Epistoma weakly excavated, expanded to less than quarter length of head; apical epistomal margin unarmed; surface shagreened; lateral margins angled proximally, each bearing 1-3 rows of setae; basal epistomal margin bearing a transverse, moderately developed, arcuate carina (Fig. 2d), that ventrally bears 2 rows of setae. Frons strongly excavated, with the excavation bordering the ocular margin and the posterior margin of the carina; surface shagreened, densely covered with 2 thick bands of long pale yellow setae; a single row of setae lining lateral margins; lateral and dorsal margins sub-acute. Antennal scape elongate and narrowly rounded distally, ventral margin with a row of setae on distal half; segments 2-7 of funicle bearing brushes of setae 2 times the length of scape on ventral margin; segments 1-7 of funicle glabrous on dorsal margin; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; apical third strigulate; basal two-thirds smooth with dense, deep, minute punctures; punctures and vestiture on median line; anterior third bearing long bristles; base and disk bearing short, fine hair-like setae; 3 rows of short bristles above lateral carinae; base strongly bisinuate (Fig. 8c); carina on lateral margin type F (Fig. 7f).

Scutellum shape type C (Fig. 12c).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with each interstriae bearing 3 rows of semi-erect, spatulate setae and 1-2 rows on declivity; interstriae 3 times the width of striae; interstitial punctures strongly confused. Declivity occupying apical half of elytra; each interstriae bearing 2 rows of semi-erect, spatulate setae; first interstria with uniseriate spatulate setae on apical third; striae weakly impressed, punctures each with a hair-like seta arising from the basal margin, those covering puncture. Tenth interstriae without a carina. Metepisternum shape type G (Fig. 9g); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

Male genitalia. Median lobe arcuate, lateral and apical margins with more sclerotization; apex broad, elongate and approximately 1/3 the length of aedeagus; apical orifice lightly sclerotized, lateral margins folded dorsally, each forming a triangle with an apex at the apical third of median lobe. Median struts stout, slightly more than a third of body length. Internal sac central area membranous; sensory claspers heavily sclerotized, ventrally curved, right lobe laterally flattened basally, dorsoventrally flattened apically, left lobe dorsoven-



**Figure 24.** *Camptocerus orientalis*, 3.2-3.7 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); paratype female head anterior (E), anterior oblique (F).



trally flattened, dorsal to right lobe (Fig. 55). Tegmen semi-circular, ventral side elongated proximally. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma weakly impressed, less than a quarter length of head and unarmed; covered by 5 rows of setae. Frons flat; 3-4 rows of setae lateral to the median line. Each gena with a triangular mycangium (Fig. 4d). Segments 4-7 of funicle scattered bearing setae, those less than the length of 5 segments. Pronotal anterior third covered with dense hair-like setae on anterolateral areas; long bristles absent; base and disk covered with short, fine hair-like setae.

**Specimens examined.** (8M, 4F)

*Type material:* Holotype *Camptocerus orientalis*, M (SDEI). Paratypes *Camptocerus orientalis*, BRAZIL: Bahia: Salobro, 6.vii.1885, (L. Gounelle), 2M, 1F (SDEI), 1M (USNM).

*Other material.* BRAZIL: Amazonas: Reserva Ducke, 26 km NE Manaus, ex. malaise trap ii.1995, (M.G.V. Barbosa), 3M, 1F (BMNH), 1M, 1F (MSUC); vi.1995, 1F (BMNH).

**Distribution.** Bolivia, Brazil (Amapá, Amazonas, Bahia).

**Hosts.** Unknown.

**Biology.** Unknown.

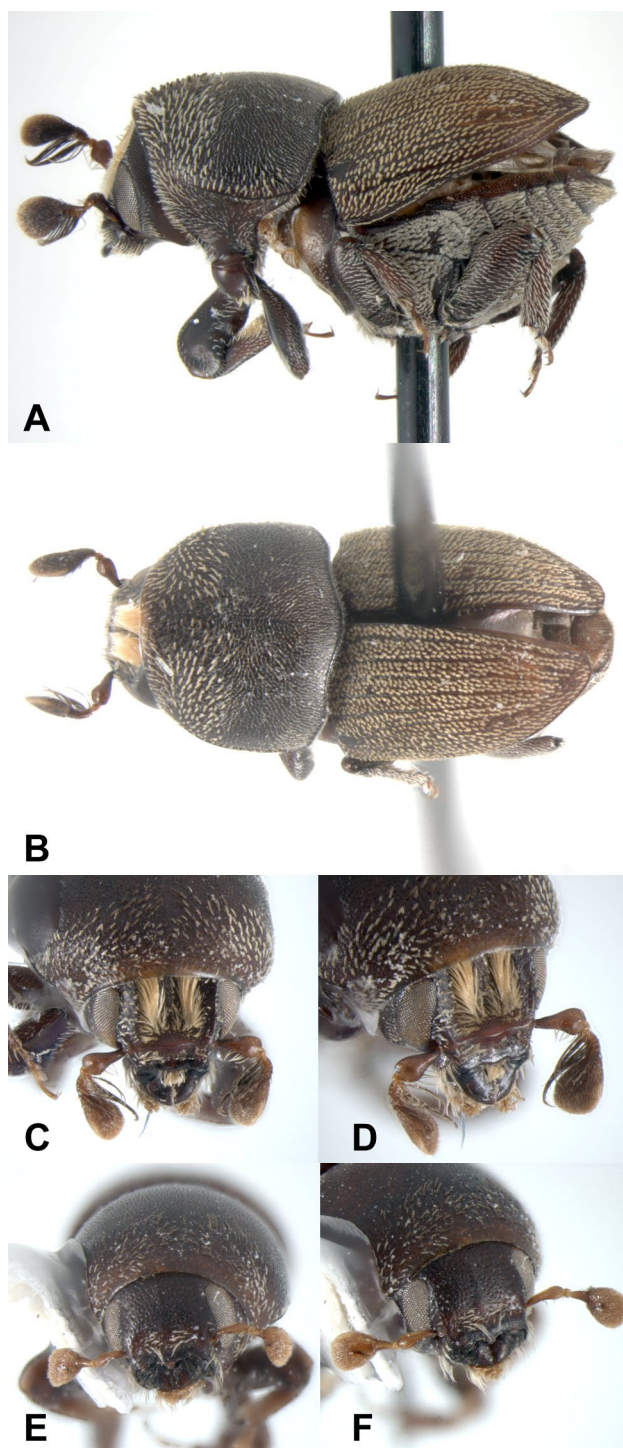
***Camptocerus rectus* Wood**  
(Fig. 25, 56)

*Camptocerus rectus* Wood 1972: 245. Holotype: male, VENEZUELA: Barinas: 40 km E Canton, 70 m, ex. *Protium tenuifolium*, 8.iii.1970, (S.L. Wood) (USNM).

**Diagnosis.** The male is distinguished by a transverse, straight and moderately developed sub-acute carina that is highest medially and nearly tuberculate.

The female is distinguished by a faint triangular impression encompassing the region from the epistoma to just below the upper level of the eyes.

**Redescription (male).** 3.5-4.3 mm long (mean = 4.0 mm; n = 20); 1.8-2.1 times as long as wide. Color uniform. Head, pronotum, thorax, abdomen, elytra, antennae and legs red-brown to dark brown. Elytral



**Figure 25.** *Camptocerus rectus* 3.5-4.3 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



interstriae bearing small, variegated, stout, tan and dark brown spatulate setae forming highly variable patterns (Venezuela) or uniformly tan (Ecuador).

Epistoma weakly excavated, expanded to less than quarter length of head, apical epistomal margin unarmed; surface shagreened; lateral margins angled proximally, each bearing 1-3 rows of setae; basal epistomal margin bearing a straight, sub-acute, strongly developed carina, that is highest medially and nearly tuberculate (Fig. 2c); the carina is ventrally lined with 3 rows of setae. Frons strongly excavated, with the excavation bordering the ocular margin and the posterior margin of the basal epistomal carina; surface shagreened, densely covered by 2 thick bands of pale, long yellow setae; single row of spatulate setae lining lateral margins; lateral and dorsal margins are rounded. Antennal scape elongate and narrowly rounded distally; scape with a row of setae on ventral margin; ventral margin of funicular segments 2-7 bearing brushes of setae 2 times the length of scape; segments 5-7 bearing setae on posterior margin as thick as those on ventral margin and less than length of 4 segments; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; apical third strigulate; basal two-thirds smooth with dense, deep, minute punctures; punctures and vestiture on median line; anterior third bearing long bristles; base and disk bearing short, fine hair-like setae; 2 rows of short bristles above lateral carinae; base strongly bisinuate (Fig. 8c); carina on lateral margin type F (Fig. 7f).

Scutellum shape type C (Fig. 12c).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with each interstriae bearing 3-4 rows of semi-erect, stout, spatulate setae and 1-3 rows on declivity; interstriae 3-4 times the width of striae; interstitial punctures strongly confused. Declivity occupying apical half of elytra; each interstriae bearing 2 rows of semi-erect, spatulate setae; interstria 1 with uniseriate spatulate setae on apical third; striae not impressed, punctures each with a hair-like seta arising from the basal margin, those covering puncture. Tenth interstriae without a carina. Metepisternum shape type G (Fig. 9g); setae palmately divided into 4 or more filaments. Mesosternum shape type C (Fig. 10c).

Male genitalia. Median lobe arcuate, lateral and apical margins with more sclerotization; apex rounded with flat lateral margins; apical orifice lightly sclerotized, lateral margins folded dorsally, each forming a triangle with an apex just below the midpoint of median lobe. Median struts stout, a third of body length; apical orifice membranous. Internal sac lightly sclerotized, apically trident shaped, apex divided into 2 dorsoventrally flattened lobes, ventral lobe reniform, arcuate laterally; dorsal lobe projecting above ventral lobe, flat; basal half composed of 2 narrowly elongated projections (Fig. 56). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma weakly impressed, less than a quarter length of head and unarmed; covered by 4 rows of setae. Frons flat, with a faint triangular impression encompassing the region from the epistoma to just below the upper level of the eyes; 5 rows of setae lateral to median line. Each gena with a triangular mycangium (Fig. 4d). Segments 5-7 of funicle bearing setae on dorsal margin, those less than the length of 3 segments. Pronotal anterior third covered with dense hair-like setae on anterolateral areas; long bristles absent; base and disk covered with short, fine hair-like setae.

#### **Specimens examined.** (25M, 28F)

*Type Material.* Holotype *Camptocerus rectus*, M (USNM); Allotype *Camptocerus rectus* F (USNM); Paratypes VENEZUELA: Barinas, 40 km E Canton, 70 m, ex. *Protium tenuifolium*, 8.iii.1970, (S.L. Wood), 3M, 5F (USNM); 9 km S Barrancas, 150 m, ex. *Protium* sp., 2.xii.1969, (S.L. Wood), 2M, 2F (USNM); 10 km SE Miri, 150 m, ex. *Protium tenuifolium*, 8.ii.1970, (S.L. Wood), 3M, 1F (USNM); 40 km SE Socopo, 150 m, ex. *Protium* sp., 25.i.1970, (S.L. Wood), 4M, 8F (USNM).

*Other material.* ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, (T.L. Erwin et al.), lot 1464, i.1996, 1M (USNM); ex. canopy fogging lot 1496, i.1996, 1M (USNM). VENEZUELA: Barinas: 40 km E Canton, 70 m, ex. *Protium tenuifolium*, 8.iii.1970, (S.L. Wood), 1M, 3F (MSUC); 10 km SE Miri, 150 m, ex. *Protium tenuifolium*, 9.ii.1970, (S.L. Wood), 2M, 4F (MSUC); 40 km SE Socopo, 150 m, ex. *Protium* sp., 22.i.1970, (S.L. Wood), 2M (MSUC), 5M, 5F (USNM).

**Distribution.** Ecuador (Napo), Venezuela (Barinas).

**Hosts.** *Protium* spp. (Burseraceae), *Protium tenuifolium* [= *Protium tenuifolium* (Engl.) Engl.].

**Biology.** Wood (2007) describes the biology as similar to that of *C. aeneipennis*, although the gallery pattern likely resembles that of *C. auricomus* and *C. niger* based on their close relationship to *C. rectus*. *Camptocerus auricomus* and *C. niger* excavate a short circumferential gallery below the bark on both sides of the entrance tunnel. Colonization occurs in tree limbs with a diameter less than 10 cm (Wood 2007).

### Latipilis Clade

Species in the latipilis clade are distinguished by the male lateral epistomal margin with vertical costa, by the basal epistomal margin tumid above scape insertion (Fig. 2b), by the carina originating at base of the tenth interstria encompassing elytra and by the lateral margin of pronotum type C. The clade contains eight species, two species are redescribed and six species are described.

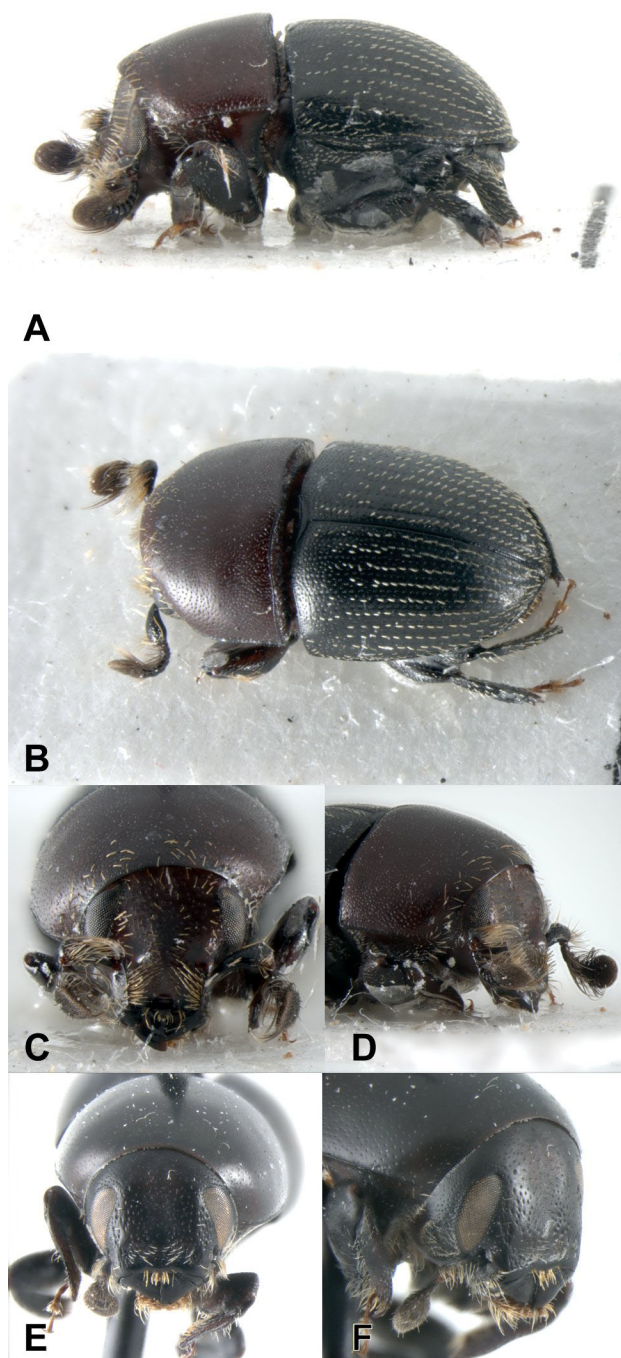
***Camptocerus charpentierae* Schedl,  
removed from synonymy**  
(Fig. 26, 57)

*Camptocerus charpentierae* Schedl 1970: 582.  
Holotype: male, **FRENCH GUIANA**:  
Massikiri-Haut Oyapock, 18.xi.1969,  
(Balachowsky-Gruner Guyane Mission),  
Schedl Collection (NHMW).

**Diagnosis.** Adults of both sexes of *C. charpentierae* can be distinguished by the black abdomen, convex second abdominal sternite and by the declivital interstriae bearing uniseriate, short, pale yellow-brown scales.

**Redescription (male).** 3.8–4.5 mm long (mean = 4.3 mm; n = 6); 1.7–2.0 times as long as wide. Head and antennae dark red-brown; abdomen, elytra, and legs black. Pronotum and legs may be red to black, but are typically reddish-brown.

Epistoma strongly excavated, expanded to greater than quarter length of head; surface shagreened; bearing 6 rows of setae lateral to the median line; each lateral margin with a sub-acute vertical costa; apical margin armed with a short rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; surface shagreened; bearing 1 erect golden setae lateral to the median



**Figure 26.** *Camptocerus charpentierae*, 3.8 – 4.5 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

line, surface clearly visible; 20-30 setae on lateral and dorsal margins. Antennal scape elongate and expanded distally, distal three-quarters bearing dense setae, those length of scape; segments 2-7 of funicle bearing setae on the ventral margin, those 1.5 times the length of funicle; setae on the dorsal margin, those less than the length of 5 segments; ventral margin bearing setae twice as thick as those on dorsal margin; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; surface minutely granulate-punctate, with minute, shallow punctures; anterior fifth bearing 2-3 rows of yellow-brown setae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from the striae 1 to interstriae 4 and from the base to just beyond the scutellum, the remaining elytral surface minutely granulate. Declivital interstriae bearing uni- and biseriate rows of pale yellow-brown scales. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type E (Fig. 10e). Second sternite convex.

Male genitalia. Median lobe flat, proximally wider than distal end, arcuate on distal quarter, lateral and apical margins with more sclerotization; apex broad, set below the level of the median lobe; apical orifice lightly sclerotized; lateral margins folded dorsally. Median struts a third of body length. Internal sac central area lightly sclerotized; faint sclerotization on the dorsal part of median lobe above seminal trough; seminal trough proximal end "V" shaped (Fig. 57). Tegmen and spicule destroyed in dissection.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head and unarmed; with a 4 rows of hair-like setae on apical margin. Frons flat, with medial area slightly impressed and joining with the impressed area of the epistoma; punctures small and shallow medially, larger and deeper laterally. Each gena with a circular mycangium (Fig. 4c). Segments 1-7 of funicle bearing scattered setae less than the length of 3 segments. Pronotal area between the eyes lined with scales.

#### **Specimens examined.** (9M, 9F)

*Type Material.* Holotype *Camptocerus charpentierae*, M (NHMW). Paratype FRENCH GUIANA: Massikiri-Haut Oyapock, 16.xi.1969, Balachowsky-Gruner Guyane Mission, 1F (MNHN).

*Other material.* BRAZIL: Amazonas: Hwy ZF 2, km 20.7, ca 60 km N. Manaus, 2°30'S, 60°15'W, ex. canopy fogging, 16.viii.1979, (*Adis, Erwin, Montgomery et al.*), 1M (USNM), 1M, 1F (MSUC); 18.viii.1979, 1M (USNM). ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, x.1998, ex. canopy fogging (*T.L. Erwin et al.*), lot 1947, 1M (USNM); ii.1999, lot 2030, 1F (USNM); ii.1999, lot 2047, 1F (USNM); Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (*T.L. Erwin et al.*), lot 644, 1M (MSUC); i.1995, lot 1000, 1M (USNM); vi.1996, lot 1550, 1F (MSUC); vi.1996, lot 1586, 1F (USNM); x.1996, lot 1753, 2M, 3F (USNM).

**Discussion.** Wood (2007) considered this species to be a synonym of *Camptocerus cinctus*. *Camptocerus cinctus* is herein recognized as a synonym of *C. suturalis*. *Camptocerus charpentierae* is resurrected based on comparison of the holotype with that of *C. cinctus* and *C. suturalis*. Phylogenetic analysis revealed the *C. charpentierae* (latipilis clade) to be in a separate clade from *C. suturalis* (aeneipennis clade) (Fig. 14).

**Distribution.** Brazil (Amazonas), Ecuador (Napo), French Guiana.

**Hosts.** Unknown.

**Biology.** Unknown.

***Camptocerus coccoformus* Smith and Cognato, new species**  
(Fig. 27, 58)



**Type Material.** Holotype: male, BRAZIL: Amazonas: Hwy ZF 2, km 20.7, ca 60 km N. Manaus, 2°30'S, 60°15'W, ex. canopy fogging, 16.viii.1979, (Adis, Erwin, Montgomery et al.) (USNM). Paratypes: BRAZIL: Amazonas: Hwy ZF 2, km 20.7, ca 60 km N. Manaus, 2°30'S, 60°15'W, ex. canopy fogging, 16.viii.1979, (Adis, Erwin, Montgomery et al.), 1F (MSUC); 69 km N Manaus, 7.xii.1979, (G. Stevens), 1F (USNM). ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (T.L. Erwin et al.), lot 626, 1F (USNM).

**Diagnosis.** The male is distinguished by the lateral epistomal margins bearing a tuft of setae on the apical third, by the red brown head, red pronotum, black body and by the convex second sternite that is scarcely protuberant below level of sternite 1.

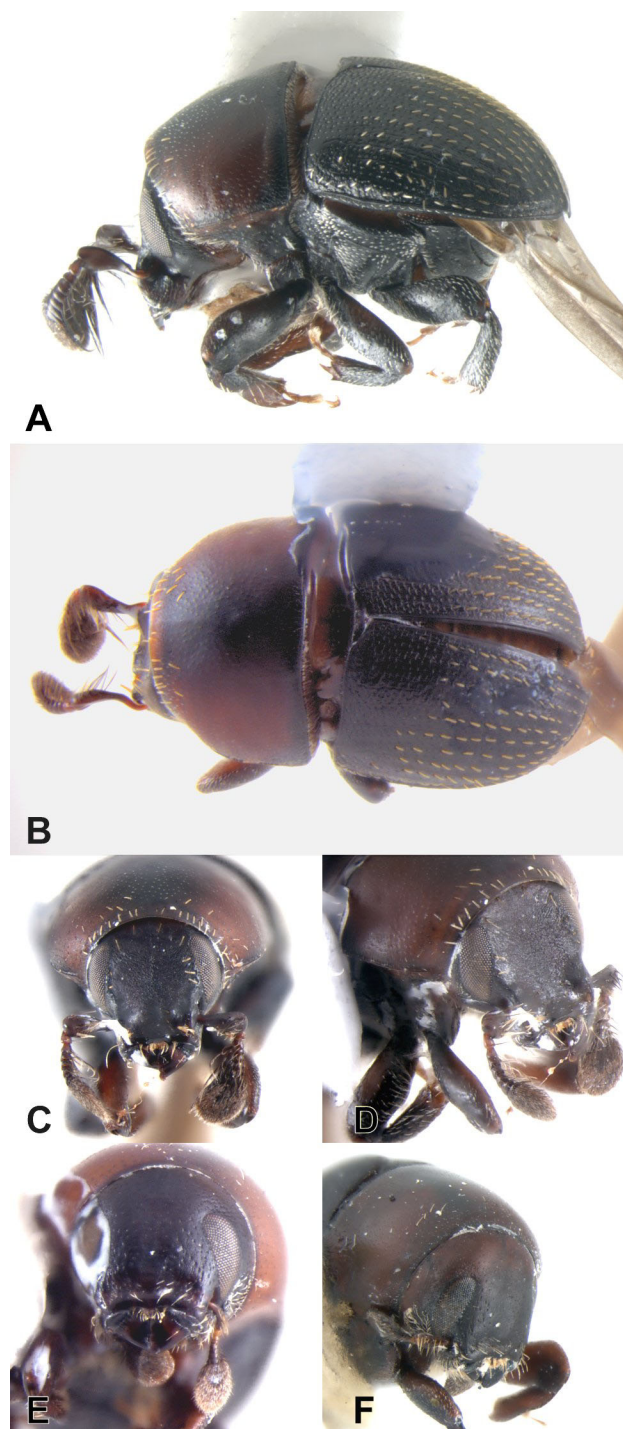
The female can be distinguished from that of *C. latipilis* by the less strongly impressed medial area of the frons and the dark red head and pronotum.

**Description (male).** 2.7 mm long (n = 1); 1.6 times as long as wide. Frons dark red brown; gena, antennae and pronotum reddish; abdomen, elytra and coxae black; legs dark red brown.

Epistoma strongly excavated, from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; bearing a tuft of setae on distal third of lateral epistomal margins; each lateral margin with a sub-acute vertical costa; apical margin armed with a short rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; surface shagreened; glabrous, surface clearly visible; lateral margins setose. Antennal scape elongate, expanded distally, bearing 4 rows of setae on distal two-thirds, these one half length of scape; segments 2-7 of funicle bearing setae on ventral margin equal to 1.5 times the length of funicle; setae on dorsal margin, less than length of 5 segments; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; surface minutely granulate-punctate, with minute, shallow punctures; anterior fifth bearing 2-3 rows of yellow-brown setae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).



**Figure 27.** *Camptocerus coccoformus*, 2.7 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 to interstriae 4 and from the base to just beyond the scutellum, the remaining elytral surface minutely granulate. Declivital interstriae bearing uniseriate rows of yellow-brown scales. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type D (Fig. 10d). Second sternite convex, scarcely protuberant below level of sternite 1.

Male genitalia. Median lobe strongly arcuate, lateral and apical margins with more sclerotization, apex broad; apical orifice membranous with sclerotized veins; lateral folds on basal third contiguous, folds forming an acute point. Median struts half of body length. Internal sac central area lightly sclerotized, seminal trough lightly sclerotized, sinuous (Fig. 58). Tegmen semi-circular, ventral side elongated proximally. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head and unarmed; a row of hair-like setae on apical margin. Frons flat, with medial area slightly impressed and joining with the impressed area of the epistoma. Each gena with a circular mycangium (Fig. 4c). Segments 3-7 of funicle bearing setae on dorsal margin less than the length of 3 segments. Second sternite ventrally convex and distally distended, noticeably smaller than that of the male.

**Specimens examined.** (1M, 3F)

**Discussion.** This species was identified as *Camptocerus latipilis* by Wood (2007).

**Distribution.** Brazil (Amazonas).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** *Cocc-* (G) = berry, *-form* (L) = shape. In reference to the species' globular and reddish appearance.

### ***Camptocerus doleae* Smith and Cognato, new species**

(Fig. 28, 59)

**Type Material.** Holotype: male, ECUADOR: *Napo*: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, ii.1999, (*T.L. Erwin et al.*), lot 2044, (USNM held in trust for MECN). Paratypes: ECUADOR: *Napo*: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, ii.1999, (*T.L. Erwin et al.*), lot 2044, 2F (MSUC) (USNM); 1M, x.1998, lot 1944, (MSUC); 1M, i.1999, lot 2091 (USNM).

**Diagnosis.** Both sexes are recognized by the elongate body, by the elytral interstriae bearing uni- and biseriate golden setae, by the tenth interstriae with a carina encompassing elytra, and by the unique color pattern described below. The male is distinguished by the moderately excavated frons with the excavation never touching the ocular margin and 6-7 setae lateral to the median line.

**Description (male).** 3.1-3.5 mm long (mean = 3.3 mm; n = 3); 2.1-2.3 times as long as wide. Head, antennae and thorax orange, legs dark red brown, abdomen black, elytra black with an orange patch covering basal third of elytra from the suture to interstria 8.

Epistoma weakly excavated, excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; nine rows of setae lateral to median line; each lateral margin with a sub-acute vertical costa; apical margin armed with a short rounded tubercle; basal margin tumid above scape insertion (Fig. 2b). Frons weakly excavated from epistoma to anterodorsal margin of the eyes, excavation not reaching the ocular margin; surface shagreened; bearing 6-7 rows of erect golden setae lateral to the median line, surface moderately



covered; lateral margins setose. Antennal scape elongate, expanded distally, dense setae on distal half, these two-thirds length of scape; segments 2-7 of funicle bearing setae on ventral margin, these 1.5 times length of funicle; segments 1-5 glabrous on dorsal margin, segment 6 with setae, these less than length of 2 segments; setae on segment 7, those equal to length of funicle; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; surface smooth with minute, shallow punctures; anterior fifth bearing 2-3 rows of yellow-brown setae; a row of yellow setae above lateral carinae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

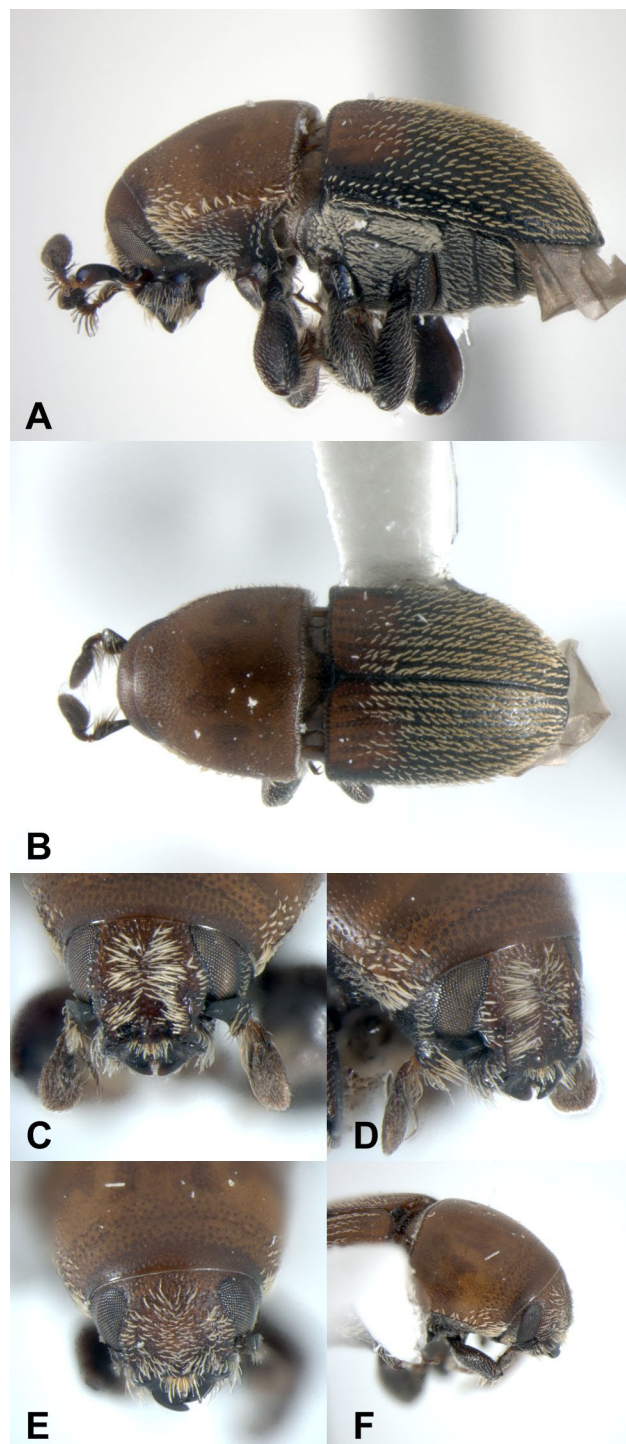
Scutellum shape type D (Fig. 12d).

Elytral sides parallel, narrowing to a smooth apex; base without never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 to interstriae 4 and from the base to just beyond the scutellum, the remaining elytral surface minutely granulate. Declivital interstriae bearing uni- and biseriate rows of pale yellow setae. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type R (Fig. 9r); setae palmately divided into 4 or more filaments. Mesosternum shape type E (Fig. 10e). Second sternite convex.

Male genitalia. Median lobe strongly arcuate, lateral and apical margins with more sclerotization, apex broad; lateral margins folded dorsally, each forming a triangle with an apex at the median half of median lobe, folds separate; apical orifice membranous. Median struts a third of body length. Internal sac dorsoventrally flattened basally and curved dorsally becoming laterally flattened apically (Fig. 59). Tegmen semi-circular, ventral side elongated proximally. Spicule 1.5 times longer than aedeagus, faintly arcuate with a sharp crook on distal end.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head and unarmed; epistoma with a 4 rows of hair-like setae on apical margin. Frons flat, punctures small, shallow medially, larger and deeper laterally; nine rows of setae lateral to the median line. Each gena with a triangular mycangium (Fig. 4d). Segments 5-7 of funicle with scattered setae, these less than length of 3 segments.

**Specimens examined.** (3M, 2F)



**Figure 28.** *Camptocerus doleae*, 3.1-3.5 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



**Distribution.** Ecuador (Napo).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** This species is named for our colleague, Stephanie Dole for her gracious mentoring and help throughout the graduate study of SMS.

***Camptocerus igniculus* Smith and Cognato, new species**

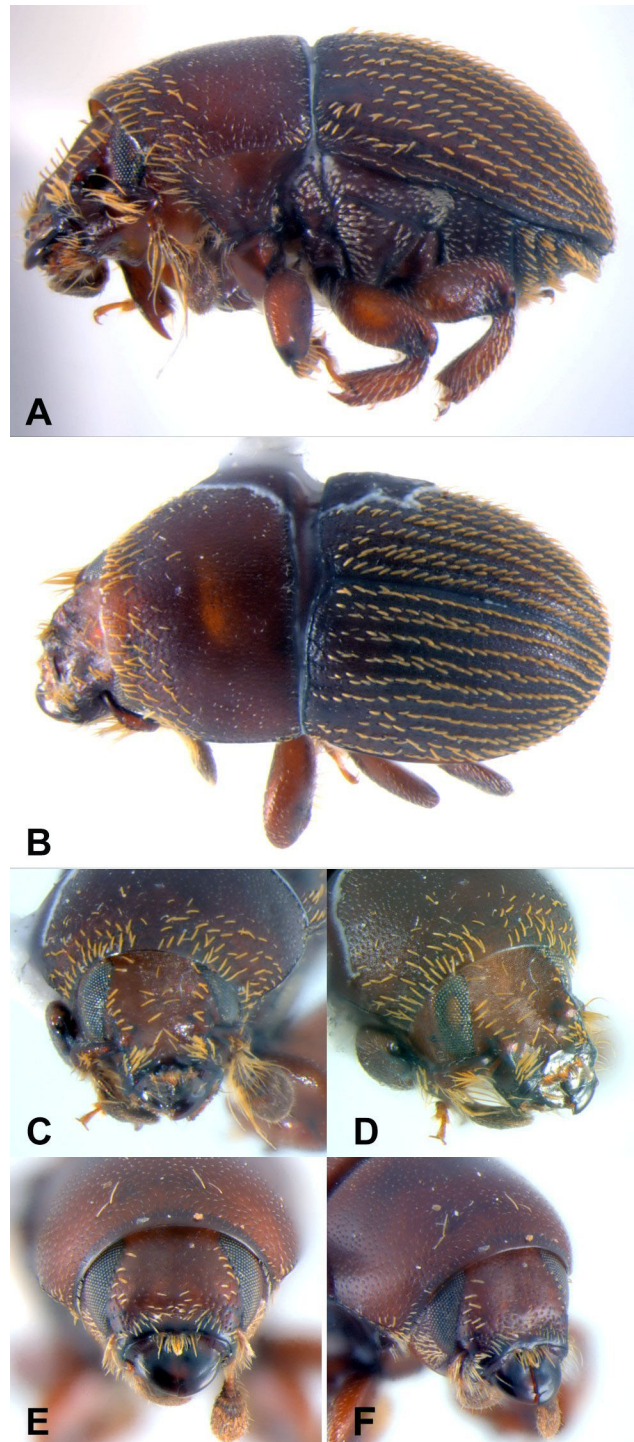
(Fig. 29, 60)

**Type Material.** Holotype: male, BRAZIL: Amazonas: Hwy ZF 2, km 20.7, ca 60 km N. Manaus, 2°30'S, 60°15'W, ex. canopy fogging, 16.viii.1979, (Adis, Erwin, Montgomery *et al.*) (USNM). Paratypes: BRAZIL: Amazonas: Hwy ZF 2, km 20.7, ca 60 km N. Manaus, 2°30'S, 60°15'W, ex. canopy fogging, 16.viii.1979, (Adis, Erwin, Montgomery *et al.*), 4M, 2F (MSUC); 9M, 4F (USNM).

**Diagnosis.** Both sexes are distinguished by the elytral interstriae bearing 1-2 rows of overlapping, semi-recumbent, golden scales, a reddish-brown hue and a convex second sternite. The habitus is distinct from all other *Camptocerus* species.

**Description (male).** 2.5 -2.8 mm long (mean = 2.7 mm; n = 10); 1.7-2.0 times as long as wide. Color uniformly reddish-brown.

Epistoma strongly excavated, excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; 1 seta lateral to median line; each lateral margin with a sub-acute vertical costa and bearing a dense brush of 8-12 erect, golden setae; apical margin armed with a short rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma to anterodorsal margin of the eyes excavation bordering the ocular margin; surface shagreened; bearing 2-3 rows of erect, golden setae lateral to the median line, surface clearly visible; lateral margins setose. Antennal scape elongate, expanded distally, bearing 4 rows of setae on distal two-thirds, those one half length of scape; segments 2-7 of funicle bearing setae on ventral margin equal to the length of funicle; setae on dorsal margin less than length of 4 segments; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose, with a partial septum.



**Figure 29.** *Camptocerus igniculus*, 2.5-2.8 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface minutely granulate-punctate with minute, shallow punctures bearing fine, golden, hair-like setae; anterior fifth bearing 2-3 rows of golden setae; a row of yellow setae above lateral carinae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 to interstriae 4 and from the base to just beyond the scutellum, remaining elytral surface minutely granulate. Discal striae with punctures 1.5-2 times as large as those of interstriae, shallow, each bearing a fine, golden seta; interstriae bearing mostly uniseriate (occasionally biseriate) golden scales. Declivital interstriae bearing uniseriate rows of golden scales. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type E (Fig. 10e). Second sternite convex; sternites 2-4 each margined with a row of golden scales, sternite 5 with 2 rows.

Male genitalia. Median lobe flat, proximally wider than distal end, lateral and apical margins with more sclerotization, apex broad, apical orifice lightly sclerotized; lateral margins folded dorsally. Median struts a third of body length. Internal sac central area lightly sclerotized, seminal trough proximal end "Y" shaped (Fig. 60). Tegmen semi-circular, ventral side elongated proximally. Spicule nearly longer than aedeagus, sickle-shaped with large hook near the distal end.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head. Frons flat. Each gena with a circular mycangium (Fig. 4c). Segments 1-7 of funicle bearing scattered setae less than the length of 3 segments. Second sternite convex.

**Specimens examined.** (14M, 6F)

**Distribution.** Brazil (Amazonas).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** *Igniculus* (L) = little flame, spark. Named for its "fiery" appearance (golden setae and reddish-brown color) and in honor of a traditional Cognato family name "Ignatius".

### ***Camptocerus latipilis* Schedl**

(Fig. 30 – 31, 61)

*Camptocerus latipilis* Schedl 1973:166. Holotype: male, BRAZIL: Pará: Benfica: Ananindeua (MZSP).

**Diagnosis.** The male is distinguished from that of *C. petrovi* by the smaller size, by the black color, by the strongly convex and protuberant second sternite, with the height of declivity behind much less than length of sternite 3, by the lateral epistomal margins bearing a dense brush of setae extending halfway from the epistoma to the level of scape insertion and by the glabrous frontal excavation with 10-12 setae on the lateral and dorsal margins.

The female can be distinguished from that of *C. coccoformus* by the more strongly impressed medial area of the frons and the black head and pronotum.

**Redescription (male).** 2.7-3.3 mm long (mean = 3.2 mm; n = 6); 1.7- 1.9 times as long as wide. Color uniformly black.

Epistoma strongly excavated, excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; bearing a dense brush of setae extending halfway on the lateral margin from the epistoma to the level of scape insertion; each lateral margin with a sub-acute vertical costa; apical margin armed with a short, rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma



to anterodorsal margin of the eyes, excavation bordering the ocular margin; surface shagreened, glabrous, with 10-12 setae on lateral and dorsal margins. Antennal scape elongate, expanded distally, bearing 5 rows of setae on distal two-thirds, these one half length of scape; segments 2-7 of funicle bearing setae on ventral margin, these equal to 1.5 times the length of funicle; setae on dorsal margin less than length of 5 segments; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose, with a partial septum.

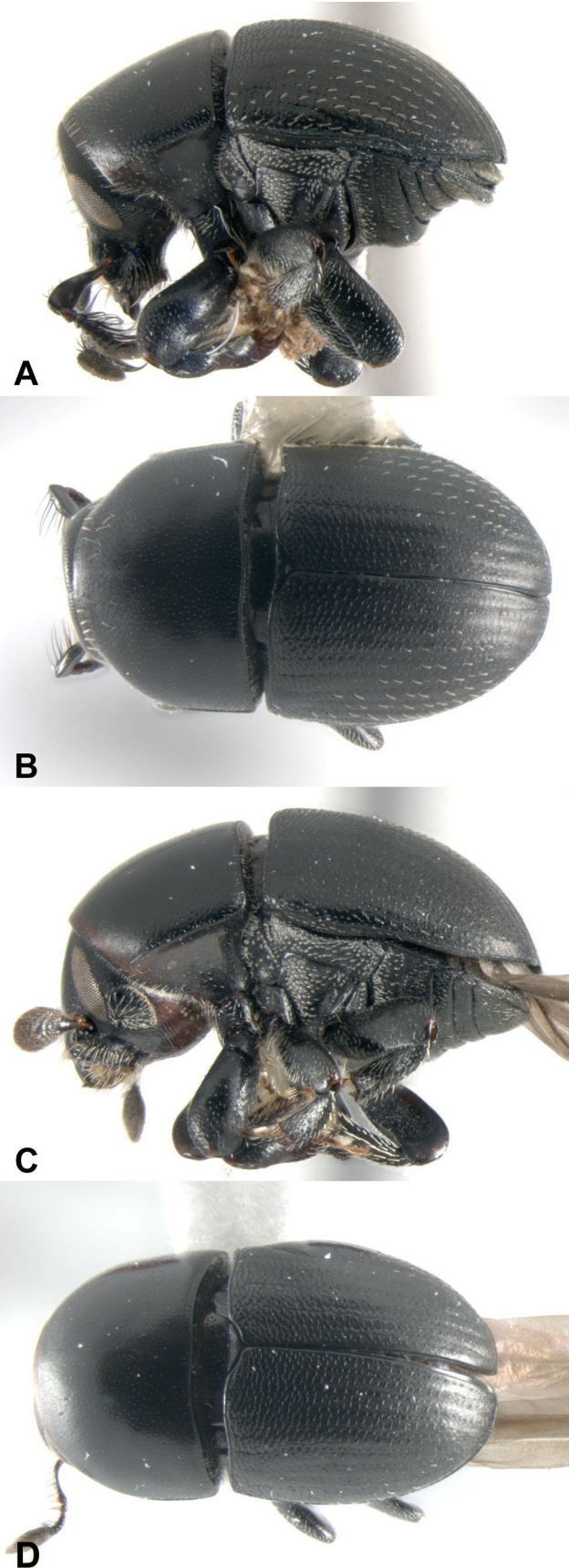
Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface minutely granulate-punctate with minute, shallow punctures; anterior fifth bearing 2-3 rows of yellow-brown setae; a row of yellow setae above lateral carinae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 to interstriae 4 and from the base to just beyond the scutellum, remaining elytral surface minutely granulate. Declivital interstriae bearing uniseriate rows of yellow-brown scales. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type E (Fig. 10e). Second sternite strongly convex and protuberant, height of declivity behind much less than length of sternite 3.

Male genitalia. Median lobe strongly arcuate, lateral and apical margins with more sclerotization, apex rounded with flat lateral margins; apical orifice membranous with sclerotized veins; lateral folds on basal third contiguous. Median struts half of body length. Internal sac central area lightly sclerotized, basal and lateral areas of seminal valve sclerotized (Fig. 61). Tegmen semi-circular, ventral side elongated proximally. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less impressed, less than a quarter length of head and unarmed; apical margin bearing a row of hair-like setae. Frons flat, with medial area slightly impressed and joining with the impressed area of the epistoma. Each gena with a circular mycangium (Fig. 4c). Segments 4-7 of funicle bearing scattered setae less than the length of 3 segments. Pronotal



**Figure 30.** *Camptocerus latipilis*, 2.7-3.3 mm, male. Lateral (A), dorsal (B); female lateral (C), dorsal (D).



anterior area between the eyes lined with scales. Second sternite ventrally convex and distally distended, noticeably smaller than that of the male.

**Specimens examined.** (8M, 5F)

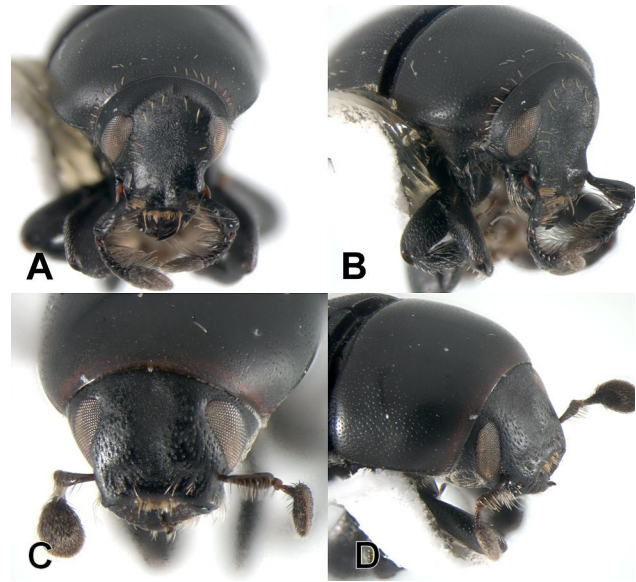
*Type Material.* Paratype *Camptocerus latipilis* BRAZIL: Pará: Belem, 18.x.1962, (J. Bechyne), M (NHMW).

*Other material.* ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, x.1994, (T.L. Erwin et al.), lot 936, 1F (USNM); vii.1996, lot 1546, 1F (USNM); Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, x.1995, (T.L. Erwin et al.), lot 1257, 1M (USNM); x.1996, lot 1727, 1M (USNM); vi.1998, lot 1895, 1M, 1F (MSUC); x.1998, lot 1930, 1F (MSUC); x.1998, lot 1947, 1M (USNM); x.1998, lot 1953, 1M (USNM); x.1998, lot 1987, 1M (MSUC); ii.1999, lot 2044, 1M (USNM); ii.1999, lot 2068, 1F (USNM).

**Distribution.** Brazil (Pará), Ecuador (Napo).

**Hosts.** Unknown.

**Biology.** Unknown.



**Figure 31.** *Camptocerus latipilis* male head anterior (A), anterior oblique (B); female head anterior (C), anterior oblique (D).

***Camptocerus mallopterus* Smith and Cognato, new species**  
(Fig. 32, 62)

**Type Material.** Holotype: male, ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250m, ex. canopy fogging, ii.1999, (T.L. Erwin et al.), lot 2087, (USNM held in trust for MECN). Paratypes: ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250m, ex. canopy fogging, ii.1999, (T.L. Erwin et al.), lot 2087, 1F (USNM); 1M, 1F (MSUC).

**Diagnosis.** Adults of both sexes are distinguished by the distinctive light orange head and pronotum, black abdomen and elytra and by the elytra densely covered in pale, recumbent setae with their apices pointed.

**Description (male).** 3.8-3.9 mm long (mean = 3.85 mm; n = 2); 1.8-1.9 times as long as wide. Head, thorax, coxae and prothoracic legs orange; antennae black and orange; meso and metathoracic femora black, orange on distal fifth, meso and metathoracic tibiae orange; abdomen and elytra black; elytral striae and interstriae densely bearing pale recumbent setae.

Epistoma strongly excavated, excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; 5 rows of setae lateral epistomal margins to median line; each lateral margin with a sub-acute vertical costa and lined with setae; apical margin armed with a short, rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; surface shagreened; bearing eight rows of erect golden setae lateral to the median line, surface moderately covered; lateral margins setose. Antennal scape elongate, expanded distally, bearing dense setae on distal three-quarters, these equal to length of scape; segments 2-7 of funicle bearing setae on ventral margin, these equal to length of funicle; setae on dorsal margin, less than

length of 5 segments; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface minutely-granulate punctate with minute, shallow punctures, densely bearing short, fine hair-like setae; anterior fifth bearing 4-5 rows of yellow-brown setae; a row of yellow setae above lateral carinae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).

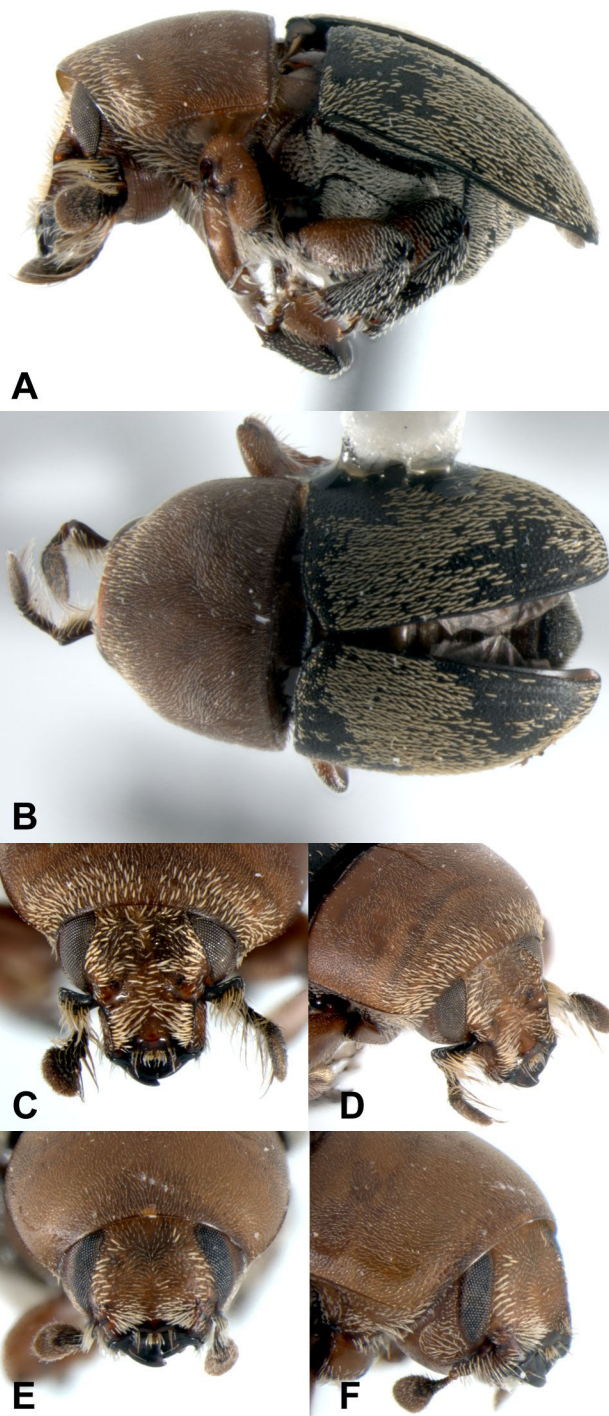
Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 interstriae 4 and from the base to just beyond the scutellum, the remaining elytral surface minutely granulate; strial punctures indistinguishable from those of interstriae. Declivital interstriae bearing 3-4 rows of pale, yellow setae; striae bearing uniseriate pale, yellow setae, those equal in length to interstitial setae. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type D (Fig. 10d). Second sternite weakly convex and strongly protuberant, the height of declivity behind greater than length of sternite 3.

Male genitalia. Median lobe flat, proximally wider than distal end, arcuate on distal quarter, lateral and apical margins with more sclerotization; apex broad, set below the level of the median lobe, apical orifice lightly sclerotized; lateral margins with more sclerotization folded dorsally. Median struts a third of body length. Internal sac central area lightly sclerotized, acute sclerotization on the dorsal part of median lobe above seminal trough; seminal trough proximal end "Y" shaped (Fig. 62). Tegmen and spicule destroyed in dissection.

**Female.** Similar to male except epistoma lateral two-thirds to median line impressed, less than a quarter length of head and unarmed; 5 transverse rows of setae. Frons flat, with medial area weakly impressed; 4 setae lateral to median line. Each gena with a circular mycangium (Fig. 4c). Segments 1-7 of funicle bearing scattered setae less than the length of 4 segments. Second sternite ventrally convex and distally distended, noticeably smaller than that of the male.

**Specimens examined.** (2M, 2F)

**Distribution.** Ecuador (Napo).



**Figure 32.** *Camptocerus mallopterus*, 3.8-3.9 mm, holotype male. Lateral (A), dorsal (B); head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



**Biology.** Unknown.

**Etymology.** *Mallo-* (G) wool, *-pterus* (G) = wing. In reference to the woolly appearance due to the dense pale setae covering the elytra.

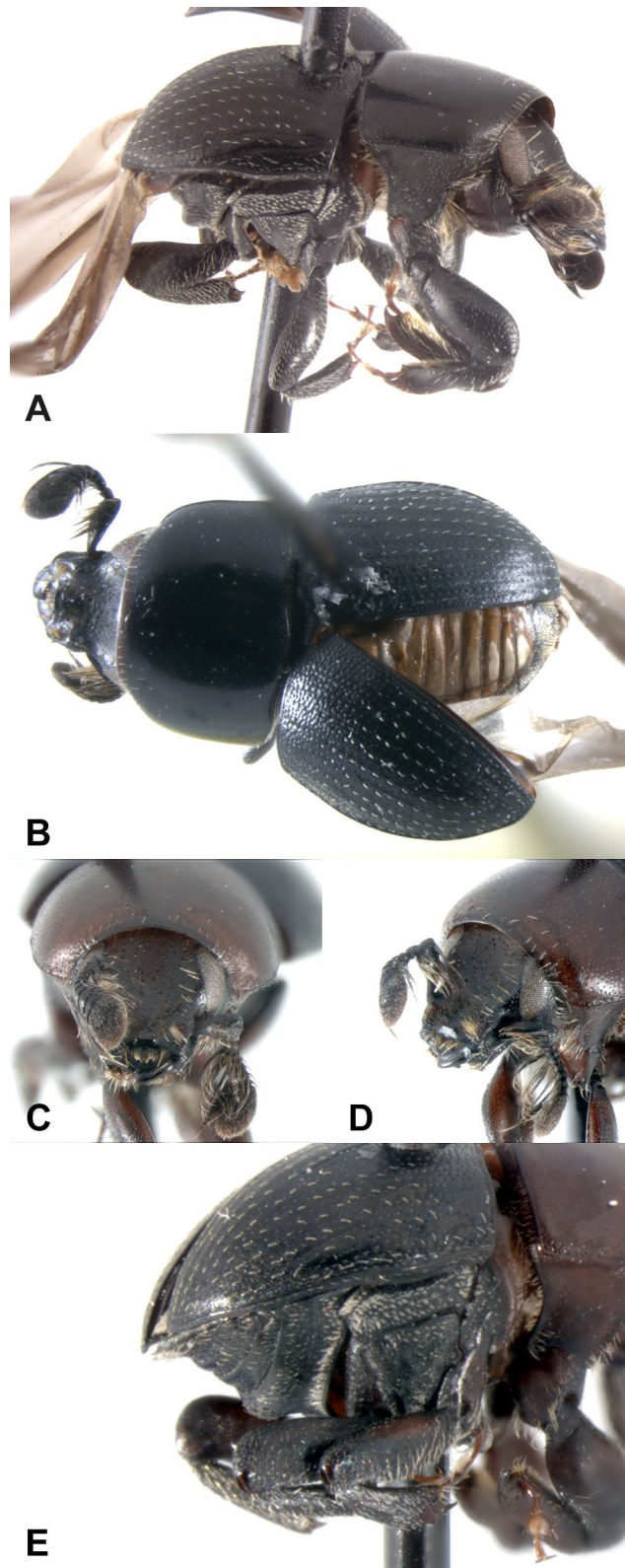
***Camptocerus petrovi* Smith and Cognato, new species**  
(Fig. 33, 63)

**Type Material.** Holotype: male, ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, ii.1999, (*T.L. Erwin et al.*), lot 1930, (USNM held in trust for MECN). Paratype: ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, ii.1999, (*T.L. Erwin et al.*), lot 1930, 1M (USNM).

**Diagnosis.** The male is distinguished by its large size, by the black color, by the second sternite strongly convex and protuberant, with the height of the declivity behind greater than the length of sternite 3, by the lateral epistomal margins bearing a dense brush of setae extending halfway from the epistoma to the level of scape insertion, by the frontal excavation bearing 1-2 setae lateral to median line, and by the 15-20 setae on the lateral and dorsal margins.

**Description (male).** 4.0 mm long (mean = 4.0 mm;  $n = 2$ ); 1.6 times as long as wide. Head, antennae, thorax, abdomen, elytra, and legs black; apical margin of pronotum dark brown. Teneral individuals with a red pronotum.

Epistoma strongly excavated, excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; bearing a dense brush of setae extending halfway on the lateral margin from the epistoma to the level of scape insertion; each lateral margin with a sub-acute vertical costa; apical margin armed with a short, rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; surface shagreened; single seta lateral to the median line; 15-20 setae on lateral and dorsal margins. Antennal scape elongate, expanded distally, bearing 5 rows of setae on distal two-thirds, those length of scape; segments 2-7 of funicle bearing setae on ventral margin equal



**Figure 33.** *Camptocerus petrovi*, 4.0 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); abdomen posterior oblique (E).



to 1.5 times length of funicle; setae on dorsal margin, less than length of 5 segments; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; surface minutely granulate-punctate with minute, shallow punctures; anterior fifth bearing 2-3 rows of yellow-brown setae; 1 row of yellow setae above lateral carinae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 to interstriae 4 and from the base to just beyond the scutellum, the remaining elytral surface minutely granulate. Declivital interstriae bearing uniseriate rows of yellow-brown scales. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type E (Fig. 10e). Second sternite strongly convex and protuberant, the height of declivity behind greater than length of sternite 3.

Male genitalia. Median lobe strongly arcuate, lateral and apical margins with more sclerotization, apex broad, apical orifice membranous with sclerotized veins; lateral folds on basal third nearly contiguous, invaginated, projecting apically and joining at apical third forming a bilobed apex. Median struts half of body length. Internal sac central area lightly sclerotized, basal and lateral areas of seminal valve sclerotized (Fig. 63). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Unknown.

**Specimens examined.** (2M, 0F)

**Distribution.** Ecuador (Napo).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** This species is named in honor of our colleague, Alex Petrov, who also shares a love of *Camptocerus* and has generously contributed important material for this study.

### ***Camptocerus satyrus* Smith and Cognato, new species**

(Fig. 34, 64)

**Type Material.** Holotype: male, BRAZIL: *Rondônia*: 62 km SW Ariquemes, nr Fzda. Rancho Grande, ex. MV & UV lights, 4-16.xi.1997 (*J.E. Eger*) (FSCA).

**Diagnosis.** The male is distinguished by its large size, by the convex second sternite, by the declivital interstriae bearing 2-3 rows of overlapping, pale, yellow, recumbent scales, which become uni- and biseriate at the apex, by the lateral epistomal margins bearing a dense brush of setae extending halfway from the epistoma to the level of scape, by the frontal excavation with 1-2 setae lateral to the median line, and by the 25-30 setae on the lateral and dorsal margins.

**Description (male).** 4.0 mm long (n = 1); 1.7 times as long as wide. Color uniformly red-orange (holotype may be teneral).

Epistoma strongly excavated, excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; expanded to greater than quarter length of head; surface shagreened; single seta lateral to median line; each lateral margin with a sub-acute vertical costa and bearing a dense brush of setae extending halfway on the lateral margin from the epistoma to the level of scape insertion; apical margin armed with a short, rectangular carina; basal margin tumid above scape insertion (Fig. 2b). Frons strongly excavated from epistoma to anterodorsal margin of the eyes, excavation bordering the ocular margin; surface shagreened; bearing 1-2 rows of erect golden setae lateral to the median line,

surface moderately covered; lateral and dorsal margins bearing 25-30 setae. Antennal scape elongate, expanded distally, bearing 5 rows of setae on distal two-thirds, those length of scape; segments 2-7 of funicle bearing setae on ventral margin equal to 1.5 times length of funicle; setae on dorsal margin, less than length of 5 segments; setae on ventral margin twice as thick as those on dorsal margin; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes lined with scales; surface minutely granulate-punctate, with minute, shallow punctures; anterior fifth bearing 2-3 rows of yellow-brown setae; a row of yellow setae above lateral carinae; base weakly recurved (Fig. 8b); carina on lateral margin type C (Fig. 7c).

Scutellum shape type B (Fig. 12b).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities extending from striae 1 to interstriae 4 and from the base to just beyond the scutellum, the remaining elytral surface minutely granulate. Discal interstriae bearing 2-3 rows of overlapping, pale, yellow recumbent scales, declivital interstriae bearing uni- and biseriate rows at the apex. Tenth interstriae with a carina encompassing elytra. Metepisternum shape type C (Fig. 9c); setae palmately divided into 4 or more filaments. Mesosternum shape type E (Fig. 10e). Second sternite convex.

Male genitalia. Median lobe strongly arcuate, lateral and apical margins with more sclerotization, apex broad, apical orifice membranous on apical quarter, lateral folds on basal half contiguous. Median struts one-fifth of body length. Internal sac central area membranous bearing setae just above seminal valve. Seminal valve heavily sclerotized, arising just above median struts, narrow on basal half, gradually apically expanding to width of median lobe, flattened medially; distal margin crenulated, folded on lateral margins of apical third, medial region with 4 tuberculate and serrate projections (Fig. 64). Tegmen semi-circular, ventral side elongated proximally. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Unknown.

**Specimens examined.** (1M, 0F)

**Distribution.** Brazil (Rondônia).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** *Satyr*- (L) = wood nymph.

### Costatus Clade

Species in the costatus clade are distinguished by the pronotal lateral margin type D (Fig. 7d), by the recurved pronotal base (Fig. 8b), the scutellum shape type I (Fig. 12i) and by the basal margin of elytra with a weak carina extending to scutellar apex (Fig. 11c). The clade contains four species, two species are redescribed and two species are described.

### *Camptocerus costatus* Chapuis

(Fig. 35 – 36, 65)

*Camptocerus costatus* Chapuis 1869: 259. Holotype: male, BRAZIL: 'Brazil, Dejean' (ISNB).

*Camptocerus seriatus* Eggers 1933b: 12. Holotype: female, FRENCH GUIANA: Les roches de Kourou (MNHN). Synonymy: Wood 2007: 205.

**Diagnosis.** The male of this species is distinguished by the elytral declivity strongly impressed below the level of the disk and occupying the apical four-fifths of the elytra, by the carinate costa on interstria eight

originating on the basal fifth and extending around the apex to the sutural margin, by the deeply impressed striae, and by the bristling brown setae originating from recumbent interstitial asperities.

The female is distinguished from that of *C. pilifrons* by the uniform color, by the larger size, and by the more deeply impressed striae.

**Redescription (male).** 3.5-3.9 mm long (mean = 3.7 mm; n = 6); 1.8-2.0 times as long as wide. Color uniformly orange red to black.

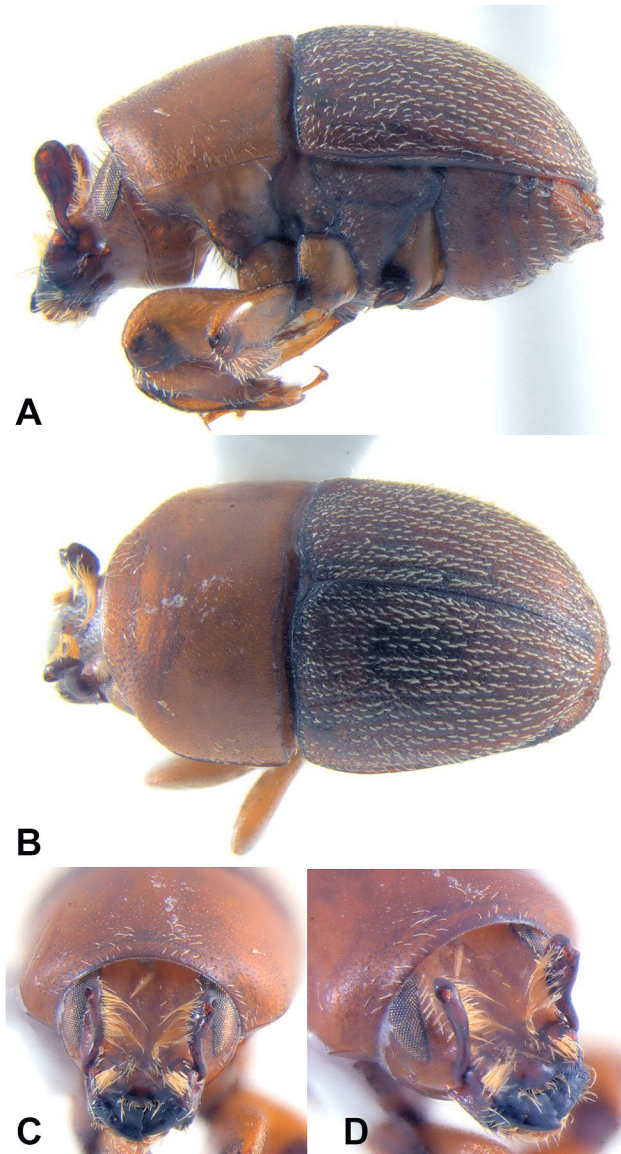
Epistoma excavated, expanded to greater than a quarter length of head, apical epistomal margin unarmed; surface shagreened; each lateral margin with a sub-acute arcuate costa angled proximally, lined entirely with setae; basal epistomal margin bearing a short, transverse, rectangular carina (Fig. 2g). Frons strongly excavated, excavation borders the ocular margin; surface shagreened; bearing dense, erect, dark yellow hair-like setae, 2 rows on lateral and dorsal margin twice the length of other setae. Antennal scape elongate and broadly rounded distally, bearing a brush of setae on distal half, those as long as scape; ventral margin of segments 2-7 bearing brushes of setae, these equal to 2 times the length of funicle; segments 1-7 of funicle bearing hair-like setae on dorsal margin, these less than length of 4 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface smooth, with dense, minute punctures; median line devoid of punctures; apical fourth bearing 5-6 transverse setae; pronotal base recurved (Fig. 8b); carina on lateral margin type D (Fig. 7d).

Scutellum shape type I (Fig. 12i).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk short, occupying basal fifth of elytra; interstriae 1-4 rugose, remaining disk smooth; basal margin of elytra with a weak carina extending to scutellar apex (Fig. 11c). Declivity strongly impressed below level of disk, occupying apical four-fifths of elytra; bearing asperities which progressively become smaller in size from the basal margin to apex, with asperities on basal margin forming crenulations, those transition to small tubercles on apical fifth and are obsolete at the elytral apex; striae moderately impressed; interstriae on basal fifth with recumbent asperities above punctures, each puncture with a short, dark yellow bristle arising from the posterior margin; twice width of striae. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type M (Fig. 9m); setae palmately divided into 4 or more filaments. Mesosternum shape type B (Fig. 10b).

Male genitalia. Median lobe flat, lateral and apical margins with moderate sclerotization; lateral folds thick, uniformly arcuate; apex broadly acute; lateral margins of median lobe folded dorsally, forming a broad point on basal third. Median struts stout, laterally compressed and wider basally, more than a quarter of body length. Internal sac central area membranous, seminal valve moderately sclerotized, forming a narrow horseshoe shape that follows the contours of the apical half of the median lobe; 2 longitudinally rectangular plates each with apices projecting basally toward lateral folds, apical region of



**Figure 35.** *Camptocerus costatus*, 3.5-3.9 mm, male. Lateral (A), dorsal (B), declivity (C); female lateral (D).



plates with a strongly arcuate ventrally curved spine (Fig. 65). Tegmen semi-circular, ventral side short. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma flat, less than a quarter length of head and unarmed; 2 rows of setae on distal margin. Frons flat; surface shagreened; short, sparse setae present on lateral margins. Each gena with a circular mycangium (Fig. 4c). Segments 1-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments. Elytra finely sculptured, without indication either of recumbent asperities or carinate costae. Disk covered with shallow rugosities to interstria eight. Declivital interstriae 1-5 on apical half with a crenulation at the base of each puncture, each bearing a short bristle, bristles of equal length; striae weakly impressed.

**Specimens examined.** (7M, 7F)

**Type Material.** Holotype *Camptocerus costatus*, M (ISNB). Holotype *Camptocerus seriatus*, F (MNHN).

**Other material.** BRAZIL: Mato Grosso: Villa Vera, 12°46'S 55°30'W, x.1970, (M. Alvarenga), 1M (CASC). ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, vi.1998, ex. canopy fogging (T.L. Erwin et al.), lot 1817, 1M (USNM); Santo Domingo de los Tsáchilas: Santo Domingo D.L.C. [de los Colorados], v.1982, 1M (BMNH); No specific locality: 'Ecuador', 1F (BMNH). GUYANA: [= Region 8]: Iwokrama Forest, 4.671822, -58.684114, 66 m, ex. *Ocotea oblonga*, 4-9.iii.2007, (Cognato, Hulcr, Smith, Dole, McCall), 2M, 4F (MSUC). PERU: Loreto: 1.5 km N Teniente Lopez, 2°35'S 76°6.92'W, 210-240 m, ex. flight intercept trap #166, 22.vii.1970, (Richard Leschen), 1F (SMEC). TRINIDAD: Morne Bleu, 2700 ft, 21.viii.1969, (H. & A. Howden), 1M (USNM).

**Distribution.** Brazil (Mato Grosso, Rio de Janeiro, Rondônia), Ecuador (Napo, Santo Domingo de los Tsáchilas), French Guiana, Guyana, Peru (Loreto), Trinidad.

**Hosts.** *Ocotea oblonga* (Meisn.) Mez. (Lauraceae).

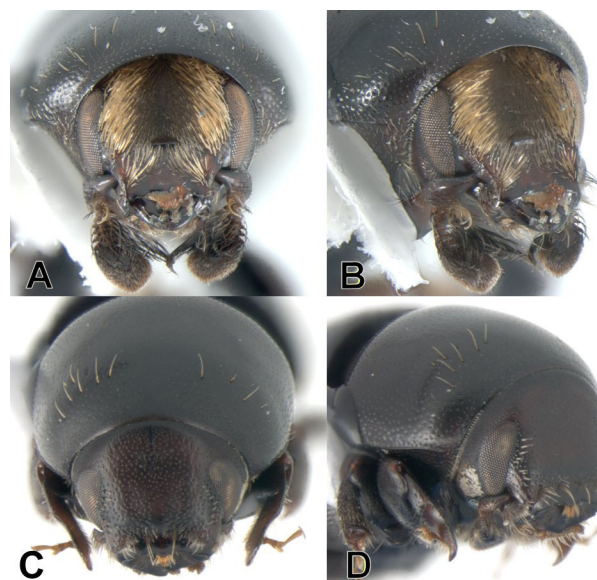
**Biology.** This species creates galleries in 1 – 2 cm diameter branches.

**Discussion.** Identity of the female and synonymy of *C. seriatus* was confirmed when five mated pairs of *C. costatus* were collected from galleries by the authors in 2007.

***Camptocerus pilifrons* Smith and Cognato, new species**

(Fig. 37, 66)

**Type Material.** Holotype: male, ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, vii.1995, (T.L. Erwin et al.), lot 1115 (USNM held in trust for MECN). Paratype: ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, vii.1994, (T.L. Erwin et al.) lot 714, 1M (USNM); vii.1995, lot 1114, 1M (USNM); viii.1995, lot 1115, 2M (MSUC); x.1995, lot 1254, 1M, 1F (USNM); x.1995, lot 1256, 1F (USNM); x.1995, lot 1260, 1F (MSUC); x.1996, lot 1669, 1M (USNM).



**Figure 36.** *Camptocerus costatus* male head anterior (A), anterior oblique (B); female head anterior (C), anterior oblique (D).

**Diagnosis.** Both sexes of *C. pilifrons* are distinguished by the small size and distinctive color pattern described below. The male is distinguished by the elytral disk bearing interstitial setae, by the absence of a carinate costa on interstria eight and by the unimpressed declivital striae.

The female is distinguished from that of *C. costatus* by the red-brown color, by the smaller size, and by the unimpressed declivital striae.

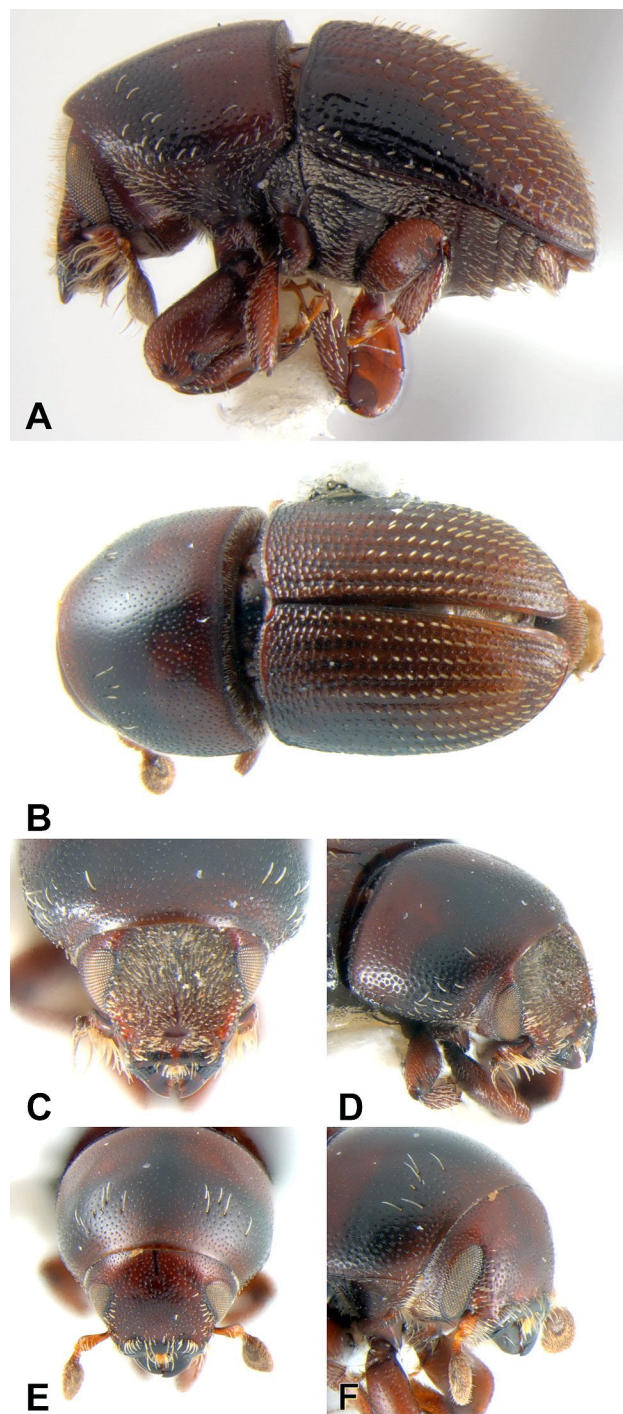
**Description (male).** 2.6-3.1 mm long (mean = 2.8 mm; n = 7); 1.9-2.2 times as long as wide. Head, thorax, abdomen, elytra, antennae and legs red-brown. Pronotum with a black patch extending from the apical pronotal margin and forming a point on the posterior third of the pronotum along the median line. Elytra with an oval-shaped black patch extending from the base to the posterior margin of the first sternite and from the lateral margin to interstria 7.

Epistoma excavated, expanded to less than a quarter length of head, apical epistomal margin unarmed; surface shagreened; each lateral margin with a sub-acute, arcuate costa angled proximally, lined entirely with setae; basal epistomal margin bearing a short, transverse, rectangular carina (Fig. 2g). Frons strongly excavated, excavation borders the ocular margin; surface shagreened; bearing dense white bristles; lateral 2 rows on frons margin slightly longer than other setae. Antennal scape elongate and broadly rounded distally, bearing a brush of setae on distal half, those as long as scape; ventral margin of segments 2-7 bearing brushes of setae, these equal to the twice the length of funicle; segments 2-7 of funicle bearing hair-like setae on dorsal margin, these half the length of those on ventral margin; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface punctate, with apical and basal margins more densely punctured; median line devoid of punctures; anterior fourth bearing 5-6 transverse setae; a row of setae above lateral carinae; pronotal base recurved (Fig. 8b); carina on lateral margin type D (Fig. 7d).

Scutellum shape type I (Fig. 12i).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk smooth; basal margin with a weak carina extending to scutellar apex (Fig. 11c). Declivity with uniseriate interstitial setae, uniform in size; interstriae twice width of striae, puncture half the diameter of those of striae; strial punctures with a setae the length of puncture originating from the basal margin. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type F (Fig. 9f); setae palmately divided into 4 or more filaments. Mesosternum shape type B (Fig. 10b).



**Figure 37.** *Camptocerus pilifrons*, 2.6-3.1 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



Male genitalia. Median lobe flat, lateral and apical margins lightly sclerotized; lateral folds lateral folds thin and straight; apex flat; lateral margins of median lobe folded dorsally, forming a broad point on basal third; apical orifice membranous. Median struts stout, laterally compressed and wider basally, less than a quarter of body length. Internal sac central area membranous; seminal valve moderately sclerotized with 2 triangular plates basally, forming a thin moderately sclerotized ring at apical orifice, connected to median lobe by a thin membrane (Fig. 66). Tegmen semi-circular, ventral side short. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma with 2 rows of setae on distal margin. Frons flat; short, sparse, setae present only on lateral margins. Each gena with a circular mycangium (Fig. 4c). Segments 5-7 of funicle bearing setae on both dorsal and ventral margins, these less than length of 3 segments. Elytra finely sculptured. Disk covered with shallow rugosities to interstria 8. Declivital interstriae 1-5 on apical half with a crenulation at the base of each puncture, each bearing a short bristle, bristles of equal length; striae weakly impressed.

**Specimens examined.** (7M, 3F)

**Distribution.** Ecuador (Napo).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** *Pili-* (L) = hairy, *-frons* (L) = forehead, brow. In reference to the setose excavation of the frons.

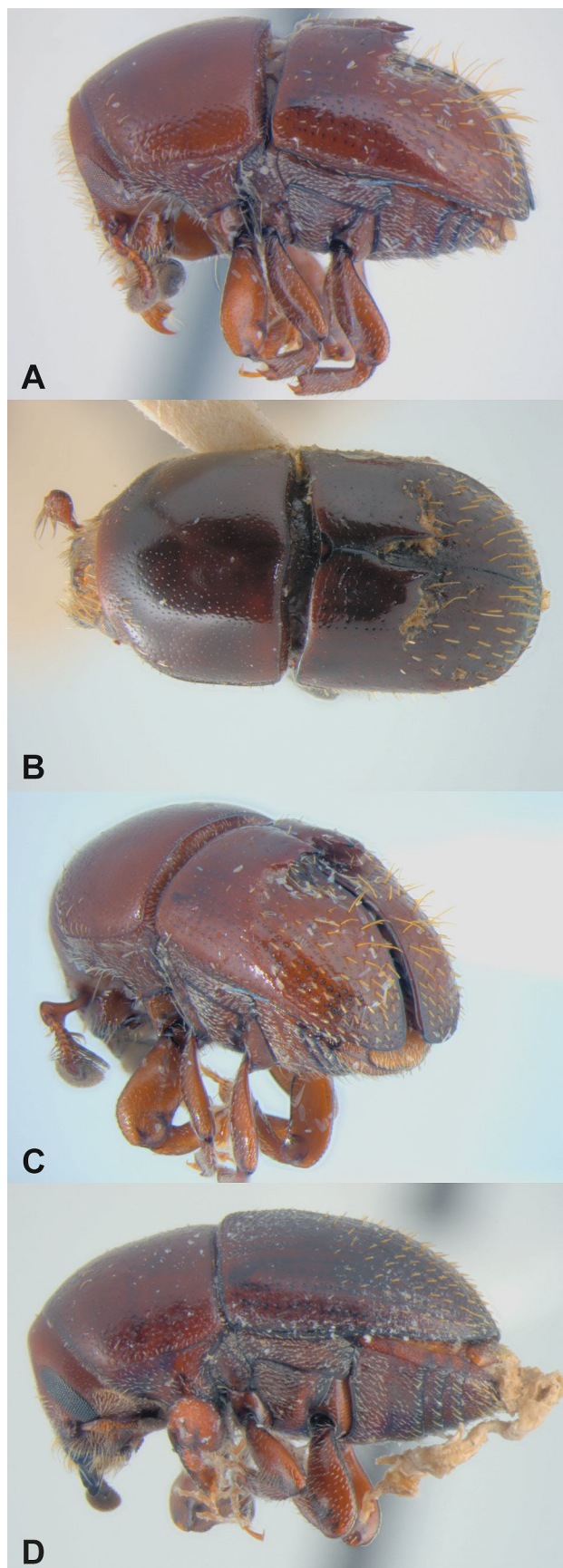
***Camptocerus quadridens* Blackman**  
(Fig. 39, 67)

*Camptocerus quadridens* Blackman 1943: 379.

Holotype: male, PANAMA: Canal Zone: Cooper's, near source of Rio Aejetá, ex. fallen tree, 19.vii.1923, (*J. Zetek*) (USNM).

**Diagnosis.** The male of this species is distinguished by the short, transverse carina on the

**Figure 38.** *Camptocerus quadridens*, 3.4-3.7 mm, male. Lateral (A), dorsal (B) posterior oblique (C); female lateral (D).





basal epistomal margin, by each elytron with 2 discal spines arising from the first to fifth striae, with a sharp spine on the first striae and a blunt spine on the second extending over the declivity, and by the red-brown color.

The female is distinguished from that of *C. costatus* by the red brown color and often dark brown striae, by the smaller size, and by the less strongly impressed striae.

**Redescription (male).** 3.4-3.7 mm long (mean = 3.6 mm; n = 4); 1.8-1.9 times as long as wide. Color uniformly orange to red brown.

Epistoma excavated, expanded to less than a quarter length of head, apical epistomal margin unarmed; surface shagreened; each lateral margin with a sub-acute, arcuate costa angled proximally, lined entirely with setae; basal epistomal margin bearing a short, transverse, rectangular carina (Fig. 2g). Frons strongly excavated; excavation borders the ocular margin; surface shagreened; bearing dense, erect, pale yellow hair-like setae of equal length. Antennal scape elongate and broadly rounded distally, bearing a brush of hair-like setae on distal half, those as long as scape; ventral margin of segments 2-7 bearing brushes of setae, these equal to the 1.5 times the length of funicle; segments 2-7 of funicle bearing hair-like setae on dorsal margin, these half the length of those on ventral margin; anterior face of the club setose, with a partial septum.

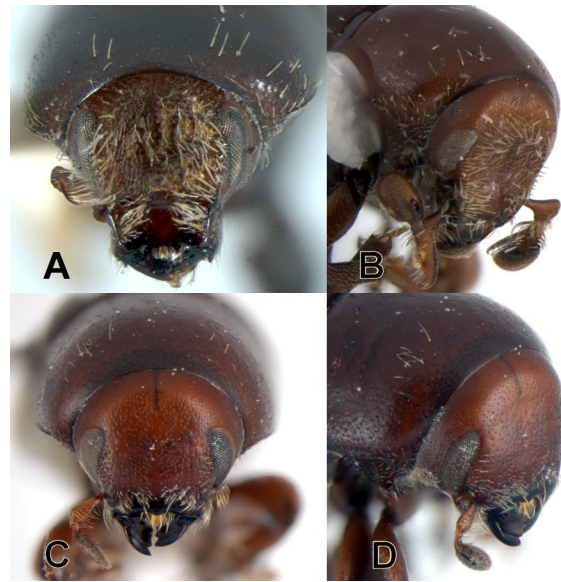
Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface smooth, densely and minutely punctate; median line devoid of punctures; anterior fourth bearing 5-6 transverse setae; a row of setae above lateral carinae; pronotal base recurved (Fig. 8b); carina on lateral margin type D (Fig. 7d).

Scutellum shape type I (Fig. 12i).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with the basal margin a weak carina extending to scutellar apex (Fig. 11c); 2 spines arising from the first to fifth striae; a sharp spine on the first striae, and a blunt rounded spine on the second; spines extend over the declivity. Declivity originates in the recess formed under the spines, this area is moderately depressed until interstria 8, where a carinate costa originates above the middle of sternite 1 and terminates above the midpoint of sternite 5; interstriae uniseriate, twice width of striae; punctures indistinct; long, thin bristles on interstriae 1-4 in the concavity to the posterior third, those 2-4 times the length of other bristles. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type I (Fig. 9i); setae bifid. Mesosternum shape type B (Fig. 10b).

Male genitalia. Median lobe flat, lateral and apical margins with light to moderate sclerotization; lateral folds thin and arcuate distally on basal half, apex broad; lateral margins of median lobe folded dorsally, forming a broad point on basal third. Median struts stout, laterally compressed and wider basally, a third of body length. Internal sac central area membranous, basal half of seminal valve lightly sclerotized with numerous heavily sclerotized veins, dorsoventrally flattened and folded basally, apical half forming 2 thin moderately sclerotized semi-circles at the apical orifice (Fig. 67). Tegmen semi-circular, ventral side short. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma with 2 rows of setae on distal margin. Frons flat; short, sparse setae present on lateral margins. Each gena with a circular mycangium (Fig. 4c). Segments 5-7 bearing setae on the dorsal margin, these less than length of 3 segments. Elytra finely sculptured, lacking both spines and carinate costae. Disk covered with shallow rugosities from the sutural space to interstria 8. Declivital interstriae 1-5 on apical half with a crenulation at the base of each puncture, each bearing a short bristle, bristles of equal length; striae weakly impressed.



**Figure 39.** *Camptocerus quadridens* male head anterior (A), anterior oblique (B); female head anterior (C), anterior oblique (D).

**Specimens examined.** (5M, 2F)

*Type Material.* Holotype *Camptocerus quadridens*, M (USNM).

*Other material.* PANAMA: Canal Zone: Barro Colorado Island, ex. trap, 13.ii.1980, (Henk Wolda), 1M (UCDC); 21, 24, 26.vii.1986, 1M (MSUC); 21, 23, 25.vii.1986, 1F (MSUC), 1-3.vii.1987, 1M (UCDC); Panama: Cerro Jefe, 19°12'N, 79°21'W, 24.ii.1973, (H. Stockwell), 1M (USNM); Cerro Jefe, 2200', 25v-1.vi.1992, (J.E. Wappes), 1F (TAMU).

**Distribution.** Panama.

**Hosts.** The holotype was collected on the same date and in the same locality as *C. aeneipennis*. These *C. aeneipennis* were collected from a *Protium* species (Burseraceae) and since multiple species often colonize the same host, *Protium* is the probable host (Wood 1982).

**Biology.** Unknown.

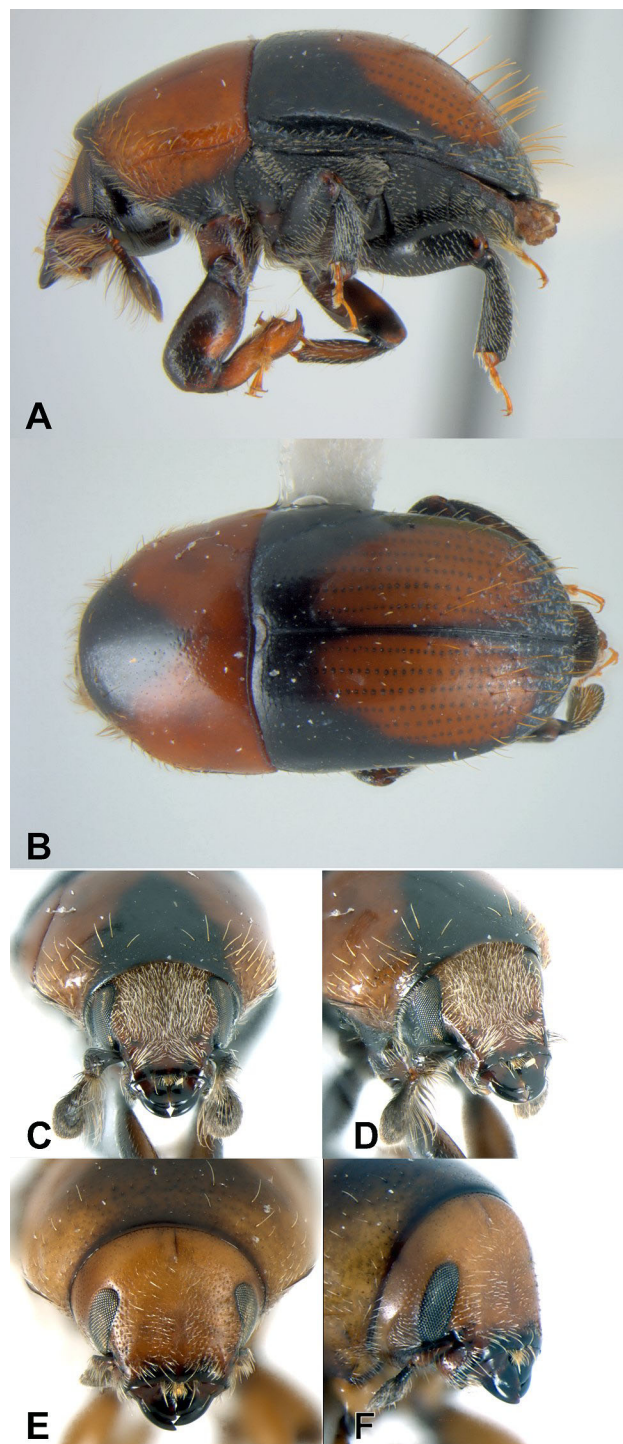
**Discussion.** This is the first time that a female has been identified for this species. It was found in a museum rather than collected in the field, so its identity is hypothesized. *Camptocerus quadridens* displays marked sexual dimorphism similar to that of its sister taxa, *C. costatus* and *C. pilifrons*.

***Camptocerus zucca* Smith and Cognato, new species**  
(Fig. 40)

**Type Material.** Holotype: male, ECUADOR: Napo: Huahua Sumaco, km 44 on Hollin-Loreto Rd. 16.xii.1989, (M.S. & J.S. Wasbauer, H. Real) (CDAE). Paratypes: ECUADOR: Napo: Huahua Sumaco, km 44 on Hollin-Loreto Rd. 16.xii.1989, (M.S. & J.S. Wasbauer, H. Real), 1F, 1M (CDAE).

**Diagnosis.** This species is closely related to *C. quadridens* and *C. costatus*. Adults are readily distinguished by their large size, by the unarmed apical epistomal margin, by a distinctive orange and black color pattern described below, by the absence of a carinate costa on the eighth interstriae and by the sparse setae on the declivity.

The female is distinguished from other females in the *costatus* clade by the distinctive color pattern, by the larger size, by the unimpressed striae and by the short, fine setae on the interstriae.



**Figure 40.** *Camptocerus zucca*, 4.0-4.1 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

**Description (male).** 4.0-4.1 mm long (mean = 4.05 mm; n = 2); 1.9 times as long as wide. Antennal scape and club black, funicle orange; epistoma and frons orange, gena black; protibia orange with black margins, profemur and meso- and metathoracic legs black with orange patches, coxae brownish-orange; pronotum orange with a black triangle extending from the apex to the basal third; elytra black, with each elytron displaying an orange oval encompassing the area from the basal margin of the disk and to the apical fifth of the elytra and from the sutural interstriae to interstria 8; ventral surface of thorax and abdomen black. Teneral adults are pale orange with dark spots.

Epistoma excavated, expanded to less than a quarter length of head, apical epistomal margin unarmed; surface shagreened; each lateral margin with a sub-acute, arcuate costa angled proximally, lined entirely with setae; basal epistomal unarmed (Fig. 2e). Frons strongly excavated; excavation borders the ocular margin; surface shagreened; bearing dense, erect, pale yellow white hair-like setae of equal length. Antennal scape elongate and broadly rounded distally, bearing a brush of setae on distal half, those as long as scape; ventral margin of segments 2-7 bearing brushes of setae, these equal to the 1.5 times the length of funicle; segments 2-7 of funicle bearing hair-like setae on dorsal margin, these half the length of those on ventral margin; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between eyes glabrous; surface smooth, minutely and nearly indistinguishably punctured; median line devoid of punctures; anterior fourth bearing 5-6 transverse setae; a row of setae above lateral carinae; pronotal base recurved (Fig. 8b); carina on lateral margin type D (Fig. 7d).

Scutellum shape type I (Fig. 12i).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Disk with shallow rugosities to interstria 3, remaining disk smooth; basal margin with a weak carina extending to scutellar apex (Fig. 11c); striae not impressed. Declivital interstriae 4 times the width of striae, each interstriae with 2-3 long setae, uniseriate, those on declivital interstriae 1-5 2-3 times as long as those on interstria 6; 3 lateral rows of short setae present on the lateral margin from sternite 1 to the suture. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type C (Fig. 9c); setae bifid. Mesosternum shape type O (Fig. 10o).

Male genitalia not examined.

**Female.** Similar to male except epistoma less than a quarter length of head. Frons flat; surface shagreened, short, sparse, setae present only on lateral margins. Each gena with a circular mycangium (Fig. 4c). Segments 3-7 of funicle bearing setae on dorsal and ventral margins, these less than length of 4 segments. Declivital interstriae bearing short semi-recumbent bristles.

**Specimens examined.** (2M, 1F)

**Distribution.** Ecuador (Napó).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** Zucca (Italian) = pumpkin (noun in apposition). In reference to this species' jack-o-lantern appearance.

### **Aeneipennis Clade**

Species in the aeneipennis clade are distinguished by the elongate and narrow male scape, the pronotal lateral margin type B (Fig. 7b), the metepisternum shape type B (Fig. 9b), and by the mesosternum shape type A (Fig. 10a). The clade contains nine species, six species are redescribed and three species are described.



***Camptocerus aeneipennis* (Fabricius)**  
(Fig. 41, 68)

*Camptocerus aeneipennis* (Fabricius) 1801: 392 (*Hylesinus*). Lectotype: male, [GUYANA]: 'Essequibo' [River] (ZMUC). Lectotype designated Wood 1982: 412

*Camptocerus gibbus* (Fabricius) 1801: 392 (*Hylesinus*). **Lectotype (here designated):** female, [GUYANA]: 'Essequibo' [River] (ZMUC). Synonymy: Eggers 1933a: 17.

**Notes.** Synonymy of *C. gibbus* confirmed by Wood (1972: 243).

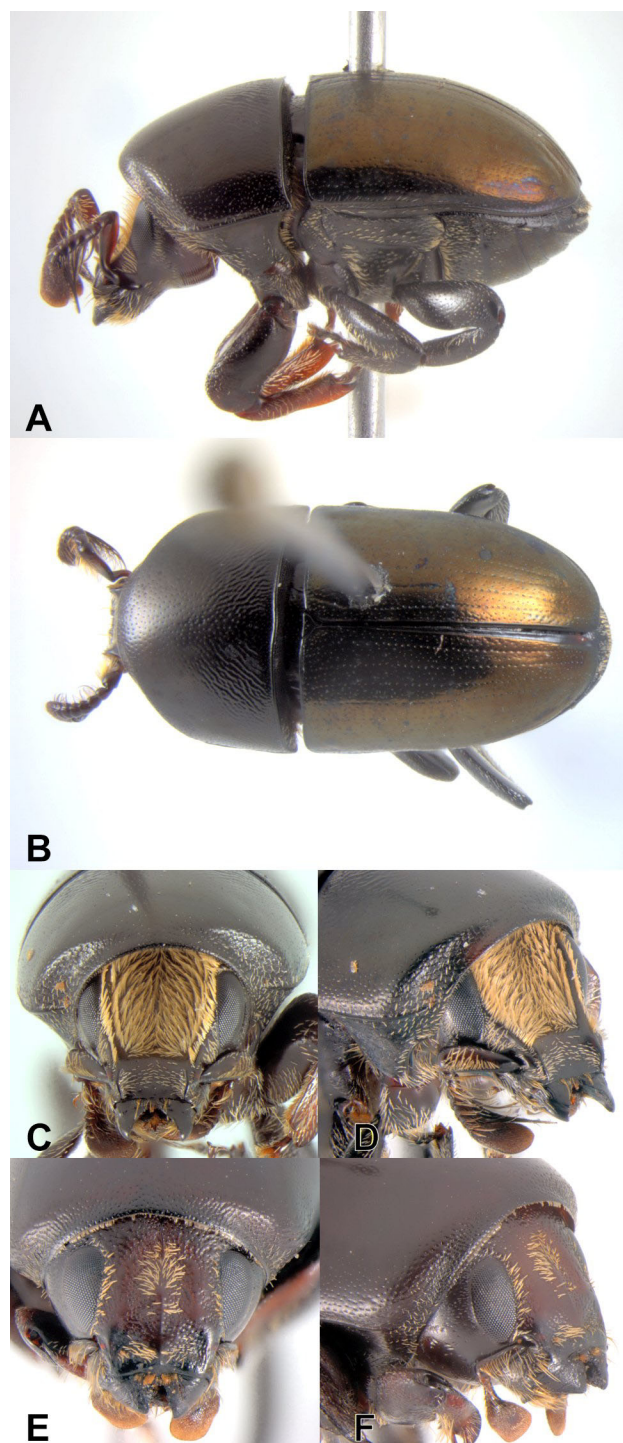
**Diagnosis.** This species always has elytra colored metallic bronze or black with a metallic sheen and is smaller in size than the morphologically similar, *C. noel*. The male is distinguished by the impressed first discal striae, by the deeper stria punctures and by the apical pronotal margin with lateral declivities extending two-thirds of distance to the median line.

Females are identified from those of *C. noel* by their smaller size and by the impressed first discal striae.

**Redescription (male).** 4.4-5.9 mm long (mean = 5.5 mm; n = 20); 1.8-2.1 times as long as wide. Head, thorax, antennae and legs red-brown; pronotum dark red-brown; abdomen black; elytra metallic bronze.

Epistoma strongly excavated, expanded to greater than quarter length of head; surface shagreened; each lateral margin with a sub-acute, arcuate costa pointing distally; apical margin unarmed; basal margin armed with a transverse, concave carina (Fig. 2a). Frons strongly excavated; surface shagreened; bearing dense long white to yellow hair-like setae; margin of excavation bearing a single row of long hair-like setae. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin with lateral declivities extending two-thirds of distance to the median line (Fig. 5b), area between eyes lined with fine bifid setae; glabrous, smooth, shining, minutely punctured; basal half deeply rugose creating a wrinkled appearance; base straight (Fig. 8a), without a transverse medial groove; carina on lateral margin type B (Fig. 7b).



**Figure 41.** *Camptocerus aeneipennis*, 4.4-5.9 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Glabrous, smooth, shining; interstitial punctures minute, strongly confused. Disc with only stria 1 impressed. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

Male genitalia. Median lobe arcuate, lateral and apical margins with moderate sclerotization; lateral folds thick, uniformly arcuate; apex mushroom shaped, entire surface except apical margin covered with fine, pale and long hair-like setae; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly less than a third of body length. Internal sac central area membranous; seminal valve on apical quarter lightly sclerotized, moderately sclerotized below base of sensory claspers; sensory claspers heavily sclerotized, dorsoventrally flattened, bilobed; each lobe composed of a small lateral lobe and a larger medial lobe; large left lobe narrower, strongly curved ventrally, subducted under right; large right lobe less strongly curved, equal to width of left (Fig. 68). Tegmen semi-circular, ventral side elongated proximally and spatulate. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head and bearing a small median tubercle. Frons flat, bearing sparse short setae; surface shagreened, reticulate dorsal and lateral margins, with moderately sized, deep punctures; a triangular impressed area originating between the eyes and terminating at the distal and lateral epistomal margins, the triangle is bisected by a shallow carina on the median line with a small tubercle at distal end. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 5-7 of funicle bearing setae on the dorsal margin less than length of 2 segments. Apical pronotal margin weakly sulcate (Fig. 6b), area between the eyes lined with scales; disk finely sculptured, smooth, shining.

#### Specimens examined. (166M, 111F)

*Type Material.* Lectotype, M, *Camptocerus aeneipennis* (MZMC); Paralectotypes, *Camptocerus aeneipennis*, NO LOCALITY: 2M, 4F (MZMC); Lectotype, *Camptocerus gibbus*, F (MZMC).

*Other specimens:* BOLIVIA: *Beni*: Cosincho region, (G.L. Harrington), 1M (USNM); Romansos, 1 km N. Junction Rio Itenez & Rio Paragua, 30.vii.1964, (J.K. Bousemen, J. Lussenhop), 1M, 1F (AMNH); *La Paz*: Chuma [dubious locality due to high elevation and biome]: xii.1936, (Y. Mexia), 1M (CASC). BRAZIL: *Amazonas*: km 60 N Manaus, 18.1 km E Campinas field station, 2° 30'S, 60°15'W, ex. terra firme forest fogged with pyrethrum (Montgomery, Erwin, Schimmel, Krischik, Date, Bacon), sample 6, 22.ii.1979, 1M (USNM); Manaus, 1 km W Taruma Falls, 100m, 12-17.ii.1981, (Ekis, Young), 1F (RJRC); Reserva Ducke, 26 km NE Manaus, ex. malaise trap, (M.G.V. Barbosa), ii.1995, 2M, 2F (BMNH); *Bahia*: (G. Bondar), 4M, 1F (FMNH); Salobro: 6.vii.1885, (E. Gounelle), 2M (SDEI); *Paraná*: Rolaudia, x.1947, (A. Maller), 1M (AMNH); *Pernambuco*: Pery-Pery, 5.vi.1892, (Gounelle), 3M, 1F (SDEI); 11.xii.1892, 1M (SDEI); *Rio de Janeiro*: (Kirsch) 1M, (SMTD); *Santa Catarina*: Corupa (Hansa Humbolt), xii.1945, (A. Maller), 1M (AMNH); *São Paulo*: (Kratz), 1M (SDEI); *No specific locality*: 'Brazil' (Mearkel), 1F (SMTD); 'Brasilien', 1M (MZMC); 'Rio Madeira' [river runs through states of Rondônia and Amazonas], 1954, (Mann, Baker), 2M (USNM). COLOMBIA: *Cauca*: 10 km SE Tambo, 30 m, ex. 'Anime' [local name of *Protium*], 9.vii.1970, (S.L. Wood), 3F (MSUC); *Choco*: Quebrada Docordo, Rio San Juan, 4-8.vi.1969, (B. Malkin), 1M (FMNH); *Putumayo*: Santa Rosa (Kofan Indian village), headwaters of Rio San Miguel, ex. at light, 9-12.x.1970, (B. Malkin, P. Bouchard), 1M (FMNH); *Santa Fe de Bogotá* [= Bogotá D.C.], 4M (SDEI). COSTA RICA: *Peralta*: Cartago, ex. 4" limb, 10.iii.1964, (S.L. Wood), 6M, 4F (MSUC); *Santa Clara*: Hamburg Farm, ex. on dry bark, (F. Nevermann), 1M (USNM). ECUADOR: *Napo*: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (T.L. Erwin et al.), lot 614, 1F (USNM); vii i.1995, lot 1028, 1M (USNM); vii.1995, lot 1110, 1M (USNM); i.1996, lot 1479, 1M, (MSUC); i.1996, lot 1498, 4M, 3F (USNM), 1M (MSUC); vii.1996, lot 1530, 1M (USNM); vii.1996, lot 1618, 1F (MSUC); Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, ii.1999, (T.L. Erwin et al.), lot 2056, 1M (MSUC); ii.1999, lot 2075, 1M (USNM). FRENCH GUIANA: *No specific locality*: 'Cayenne' 2M (SDEI); 2M (MZMC). GUYANA: [= Region 8]: Iwokrama Forest, 4.671822, -58.684114, 66m, ex. *Ocotea oblonga*, 4-9.iii.2007, (Cognato, Hulcr, Smith, Dole, McCall), 68M, 42F (MSUC). PANAMA: *Bocas del Toro*: Corriente Grande, 100 m, 9°17'30"N, 82°32'41"W, 30.iv-5.v.1980, (H. Wolda), 1F (CASC); *Canal Zone*: Barro Colorado Island, ex. trap, 9-

13.xi.1987, (*H. Wolda*), 3F (UCDC); 24.vi.1986, (*H. Wolda*), 1F (UCDC); Cooper's nr. source of Rio Ajeta [= along Pipeline Road], 19.viii.1928, (*J. Zetek*), 1M, 2F (USNM); Panama: Parque Nacional Soberanía, Pipeline Rd, 9.166667, -79.75, 95 m, 3.ix.2008, (*S.M. Smith, A.D. Smith, A.R. Gillogly*), 1M (MSUC). PERU: Madre de Dios: Los Amigos Biological Station, -12.56916, -70.100114, 250 m, ex. *Protium amazonicum* (*Smith, Hulcr*) 26.iv.-27.v.2008, 1M, 2F (MSUC). SURINAME: No specific locality: 'Surinam' 2M (MZMC). VENEZUELA: Barinas: 9 km S Barrancas, ex. *Protium* sp., 6.xii.1970, (*S.L. Wood*), 25M, 28F (MSUC); 40 km E Canton, 100 m, ex. *Protium* sp. 11.iii.1970, (*S.L. Wood*), 2M, 4F (MSUC); 10 km SE Miri, 150 m, ex. *Protium* sp., 9.ii.1970, (*S.L. Wood*), 4M, 2F (MSUC). NO SPECIFIC LOCALITY: 'Amazons', 1M (MZMC); 'Cujam' [?] 7M, 2F (SDEI).

**Distribution.** Argentina (Chaco), Bolivia (Beni, La Paz), Brazil (Amazonas, Bahia, Brasília, Mato Grosso, Pará, Parana, Pernambuco, Rio de Janeiro, Santa Catarina, São Paulo), Colombia (Bogotá, Cauca, Choco, Putumayo), Costa Rica, Ecuador (Napó), French Guiana, Guyana, Panama, Peru (Loreto, Madre de Dios), Suriname, Venezuela (Barinas).

**Hosts.** Euphorbiaceae, *Ocotea oblonga* (Meisn.) Mez (Lauraceae), *Myrocarpus frondosus* Fr. Allem (Fabaceae), Myrtaceae, *Protium* sp. (Burseraceae) (= "Almesca branca" [Brazil], "Almesca vermelha" [Brazil], "Breu branco" [Brazil] (Beaver 1972)), *Protium amazonicum* Swart, *Protium decandrum* (Aubl.) Marchand, *Protium glabrum* (Rose) Engl. *Protium* sp., *Protium tenuifolium* (Engl.) Engl., *Tetragastris altissima* (Aubl.) Swart (Burseraceae).

**Biology.** *Camptocerus aeneipennis* colonizes trunks and large branches ranging from 5 cm to more than 30 cm diameter. Wood (2007) offers a detailed description of the gallery system. Beaver (1972) provides a detailed life history. The galleries closely resemble those of *C. noel*. *Camptocerus aeneipennis* aggregate in leaves around host trees and perform maturation feeding on leaves (von Winning 1930; Smith, pers. ob.).

**Discussion.** *Camptocerus aeneipennis* from Costa Rica and Bolivia exhibited slight variation in the degree of separation was observed in the sensory claspers of the aedeagus.

### ***Camptocerus angustior* Eggers**

(Fig. 42, 69)

*Camptocerus angustior* Eggers 1928: 91. Lectotype: male, BOLIVIA: Yungas: 1000 m (USNM). Lectotype designated Anderson and Anderson 1971: 4.

**Diagnosis.** This species has metallic bronze elytra. The male of the species is distinguished by a conical median tubercle on the apical epistomal margin, by the constricted proximal epistomal margin, by the nearly sulcate anterior pronotal margin (Fig. 5b), by the less rugose basal half of pronotum, by the larger, deeper pronotal punctures and by the more shallow stria punctures.

The female is distinguished from those of *C. aeneipennis* by the unimpressed striae and cannot be distinguished from *C. noel*. This species occurs at higher elevations (1200-3000m) as compared to *C. aeneipennis* or *C. noel*.

**Redescription (male).** 5.0-5.8 mm long (mean = 5.5 mm; n = 4); 1.9-2.0 times as long as wide. Head, antennae, thorax, abdomen and legs black; elytra metallic bronze to black.

Epistoma strongly excavated, expanded to greater than quarter length of head; surface shagreened; each lateral margin with a sub-acute, arcuate costa pointing distally; apical margin armed with a conical median tubercle 1.5 times longer than base width; basal margin armed with a transverse, concave carina (Fig. 2a); proximal margin distinctly constricted. Frons strongly excavated; surface shagreened; bearing dense long white to yellow hair-like setae; margin of excavation bearing a single row of long hair-like setae. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the



length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin declivous, partially sulcate (Fig. 5b), area between eyes lined with fine bifid setae; glabrous, smooth, shining, minutely punctured; weakly rugose creating a wrinkled appearance; base straight (Fig. 8a), with a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Glabrous, smooth, shining; minutely punctate; interstitial punctures strongly confused. Discal striae not impressed. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

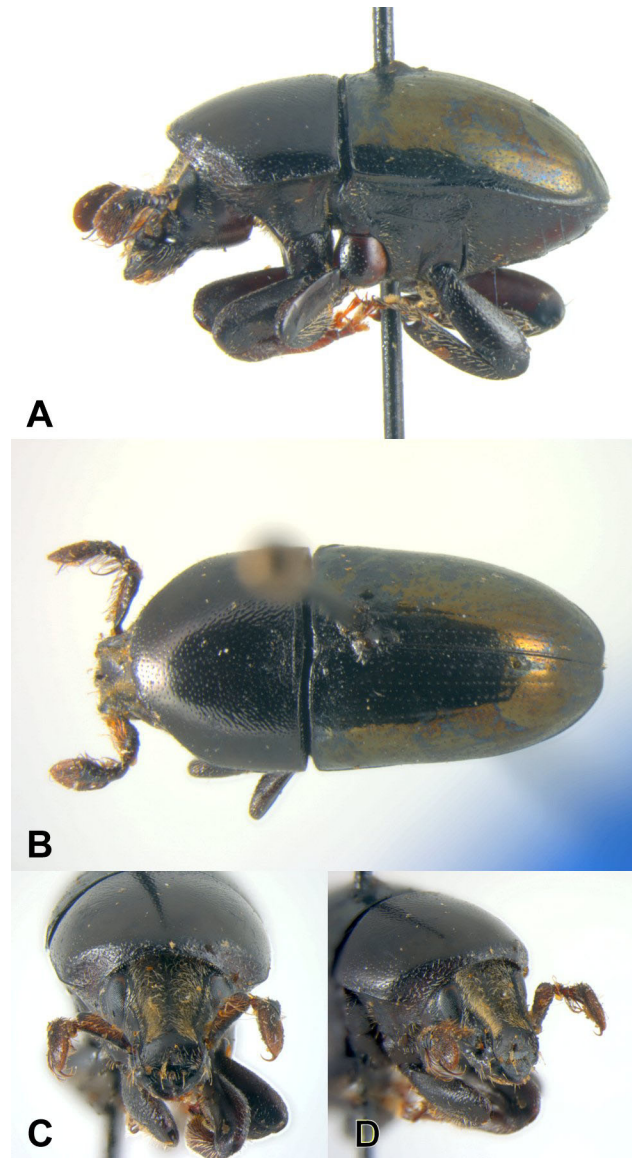
Male genitalia. Median lobe arcuate, lateral and apical margins with moderate sclerotization; lateral folds narrow, uniformly arcuate; apex rounded with flat lateral margins, entire surface except apical margin covered with fine, pale and long hair-like setae; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts, forming a thicker subacute point in middle; from each subacute point arises a ventrally projecting, lightly sclerotized, narrowly and gradually constricting lobe, lobe apices on apical quarter of median lobe, apices round; apical orifice lightly sclerotized. Median struts stout, laterally compressed and wider basally, slightly more than a third of body length. Internal sac central area membranous; seminal through membranous (Fig. 69). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma less than a quarter length of head, with a small median tubercle. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 4-7 of funicle bearing setae on dorsal margin, these less than length of 2 segments. Apical pronotal margin weakly sulcate (Fig. 6b), area between the eyes lined with scales; disk finely sculptured, smooth, shining; transverse medial groove on base absent. Female specimen missing majority of frons.

#### Specimens examined. (5M, 1F)

*Type material.* Lectotype, *Camptocerus angustior*, M (USNM); Paralectotypes, BOLIVIA: *No specific locality*: 'Bolivia', 1M (BMNH) 1F (USNM). COLOMBIA: *Tolima*: (Natagaima), E. Pehlke S., 1915, (*M. Hagedorn*), 1M (USNM).

*Other material.* PERU: *Junín*: Utcuyacu, Tarms, iii.1948, (*F. Woytkowski*), 1M (AMNH); 1600–3000 m, 12.iii.1948, (*F. Woytkowski*), 1M (AMNH).



**Figure 42.** *Camptocerus angustior*, 5.0-5.8 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D).

**Discussion.** *Camptocerus pseudoangustior* is commonly identified as *C. angustior* in collections and keys (ex. Wood 2007).

**Distribution.** Bolivia (La Paz), Colombia (Tolima), Peru (Junín).

**Hosts.** Unknown.

**Biology.** Unknown.

***Camptocerus aterrimus* Eggers**

(Fig. 43, 70)

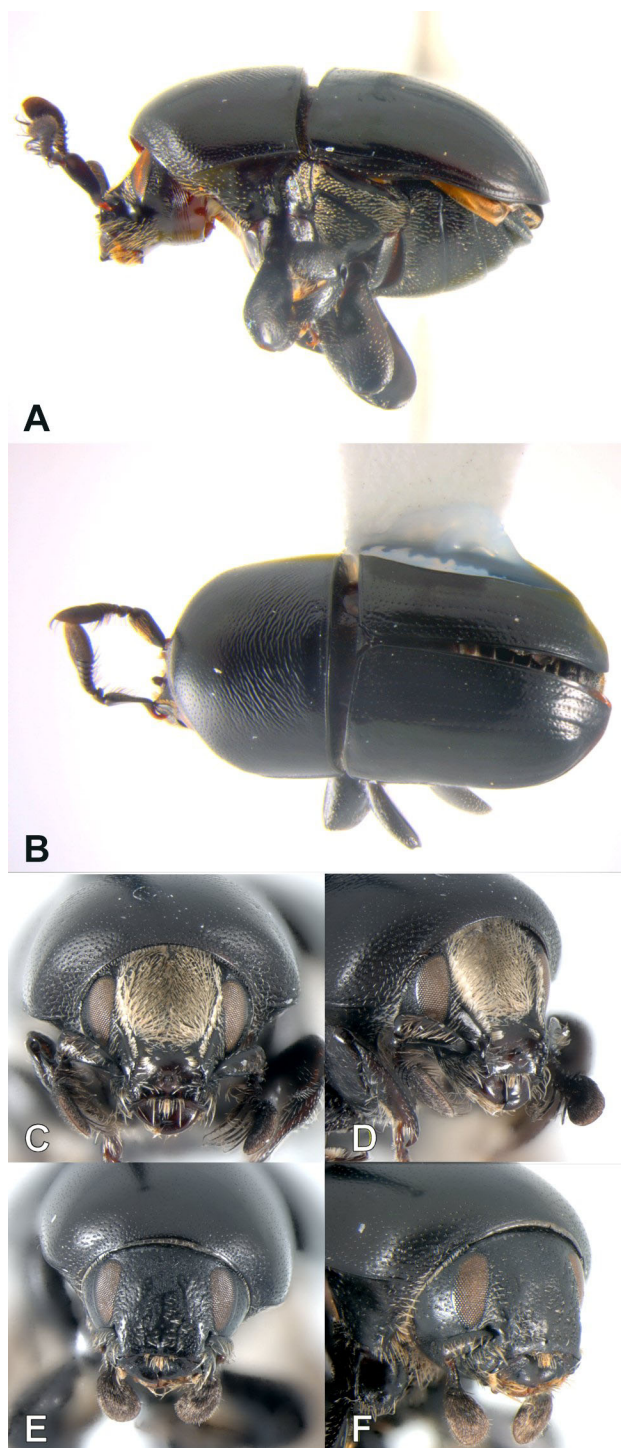
*Camptocerus aterrimus* Eggers 1933b: 12. Holotype: female, FRENCH GUIANA: Passoura [= River] (MNHN).

**Diagnosis.** This species is black with dark brown gena and legs. The species is distinguished by its black color, by the conical medial tubercle on the apical epistomal margin, by the weakly sulcate (nearly round) apical pronotal declivity (Fig. 5b), by the transverse median groove on the pronotal base, and by the mostly uniseriate discal interstitial punctures.

Females are distinguished from those of *C. pseudoangustior* by the smaller body size.

**Redescription (male).** 3.1-4.5 mm long (mean = 3.9 mm; n = 20); 1.7-2.2 times as long as wide. Head, antennae, thorax, legs, abdomen and elytra and legs black; gena and coxa red brown.

Epistoma strongly excavated, expanded to less than a quarter length of head; surface shagreened; each lateral margin with a sub-acute, arcuate costa pointing distally; apical margin armed with a conical median tubercle 1.5 times longer than base width; basal margin armed with a transverse, concave carina (Fig. 2a), bearing a tuft of thick apically rounded setae above scape insertion. Frons strongly excavated; surface shagreened; bearing dense long white hair-like setae; margin of excavation bearing a single row of long hair-like setae, those at ocular margin with flattened apices. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.



**Figure 43.** *Camptocerus aterrimus*, 3.1-4.5 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

Apical pronotal declivity weakly sulcate (nearly round) (Fig. 5b), area between eyes lined with fine bifid setae; glabrous, smooth, shining, minutely punctured; basal half deeply rugose creating a wrinkled appearance; base straight (Fig. 8a), with a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Elytra glabrous, smooth, shining. Discal interstriae with strongly confused. Tenth interstriae with a carina longer than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

Male genitalia. Median lobe arcuate, lateral and apical margins with moderate sclerotization; lateral folds thick, uniformly arcuate; apex rounded with flat lateral margins, entire surface bearing fine, pale and long hair-like setae except apical margin; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly less than a third of body length. Internal sac central area membranous; seminal valve on apical quarter bilobed, moderately sclerotized, more sclerotization on margins, moderately sclerotized below base of sensory claspers; internal sac appears to be continuous with right sensory clasper; sensory claspers heavily sclerotized, dorsoventrally flattened, scythe shaped, slightly curved, equal in size; apex of left clasper projecting right, subducted under right clasper, apex of right clasper projecting left (Fig. 70). Tegmen semi-circular, ventral side elongated proximally, spatulate and weakly emarginate. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head and bearing a small median tubercle. Frons weakly convex, bearing sparse short setae; surface shagreened, with small, deep punctures; lateral and dorsal margins reticulate; a triangular impressed area originating between the eyes and terminating at the distal and lateral epistomal margins, the triangle is bisected by a shallow carina on the median line. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 4-7 of funicle bearing setae on the dorsal margin less than length of 2 segments. Pronotal apical area between the eyes lined with scales; disk smooth, shining; transverse medial groove on base absent.

#### **Specimens examined.** (32M, 94F)

*Type Material.* FRENCH GUIANA: Passoura [River], vi.1907, (*E. Le Mout*), F (MNHN).

*Other material.* BRAZIL: Amazonas: Reserva Ducke, 26 km NE Manaus, ex. malaise trap, ii.1995, (*M.G.V. Barbosa*), 1M (BMNH); 69 km N Manaus, 7.xii.1979, (*G. Stevens*), 8M, 7F (USNM); Manaus, 'Corcovado, N.P.' [error? - this park is in Costa Rica], 26.xi.1979, (*G. Stevens*), 1F (USNM); Mato Grosso: 12° 31'S, 51° 46'W, R.S. & R.G.S. Exped., ex. dry forest, 12-18.xi.1968, (*O.W. Richards*), 1M (BMNH); [Mato Grosso]: 12° 31'S, 51° 46'W, RS-RGS, 12-18.xi.1968, (*R.A. Beaver*), 6M, 8F (USNM); Rondônia: BR: 364, km 48, ex. armadilha de malaise [= malaise trap], 27.ix.1979, (*Cecil Blancardi*), 1M (USNM). ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, vii.1994, (*T.L. Erwin et al.*), lot 744, 1M (USNM), 1M, 1F (MSUC); x.1994, lot 936, 1F (USNM); i.1995, lot 961, 1M, (USNM); x.1995, lot 1265, 3M, 3F (USNM), 1F (MSUC); x.1995, lot 1495, 1M (MSUC); x.1996, lot 1755, 1M, 2F (USNM). GUYANA: [= Region 8]: Iwokrama Forest, Pakalau hills, 4.748333, -59.026667, 70 m, ex. beating treefall litter, 27.v.2001, (*R. Brooks, Z. Falin*), 1M (SMEC); ex. on bark, downed tree, 27.v.2001, (*R. Brooks, Z. Falin*), 1M (SMEC). PERU: Madre de Dios: Los Amigos Biological Station, -12.56916, -70.100114, 250 m, 10-16.v.2008, (*Smith, Hulcr*), 2M, 45F (MSUC); 17-25.v.2008, (*Smith, Hulcr*), 3M, 24F (MSUC); Tampopata, 15 km NE Puerto Maldonado, Reserva Cuzco Amazonico, Quebrada Mariposa, -12.55, -69.55, 200 m, flight intercept trap, 13-15.vi.1989, (*A. Leschen*), 1M (SMEC); No specific locality: 'Ibaria' (?), Rio Pachitea, 120 m, 10.xii.1967, (*R. Garcia*), 1M (MUSM).

**Distribution.** Brazil (Amazonas, Mato Grosso, Pará, Rondônia), Ecuador (Napo), French Guiana, Guyana, Peru (Madre de Dios).

**Hosts.** *Protium amazonicum* Swart (Burseraceae), *Protium* sp. ("Almesca branca" [Brazil], "Almesca vermelha" [Brazil], "Breu branco" [Brazil]) (Beaver 1972).



**Biology.** *Camptocerus aterrimus* infest 2 - 5 cm diameter branches and create a vertical maternal gallery extending above and below the entrance tunnel in the pith of small branches and twigs. Two short radial maternal galleries may also be created in larger stem. Females lay single eggs along the maternal gallery in wide niches cut at right angles to the gallery and plugged with boring dust. Larvae enlarge their cradles parallel to the maternal gallery and parallel to the grain of wood. Beaver (1972) provides a detailed description of the life history.

***Camptocerus distinctus* Smith and Cognato, new species**  
(Fig. 44, 71)

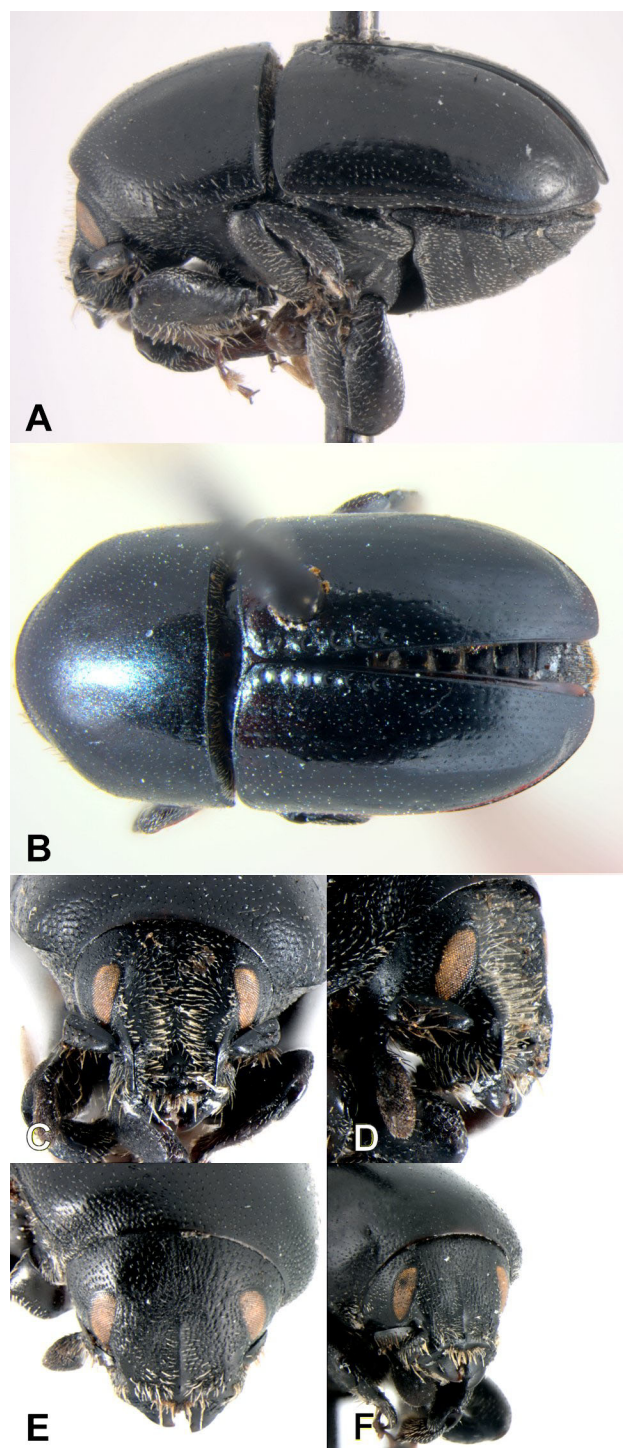
**Type Material.** Holotype: male, ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (T.L. Erwin *et al.*), lot 613 (USNM held in trust for MECN). Paratypes: ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (T.L. Erwin *et al.*), lot 613, 2F (USNM); 1M, 1F (MSUC).

**Diagnosis.** This species is solid black. The male is distinguished by the shining, black elytra, by each elytron with 8 rugae on the discal sutural interstriae and extending to the second discal interstria and each rugae bearing a single setae that arises from the center, by the conical median tubercle on the apical epistomal margin, by the lateral epistomal margins bearing vertical carinae, by the basal epistomal margin tumid above scape insertion (Fig. 2b), by the erect frontal setae, and by the absence of a transverse groove on the basal pronotal margin.

The female is distinguished by the 8 shallow rugae on the discal sutural interstriae of each elytron, each rugae bearing a single setae that arises from the center and by the reticulate frons.

**Description (male).** 5.3 mm long (mean = 5.3 mm; n = 2); 1.9-2.1 times as long as wide. Color uniformly shining black.

Epistoma strongly excavated, expanded to greater than quarter length of head; surface reticulate; bearing a few short setae; each lateral margin with a sub-acute vertical costa pointing; apical margin armed with a conical median tubercle 1.5 times longer than base width; basal margin tumid above scape insertion. Frons strongly excavated; reticulate; bearing moderately dense, erect, fine, pale hair-like setae; excavation borders the ocular mar-



**Figure 44.** *Camptocerus distinctus*, 5.3 mm, holotype male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

gin; excavation margins rounded and bearing a single row of long hair-like setae. Antennal scape elongate, expanded distally, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin broadly rounded (Fig. 5a), area between the eyes glabrous; glabrous, smooth, shining, minutely punctured; base recurved (Fig. 8a), without a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type H (Fig. 12h).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Glabrous, smooth, shining. Discal sutural interstriae bearing 8 rugae to the second interstria of each elytron, each rugae bearing a single setae arising from its center, striae not impressed; stria punctures small, interstitial punctures minute, half size of those of striae and strongly confused. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

Male genitalia. Median lobe flat, lateral and apical margins with moderate sclerotization; lateral folds thick, uniformly arcuate; apex flat; lateral margins of median lobe folded dorsally, forming a broad point on apical third. Median struts stout, laterally compressed and wider basally, more than a third of body length. Internal sac central area and seminal valve membranous; sensory claspers heavily sclerotized, equal in size, dorsoventrally flattened and broadly rounded at base, laterally compressed medially, dorsoventrally flattened and scythe shaped apically; apex of left clasper projecting right, subducted under right clasper, apex of right clasper projecting left (Fig. 71). Tegmen semi-circular, ventral side elongated proximally. Spicule destroyed in dissection.

**Female.** Similar to male except epistoma less than a quarter length of head, bearing a small median tubercle with height one half of the base width; moderately covered with setae; basal margin tumid above scape insertion. Frons flat, bearing sparse, short, fine setae; reticulate, with moderately sized, deep punctures; a triangular impressed area originating near the vertex and terminating at the distal and lateral epistomal margins, the triangle is bisected by a shallow carina on the median line. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 5-7 of funicle bearing setae on both ventral and dorsal margins, those less than the length of 2 segments. Each elytron with 8 shallow rugae on the discal sutural interspace to second interstriae, each rugae with a single setae arising from its center.

**Specimens examined.** (2M, 3F)

**Distribution.** Ecuador (Napo).

**Hosts.** Unknown.

**Biology.** Unknown.

**Etymology.** *Distinctus* (L) = distinct. This species possesses numerous distinct autapomorphies and is very different from other *Camptocerus* species.

***Camptocerus hirtipennis* Schedl, removed from synonymy**  
(Fig. 45, 72)

*Camptocerus hirtipennis* Schedl 1973: 165. Holotype: male, BRAZIL: Amazonas: Tefe (MZSP).

**Diagnosis.** This species has a dark brown pronotum and solid black elytra. The elytra are densely covered with long, yellow, recumbent hair-like setae. This species is closely related to *C. suturalis* and the male is distinguished by the larger size, the solid black elytra, the lateral epistomal margins bearing an arcuate costa pointing distally, by the partially sulcate apical pronotal margin (Fig. 5b), and by the rugose basal medial area of pronotum.



The female is distinguished from that of *C. suturalis* by the solid black elytra and vestiture as mentioned above, by area of the apical pronotal margin between the eyes lined with scales, by the crescent-shaped gena mycangia (Fig. 4b) and by the enlarged punctures on the vertex.

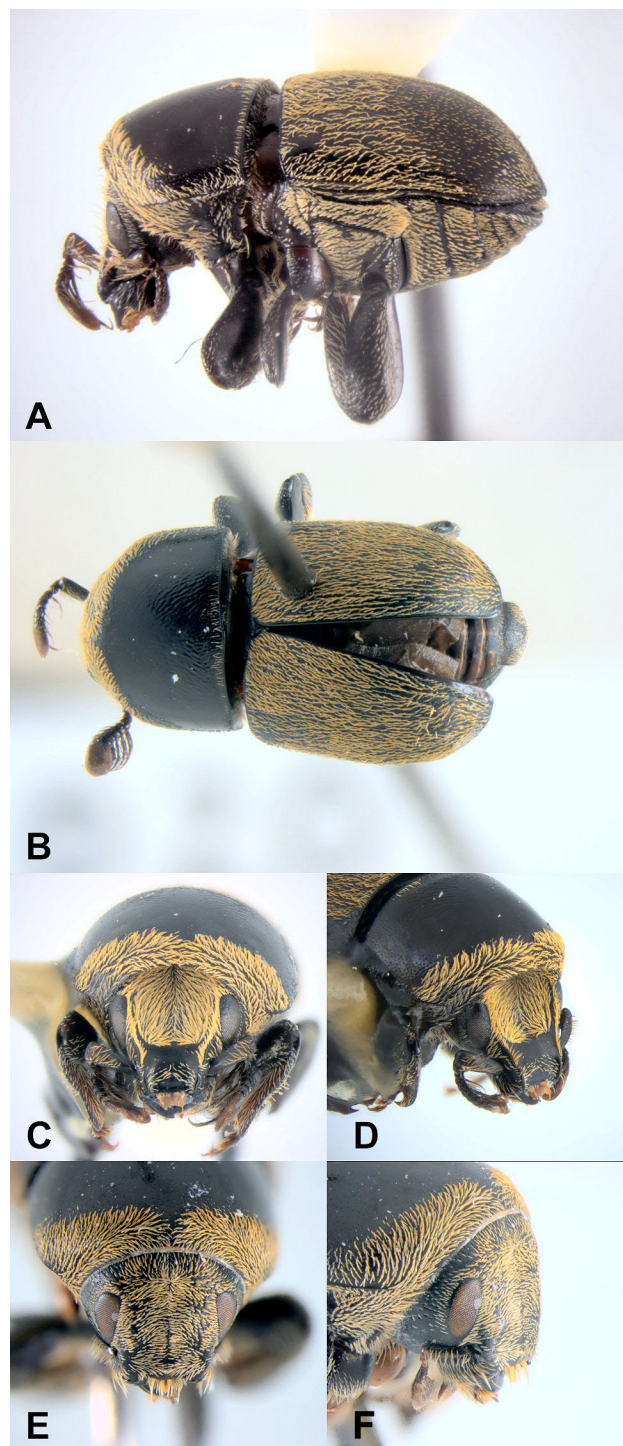
**Redescription (male).** 4.9-5.6 mm long (mean = 5.0 mm;  $n = 9$ ); 1.9-2.2 times as long as wide. Color uniformly dark brown or black. The body, except pronotum disk, is entirely covered by dense recumbent, hair-like golden setae. Setae are sometimes abraded.

Epistoma strongly excavated, expanded to greater than a quarter length of head; surface shagreened; bearing few short setae; each lateral margin of epistoma with a sub-acute, arcuate costa pointing distally; apical epistomal margin unarmed; basal epistomal margin armed with a glabrous, transverse, concave carina. Frons strongly excavated; surface shagreened; bearing dense long golden hair-like setae; margin of excavation bearing a single row of long hair-like setae. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin declivous, partially sulcate (Fig. 5b), area between eyes lined with fine bifid setae; smooth, shining, minutely punctured; basal half deeply rugose creating a wrinkled appearance; anterior fifth bearing long yellow setae, which project diagonally along the lateral margin from the anterolateral margin; basal margin with a row of short setae, those on medial third setae twice as long as those of later thirds; vestiture emarginate at median line; base straight (Fig. 8a), without a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Elytra densely covered with long recumbent golden hair-like setae on both striae and interstriae; striae not impressed, punctures twice as large as those of interstriae; interstitial punctures minute, strongly confused. Discal interstriae bearing 2-4 rows of setae. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).



**Figure 45.** *Camptocerus hirtipennis*, 4.9-5.6 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



Male genitalia. Median lobe arcuate, lateral and apical margins with heavy sclerotization; lateral folds thick, uniformly arcuate; apex mushroom shaped, surface bearing fine, pale and long hair-like setae; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly more than a third of body length. Internal sac central area membranous; seminal valve on apical quarter amorphous, lightly sclerotized with moderately sclerotized 'V', lightly sclerotized below base of sensory claspers; sensory claspers heavily sclerotized, dorsoventrally flattened, each half as wide as median lobe basally, broad basally and rapidly tapering apically, left lobe strongly ventrally curved, subducted under right, apex broadly rounded, right lobe not as ventrally curved, apex bilobed (Fig. 72). Tegmen semi-circular, ventral side elongated proximally and spatulate. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head, with a small median tubercle. Frons flat, bearing short, moderately dense setae; moderately sized, deep punctures; a triangular impressed area originating between the eyes and terminating at the distal and lateral epistomal margins the triangle is bisected by a shallow carina on the median line. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 5-7 of funicle bearing setae on dorsal margin, these less than length of 2 segments. Apical pronotal margin rounded (Fig. 6a), margin between eyes lined with scales; disk smooth, shining.

**Specimens examined.** (8M, 13F)

*Type material.* Allotype, BRAZIL: Amazonas: Tapurucuara am Rio Negro, 29.xi.1962, (C. Lindemann), F (NHMW).

*Other material.* BRAZIL: Amazonas: Hwy ZF 2, km 20.7, ca 60 km N. Manaus, 2°30'S, 60°15'W, ex. canopy fogging, 16.viii.1979, (Adis, Erwin, Montgomery et al.), 1F (USNM); 69 km N Manaus, 7.xii.1979, (G. Stevens), 7M, 7F (USNM). ECUADOR: Napo: Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, vi.1998, (T.L. Erwin et al.), lot 1853, 1F (USNM); vi.1998, lot 1867, 1F (MSUC); vi.1998, lot 1892, 1M (MSUC); x.1998, lot 1955, 1F (USNM); x.1998, lot 1988, 1F (USNM).

**Discussion.** Wood and Bright (1992) considered this species to be a synonym of *Camptocerus suturalis*. Holotype comparison required the resurrection of *C. hirtipennis* based on the solid black color of the elytra, on the presence of genal mycangia, on the presence of dense vestiture restricted to the anterior margin of the pronotum, on the larger size, and on characters of the male genitalia.

**Distribution.** Brazil (Amazonas), Ecuador (Napo).

**Hosts.** Unknown.

**Biology.** Unknown.

***Camptocerus mandelshtami* Petrov**

(Fig. 46, 73)

*Camptocerus mandelshtami* Petrov 2007: 101. Holotype: male, PERU: Loreto: 68 km SW from Iquitos to Itaya river, 4°11'S 73°26'W, 120 m, (A. Petrov) (ZMMU).

**Diagnosis.** This species is distinguished by the glabrous elytra, by the bicolored pronotum (anterior black, posterior fifth - two fifths orange) and the other color patterns described below. Males of the species are distinguished by the apical epistomal margin bearing a median triangular tubercle, by the strongly rugose basal medial region of pronotum, by the sulcate apical pronotal margin (Fig. 5c), and by the transverse medial groove on the pronotal base.

Females are distinguished by the unique color pattern and by a black frons with an orange patch extending from the vertex to the epistoma.

**Redescription (male).** 5.9-6.5 mm long (mean = 6.3 mm; n = 6); 1.8-2.0 times as long as wide. Head and antennae, dark red brown; pronotum bicolored (anterior fifth to two-fifth's orange, remainder black), prothoracic legs red orange, remaining legs black; thorax, abdomen and elytra black.

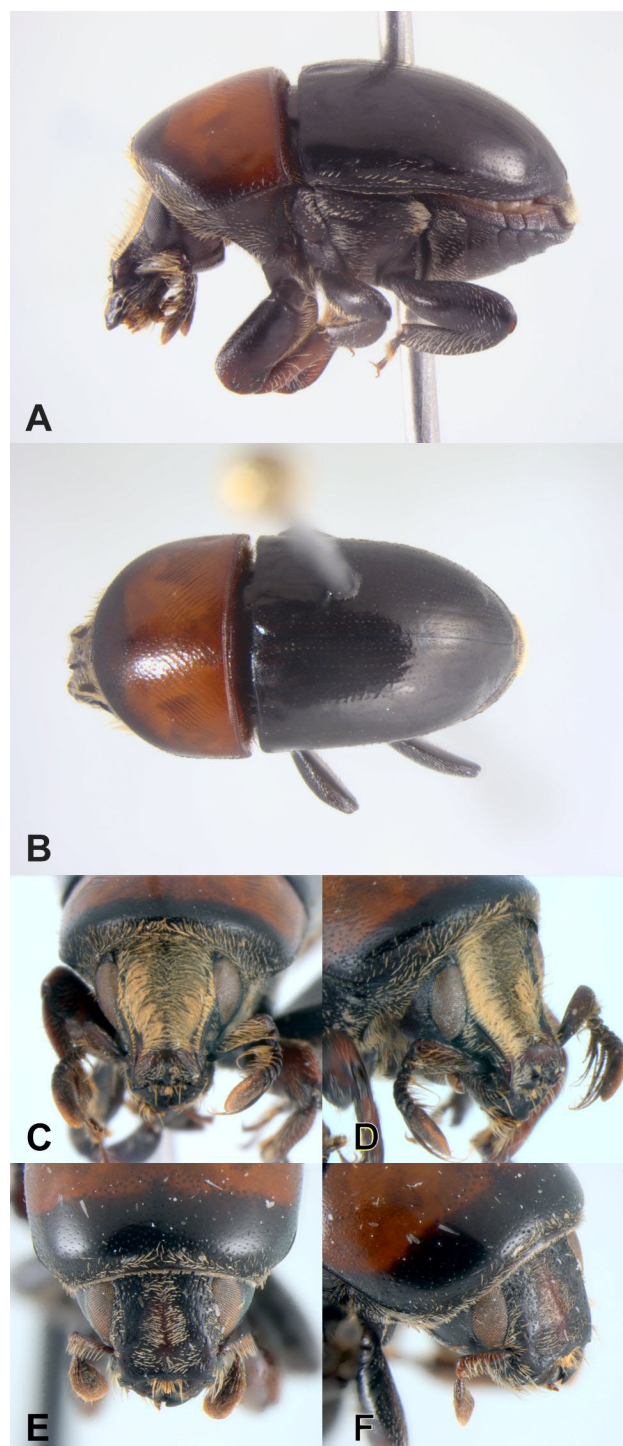
Epistoma strongly excavated, expanded to less than a quarter length of head; surface shagreened; each lateral margin with a sub-acute, arcuate costa pointing distally; apical margin armed with a conical median tubercle as long as than base width; basal margin armed with a transverse, concave carina (Fig. 2a), bearing a tuft of thick apically rounded setae above scape insertion. Frons strongly excavated; surface shagreened; bearing dense, long, golden hair-like setae; margin of excavation bearing a single row of long hair-like setae, those near the ocular margin with flattened apices. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin declivous, entirely sulcate (Fig. 5c), area between eyes lined with fine bifid setae; glabrous, smooth, shining, minutely punctured; basal three-quarters deeply rugose creating a wrinkled appearance; base straight (Fig. 8a), with a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Elytra glabrous, smooth, shining. Discal interstitial punctures minute, shallow, strongly confused on disk. Declivital striae not impressed. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

Male genitalia. Median lobe arcuate, lateral and apical margins with heavy sclerotization; forming a thicker subacute point in middle; apex mushroom shaped, apical and lateral margins with fine, pale and long hair-like setae; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly more than a third of body length. Internal sac central area membranous; seminal valve on apical quarter moderately sclerotized, amorphous, with a heavily sclerotized longitudinal keel and many sclerotized longitudinal ridges just left of the median line, 2 heavily sclerotized rounded lobes against lateral folds,



**Figure 46.** *Camptocerus mandelshtami*, 5.9-6.5 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

moderately sclerotized below base of sensory claspers; sensory claspers heavily sclerotized, dorsoventrally flattened, each half as wide as median lobe basally, broad basally and rapidly tapering apically; left lobe strongly ventrally curved, subducted under right, right lobe not as ventrally curved (unable to examine apices of sensory claspers) (Fig. 73). Tegmen damaged in dissection. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head, and bearing a small median tubercle. Frons flat, bearing sparse, short setae; with large, deep punctures; a triangular impressed area originating between the eyes and terminating at the distal and lateral epistomal margins, the triangle is bisected by a shallow carina on the median line; medial impressed triangular region is orange. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 1-7 of funicle bearing setae on both dorsal and ventral margins, those less than the length of 2 segments. Apical pronotal declivity partially sulcate (Fig. 6b), area between the eyes lined with scales; disk, smooth, shining; transverse medial groove on base absent.

#### **Specimens examined.** (11M, 14F)

*Type Material.* Unable to examine type material.

*Other material.* ECUADOR: *Napo*: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, x.1994, (*T.L. Erwin et al.*), lot 952, 1M (USNM), 2M (MSUC); vii.1995, lot 1082, 2M, 4F (USNM); x.1995, lot 1222, 1F (USNM); x.1995, lot 1254, 1M (MSUC); vii.1996, lot 1604, 1M (USNM), 1F (MSUC); x.1996, lot 1712, 1F (USNM), 1F (MSUC); vi.1998, lot 1856, 2F (USNM). PERU: *Loreto*: 70 km SSW from Iquitos to Nauta, left bank of Amazon River, 140 m, 23.ii.2008, (*A. Petrov*), 3M, 2F (MSUC); 29.ii.2008, 1M, 1F (MSUC); *No specific locality*: 'Peru', 1F (MNHN).

**Distribution.** Ecuador (*Napo*), French Guiana, Peru (*Loreto*).

**Hosts.** *Protium* spp. (Burseraceae).

**Biology.** Petrov (2007) provides a detailed account of the gallery system, which appears to resemble that of *C. aeneipennis*.

#### ***Camptocerus noel* Smith and Cognato, new species**

(Fig. 47, 74)

**Type Material.** Holotype: male, PERU: *Loreto*: 1.5 km N Teniente Lopez, 2°35.66'S 76°6.92'W, 210-240m, ex. flight intercept trap #134, 20.vii.1993, (*Richard Leschen*) (SMEC). Paratypes: BOLIVIA: *La Paz*: 'Chuma' [dubious locality due to high elevation and cold climate]: xii.1936 (*Y. Mexia*), 6M, 4F (CASC); 'Mapiri', 1F (NHRS). BRAZIL: *Amazonas*: AM 010, km 26, Reserva Ducke, ex. malaise trap, 27.ix.1978, (*J. Arias*), 1F (USNM); Manaus, ii.1944, (*Praetorius*), 1F (AMNH); Reserva Ducke, 26 km NE Manaus, ex. malaise trap, (*M.G.V. Barbosa*), ii.1995, 2M, 1F (BMNH); iii.1995, 1F (BMNH); *Mato Grosso*: 12° 50'S, 51° 45'W, Roy. Soc.-Roy. Geographic Soc. Xavantina-Cachimbo Exped. 1967-1969, coll. 1968, (*B.E. Freeman*), 1M (BMNH); [*Minas Gerais*]: Sete Lagoas, 1F (MZMC); *Pará*: Benevides, ii.1895, (Gounelle), 2F (SDEI); *Rio de Janeiro*: (*Kirsch*), 1F (SMTD); *Santa Catarina*: Joinville, ?ii.1920, (*Melzer*), 1F (SDEI); *No specific locality*: *São Paulo*: 13F (SDEI); 'Brasil', (*W. Müller*), 2F (SMTD); 'Brasília', 1F (MZMC); 'Brasilien', (*Kratz*), 1F (SDEI); 'Rio Madeira' [river runs through states of Rondônia and Amazonas], Madeira – Mamore R.R. Co Camp 35, (*Mann, Baker*), 2M (USNM). COLOMBIA: [= *Antioquia*]: 'Remedios', (*Nisser*), 1M (NHRS); *Santa Fe de Bogotá* [= *Bogotá D.C.*], 1M (SDEI). ECUADOR: [*Esmeraldas*]: Cachabé: low e., xii.[18]96 (*Rosenberg*), 1M (BMNH); *Napo*: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, i.1994, (*T.L. Erwin et al.*), lot 599, 1F, (USNM); i.1994, lot 602, 1F (MSUC); 1994, lot 751, 1M (MSUC); vii.1994, lot 763, 1M (USNM); vii.1994, lot 774, 1F (USNM); vii.1994, lot 776, 1M (USNM); vii.1994, lot 777, 1F (USNM); vii.1994, lot 778, 2M, 1F (USNM); i.1995, lot 952, 3M, 1F (USNM); i.1995, lot 1030, 1F (USNM); vii.1995, lot 1082, 1M (MSUC); x.1995, lot 1179, 2F (USNM); x.1995, lot 1217, 1M (USNM); i.1996, lot 1452, 1M, 1F (USNM), 1F (MSUC); vii.1996, lot 1572, 1M (MSUC); vii.1996, lot 1604, 2M (MSUC), 2F (USNM); vii.1996, lot 1618, 1M (USNM);



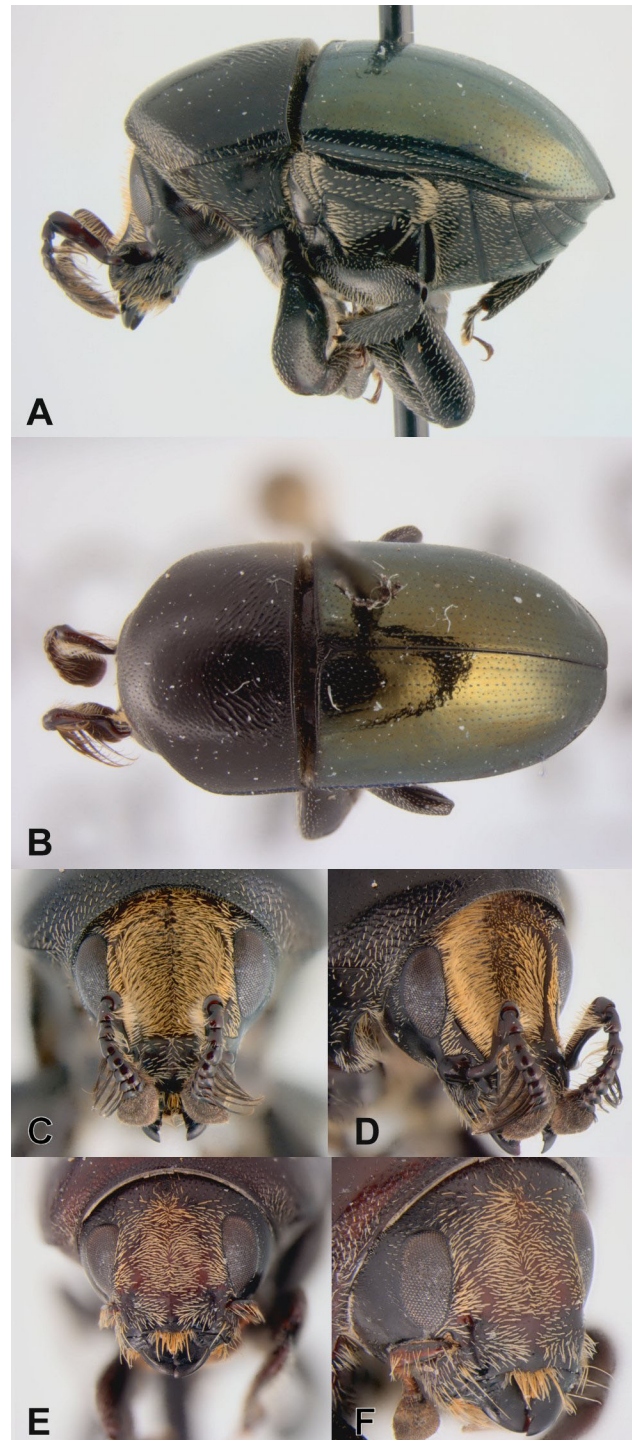
vi.1998, lot 1853, 1M (USNM); Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, vi.1998, (*T.L. Erwin et al.*), lot 1856, 2M (USNM); x.1998, lot 1949, 1M (USNM); *Pastaza*: Cusuimi, Rio Cusuimi, 150 km SE of Puyo, 320 m, 15-31.v.1971, (*B. Malkin*), 1F (FMNH); *Santo Domingo de los Tsáchilas*: Santa Domingo D.L.C. [de los Colorados], v.1982, 1F (BMNH). FRENCH GUIANA: 'Gourdonville' vii.1907, (*E. Le Moutt*), 2M (MNHN); *No specific locality*: 'Cayenne', 1F (MZMC); 'Cayenne', 1915, (*Felsche Geschenk*), 1M, 1F (SMTD); 'French Guiana', 1F (USNM); 'Guyane Franç.', 1898 (*E. Reche*), 2M (MNHN); 'Guyane Franç.', 1909 (*A. Bonhoure*), 1F (MNHN). GUYANA: [= *Region 8*]: Iwokrama Forest, 4.671822, -58.684114, 66 m, ex. *Ocotea oblonga*, 4-9.iii.2007, (*Cognato, Hulcr, Smith, Dole, McCall*), 6M, 4F (MSUC). PERU: [*Huánuco*]: 15 mi NE of Tingo Maria, 700 m, 11.xi.1954, (*E.I. Schlinger, E.S. Ross*), 4F (CASC); *Junín*: Satipo, xii.1943, (*Paprzycki*), 1M (USNM); *Loreto*: Iquitos [province not specified, Iquitos is in Loreto], iii-iv.1931, (*R.C. Shannon*), 1F (USNM); *Madre de Dios*: Los Amigos Biological Station, -12.56916, -70.100114, 250 m, ex. *Protium amazonicum*, 26.iv.-27.v.2008, (*Smith, Hulcr*), 33M, 41F (MSUC), 3M, 3F (MUSM). SURINAME: *Saramacca*: W Suriname Rd, 108 km WSW Zanderij Airport, 5°13'35N, 55°52'54"W, 30 m, ex. flight intercept trap, 8-10.vi.1999, (*Z.H. Falin, B. DeDijn*), 1M (SMEC). VENEZUELA: *Amazonas*: Cerro de la Neblina, 1 km S Basecamp, 0°50'N, 66°10'W, 140 m, ex. along a small whitewater stream; pools of dead leaves & sticks, 11.ii.1985, (*P.J. & P.M. Spangler, R. Faitoute, W. Steiner*), 1M (USNM).

**Diagnosis.** This species has metallic elytra and closely resembles *C. aeneipennis*. The male is distinguished by the larger size, the smooth elytral disk, by the shallow striae punctures and by the apical pronotal margin with lateral declivities extending to the median line (Fig. 5b).

The female is distinguished from that of *C. aeneipennis* by the larger size and by the unimpressed discal striae.

**Description (male).** 6.0-7.1 mm long (mean = 6.6 mm;  $n = 20$ ); 1.8-2.0 times as long as wide. Head, thorax, antennae and legs red-brown; pronotum commonly crimson, but may also be black; abdomen black; elytral color, ranging from metallic bronze to metallic green; rarely metallic blue in Bolivia and Peru.

Epistoma strongly excavated, expanded to greater than a quarter length of head; surface shagreened; bearing few short setae; each lateral margin with a sub-acute, arcuate costa pointing distally; apical



**Figure 47.** *Camptocerus noel*, 6.0-7.1 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).

margin unarmed; basal margin armed with a transverse, concave carina (Fig. 2a). Frons strongly excavated; surface shagreened; bearing dense long white to yellow hair-like setae; margin of excavation bearing a single row of long hair-like setae. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin with a lateral declivity extending to median line (Fig. 5b), area between eyes lined with fine bifid setae; glabrous, smooth, shining, minutely punctured; basal half deeply rugose creating a wrinkled appearance; base straight (Fig. 8a), without a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Elytra glabrous, smooth, shining; interstitial punctures strongly confused; interstitial and stria punctures minute. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

Male genitalia. Median lobe arcuate, lateral and apical margins with heavy sclerotization; lateral folds thick, uniformly arcuate; apex rounded with flat lateral margins, entire surface bearing fine, pale and long hair-like setae except apical margin; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly less than a third of body length. Internal sac central area membranous; seminal valve on apical quarter moderately sclerotized, lightly sclerotized below base of sensory claspers; sensory claspers heavily sclerotized, dorsoventrally flattened, bilobed, smaller lobe lateral, larger lobe medial; larger left lobe narrower, strongly ventrally curved, subducted under right, larger right lobe less strongly curved, broad, nearly occupying width of median lobe (Fig. 74). Tegmen semi-circular, ventral side elongated proximally, spatulate and weakly emarginate. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head, bearing a small median tubercle. Frons weakly convex, bearing sparse short setae; rugose, with moderately sized, deep punctures; a triangular impressed area originating between the eyes and terminating at the distal and lateral epistomal margins, the triangle is bisected by a shallow carina on the median line. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 1-7 of funicle bearing setae on both dorsal and ventral margins, those less than the length of 2 segments. Apical pronotal declivity weakly sulcate (Fig. 6b), margin between eyes lined with scales; disk smooth, shining.

**Specimens examined.** (84M, 103F)

**Distribution.** Bolivia (La Paz), Brazil (Amazonas, Mato Grosso, Minas Gerais, Pará, Rondônia?, Rio de Janeiro, Santa Catarina, São Paulo), Colombia (Antioquia, Bogotá), Ecuador (Esmeraldas, Napo, Pastaza, Santo Domingo de los Tsáchilas), French Guiana, Guyana, Peru (Huánuco, Junín, Loreto, Madre de Dios), Suriname, Venezuela (Amazonas).

**Hosts.** *Ocotea oblonga* (Meisn.) Mez (Lauraceae), *Protium amazonicum* Swart (Burseraceae).

**Biology.** *Camptocerus noel* colonize large branches ranging from 5 cm diameter to more than 20 cm. Females create an entrance tunnel running in a transverse plane toward the center of the stem. From this tunnel, one or two circumferential branches are added creating maternal galleries. The galleries closely resemble those of *C. aeneipennis*. *Camptocerus noel* aggregate in leaves around host trees (Smith 2009) and perform maturation feeding on leaves as (von Winning 1930; Smith 2009).

**Discussion.** *Camptocerus noel* has been considered *C. aeneipennis* for many years and is identified as *C. aeneipennis* in collections. However, the male genitalia clearly diagnoses the species. The apex of the median lobe is rounded in *C. noel* (mushroom shaped in *C. aeneipennis*); the sensory claspers are spatulate in *C. noel* (scythe shaped in *C. aeneipennis*). In addition to the morphological characters, molecular characters support the validity of this species. The species is differentiated from *C. aeneipennis* by a 12.5% sequence divergence of mitochondrial cytochrome oxidase 1 and has a 5bp insertion in the D2F1-



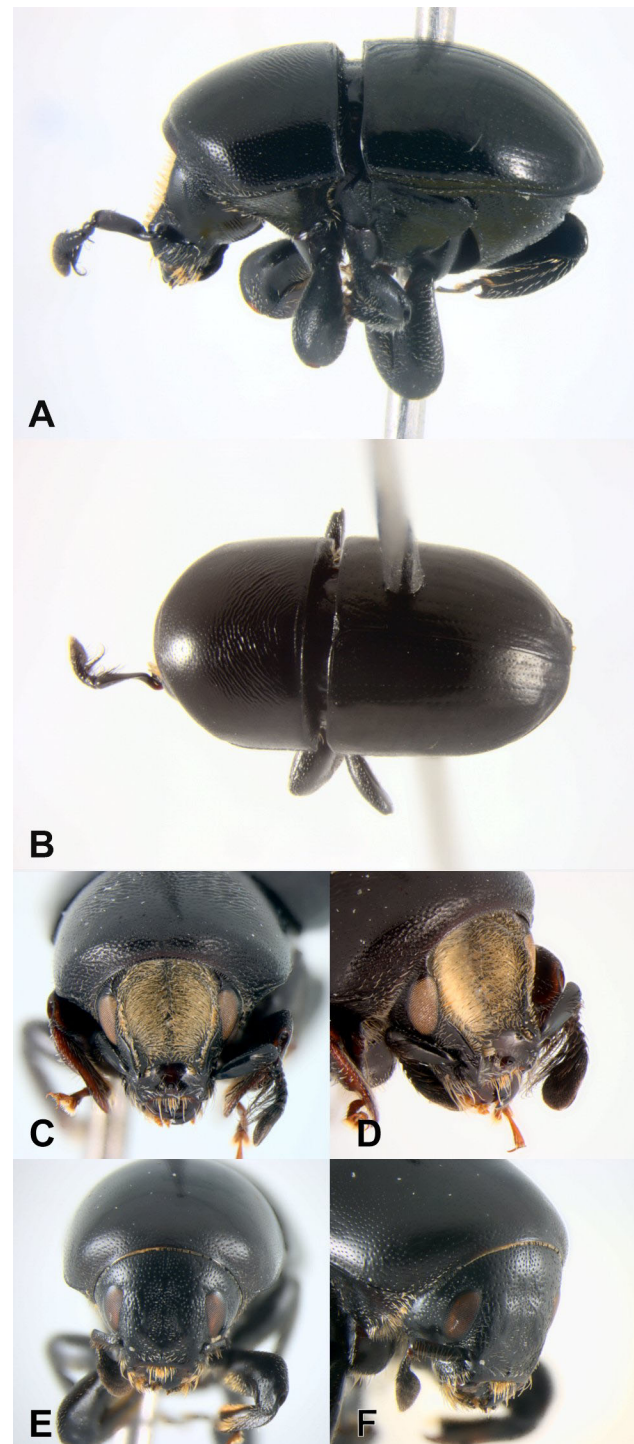
D3R2 region of nuclear ribosomal 28S. Little nucleotide variation is seen within each species (Smith and Cognato, unpublished).

Geographic variation was found in several species, but most notable are the size differences and slight color variation of *C. noel*. The elytra of *C. noel* is a brilliant metallic green in northern South America and the color changes to a metallic bronze in southern Peru and to metallic blue in southern Peru and Bolivia. Color also varies between teneral and mature adults; mature adults are darker colored.

**Etymology.** *Noel* (English) = Christmas (used as a noun in apposition). This species commonly displays 'Christmas' colors: crimson pronotum and brilliant metallic green elytra.

***Camptocerus pseudoangustior* Smith and Cognato, new species**  
(Fig. 48, 75)

**Type Material.** Holotype: male, ECUADOR: *Pastaza*: Cononaco, ex. malaise trap, 29.iv.1976, (*J. Cohen*) (USNM). Paratypes: BRAZIL: *Amazonas*: km 60 N Manaus, 18.1 km E Campinas field station, 2° 30'S, 60°15'W, ex. terra firme forest fogged with pyrethrum, (*Montgomery, Erwin, Schimmel, Krischik, Date, Bacon*), sample 20, 22.ii.1979, 1F (USNM); Manaus, 1 km W Taruma Falls, 100 m, 2.iii.1981, (*C. Young*), 1F (RJRC); 69 km N Manaus, 7.xii.1979, (*G. Stevens*) 1M, 1F (USNM); 'São Paulo d' Olivença, juin-juliet.1883', (*M. de Mathan*), 1M (MNHN); Tefé [= Ega] '7bre-8bre.1879' (*M. de Mathan*), 1F (NMHW); *Pará*: Santarém 1M (BMNH); 'Pará', 1F (BMNH). ECUADOR: *Napo*: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, vii.1994, (*T.L. Erwin et al.*), lot 684, 1M (USNM); vii.1995, lot 1125, 1F (USNM); x.1995, lot 1185, 1M (USNM); x.1995, lot 1265, 1M (USNM); vii.1996, lot 1615, 2M, 1F (MSUC); x.1996, lot 1755, 1M (USNM); Tiputini Biodiversity Station, -0.631944, -76.144167, 220-250 m, ex. canopy fogging, vi.1998, (*T.L. Erwin et al.*), lot 1876, 1M (USNM); x.1998, lot 1927, 1F (USNM); vi.1998, lot 1950, 1F (USNM); *Pastaza*: Cononaco, ex. malaise trap, 29.iv.1976, (*J. Cohen*), 1M, 2F (USNM). PERU: [*Amazonas*]: 'Peru, Rio Santiago' xi.12.1924, 1F (AMNH); [*Huánuco*]: 15 mi NE of Tingo Maria, 700 m, 11.xi.1954, (*E.I. Schlinger, E.S. Ross*), 1F (USNM); *Loreto*: 58 km SSW from Iquitos to Nauta, Itaya river 120m, 6.ii.2007, (*A. Petrov*), 1M (MSUC); *Madre de Dios*: Los Amigos Biological Station, -12.56916, -70.100114, 250 m, ex. *Protium amazonicum*, 10-



**Figure 48.** *Camptocerus pseudoangustior*, 4.5-5.4 mm, male. Lateral (A), dorsal (B); head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



16.v.2008, (*Smith, Hulcr*), 5M, 27F (MSUC); 17-25.v.2008, (*Smith, Hulcr*), 3M, 4F (MSUC), 1M, 1F (MUSM); Z.R. Tampopata, 300 m, iv-v.1986, (*I. Bohórquez*), 1F (MUSM). *NO SPECIFIC LOCALITY*: 'Bassin de l'Amazone', [Amazon Basin] 1913, (*Guilhermo Hoffmann*), [Eggers cotype *Camptocerus aterrimus*] 1M (NHMW).

**Diagnosis.** This species is black with dark brown gena and legs. Males are distinguished by the generally larger body size, by the apical epistomal margin bearing a median tubercle, by the transverse medial groove on the pronotal base, by the basal medial pronotum region strongly rugose, and by the mostly confused elytral interstrial punctures.

Females are distinguished from those of *C. aterrimus* by the larger size.

**Description (male).** 4.5-5.4 mm long (mean = 5.1 mm; n = 18); 1.7-2.0 times as long as wide. Head, antennae, thorax, abdomen and elytra black; gena and legs dark red brown.

Epistoma strongly excavated, expanded to less than a quarter length of head; surface shagreened; each lateral margin with a sub-acute, arcuate costa pointing distally; apical margin armed with a conical median tubercle 1.5 times longer than base width; basal margin armed with a transverse, concave carina (Fig. 2a), bearing a tuft of thick apically rounded setae above scape insertion. Frons strongly excavated; surface shagreened; bearing dense long white hair-like setae; margin of excavation bearing a single row of long hair-like setae, those near the ocular margin with flattened apices. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin declivous, entirely sulcate (Fig. 5c), area between eyes lined with fine bifid setae; glabrous, smooth, shining, minutely punctured; basal half deeply rugose creating a wrinkled appearance; base straight (Fig. 8a), with a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Elytra glabrous, smooth, shining. Discal interstriae with punctures strongly confused, minute and shallow. Tenth interstriae with a carina longer than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

Male genitalia. Median lobe arcuate, lateral and apical margins with moderate sclerotization; forming a thicker subacute point in middle; apex rounded with flat lateral margins, surface covered with fine, pale and long hair-like setae; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly less than a third of body length. Internal sac central area membranous; seminal valve on apical quarter rounded, with a semi-circular sclerotized band, lightly sclerotized below base of sensory claspers; sensory claspers heavily sclerotized, dorsoventrally flattened, scythe shaped, slightly curved, each equal in size; apex of left clasper projecting right, subducted under right clasper, apex of right clasper projecting left (Fig. 75). Tegmen semi-circular, ventral side elongated proximally, spatulate. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head, with a small median tubercle; Frons flat, bearing sparse short setae; surface shagreened, often rugose-reticulate, with large, deep punctures; a triangular impressed area originating between the eyes and terminating at the distal and lateral epistomal margins, the triangle is bisected by a shallow carina on the median line. Each gena with a crescent-shaped mycangium (Fig. 4b). Segments 1-7 of funicle bearing setae on the dorsal margin, these less than length of 2 segments. Apical pronotal declivity partially sulcate (Fig. 6b), margin between eyes lined with scales; disk smooth, shining; transverse medial groove on base absent.

**Specimens examined.** (23M, 45F)

**Distribution.** Brazil (Amazonas; Pará), Ecuador (Napo, Pastaza), Peru (Amazonas, Huánuco, Junín, Loreto, Madre de Dios).

**Hosts.** *Protium amazonicum* Swart (Burseraceae), *Protium* sp.

**Biology.** *Camptocerus pseudoangustior* infest 2 - 5 cm diameter branches. The maternal gallery extends transversely through the stem to near the opposite side. Females create a vertical maternal gallery extending above and below the entrance tunnel in the pith of small branches and twigs. Two short radial maternal galleries are created in larger stem. Females lay single eggs along the maternal gallery in wide niches cut at right angles to the gallery and plugged with boring dust. Larvae enlarge their cradles parallel to the maternal gallery and parallel to the grain of wood. Galleries strongly resemble those of *C. aterrimus*. Beetles aggregate in leaves around host trees and perform maturation feeding on leaves (Smith 2009).

**Discussion.** Specimens of this species have been commonly identified as *C. angustior* in collections and keys (ex. Wood 2007).

**Etymology.** *Pseudo-* (G) = false, *- angustior* = a *Camptocerus* species.

### ***Camptocerus suturalis* (Fabricius)**

(Fig. 49, 76)

*Camptocerus suturalis* (Fabricius) 1801: 393 (*Hylesinus*). **Lectotype (here designated):** male, [GUYANA]: 'Essequibo' [River] (ZMUC).

*Camptocerus cinctus* Chapuis 1869: 51. Holotype: female, [South America] 'Amerique meridionale' (ISNB).

#### **New synonymy.**

*Camptocerus fasciatus* (Fabricius) 1801: 392 (*Hylesinus*). **Lectotype (here designated):** male, [GUYANA]: 'Essequibo' [River] (ZMUC). Synonymy: Eggers 1929: 45.

**Notes.** Synonymy of *C. fasciatus* confirmed by Wood (1972: 243).

**Diagnosis.** Both sexes display a unique color pattern described below. The elytra of both sexes are moderately covered by short, recumbent golden hair-like setae on the striae and interstriae. The male is distinguished from other species in the aeneipennis clade by the lateral epistomal margins bearing vertical costae, and by the proximal epistomal margin bearing a transverse, weakly developed carina.

The female is recognized by the area of the apical pronotal margin between the eyes bearing setae palmately divided into 2-3 filaments and by the absence of mycangia on the gena or vertex.

**Redescription (male).** 3.6-5.0 mm (mean = 4.3 mm; n = 14); 1.8-2.1 times as long as wide. Head, antennae, thorax, pronotum, legs are red-orange to red. Each elytron is black with an orange oval extending from the lateral margin of the elytral interstriae to interstria 10 and from the basal fifth of elytra to the apical four-fifths. Body moderately covered by recumbent, hair-like setae. Setae are sometimes abraded.

Epistoma strongly excavated, expanded to greater than a quarter length of head; surface shagreened; bearing few short setae; each lateral margin of epistoma with a vertical carina; apical margin unarmed; basal margin armed with a glabrous, transverse, concave carina (Fig. 2a). Frons strongly excavated; surface shagreened; bearing dense long golden hair-like setae; margin of excavation bearing a single row of long hair-like setae. Antennal scape elongate and narrow, glabrous on proximal quarter, ventral half bearing setae, these equal to 1/3 length of scape; segments 2-7 of funicle bearing brushes of setae, these equal to 1.5 times the length of scape; segments 2-7 of funicle bearing setae on dorsal margin, these less than length of 3 segments; anterior face of the club setose, with a partial septum.

Apical pronotal margin declivous, partially sulcate (Fig. 5b), area between eyes lined with fine setae palmately divided into 3-4 filaments; glabrous, smooth, shining, minutely and moderately deeply punctured; bearing recumbent hair-like setae (sometimes abraded); base straight (Fig. 8a), without a transverse medial groove; carina on lateral margin type B (Fig. 7b).

Scutellum shape type A (Fig. 12a).

Elytral sides parallel, narrowing to a smooth apex; base never tumid from interstriae 7-9. Elytra densely covered with long recumbent golden hair-like setae on both the striae and interstriae (sometimes abraded); striae weakly impressed, punctures small, shallow; interstitial punctures minute, strongly confused. Tenth interstriae with a carina shorter than metepisternum. Metepisternum shape type B (Fig. 9b); setae bifid. Mesosternum shape type A (Fig. 10a).

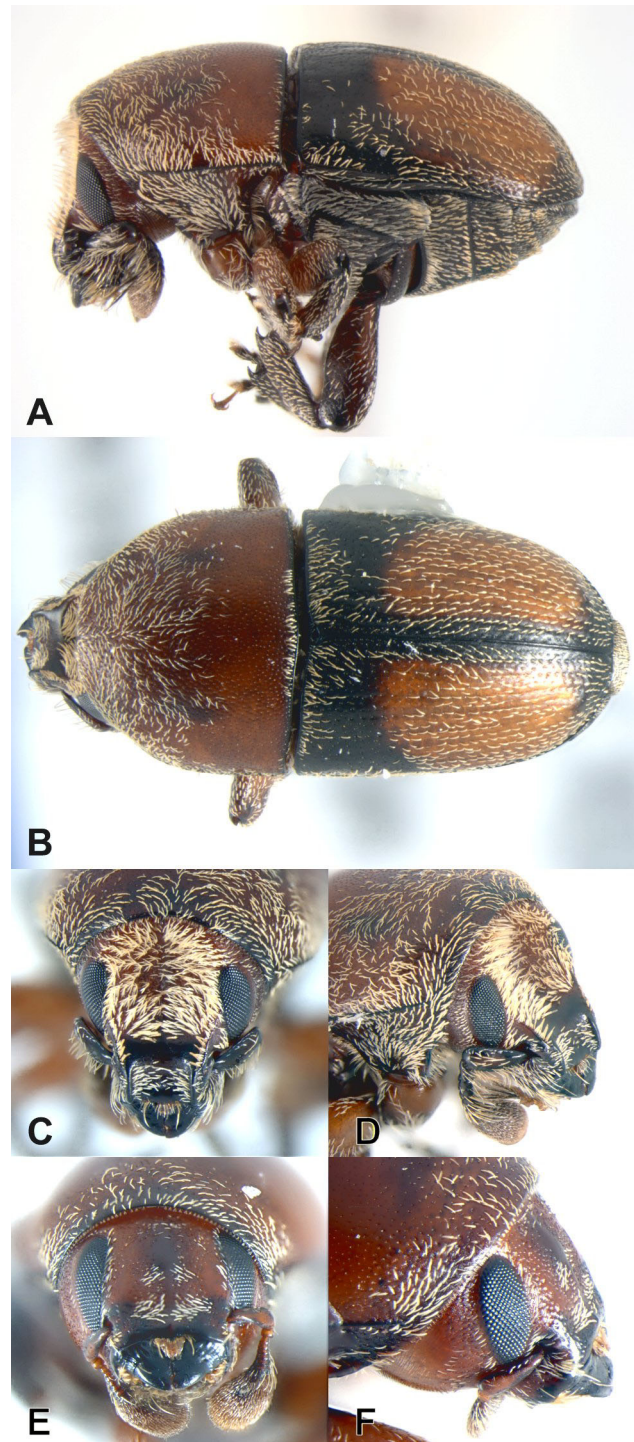
Male genitalia. Median lobe strongly arcuate, lateral and apical margins with more sclerotization; apex mushroom shaped, set below the level of the median lobe, apical and lateral margins with fine, long and long hair-like setae; lateral margins of median lobe folded dorsally, thick, broadly arcuate from apex to median struts. Median struts stout, laterally compressed and wider basally, slightly less than a quarter of body length. Internal sac central area lightly sclerotized, seminal valve on apical third sclerotized, dorsoventrally flattened, semi-circular, forming an acute point basally and broad and emarginated apically (Fig. 76). Tegmen semi-circular, ventral side elongated proximally and spatulate. Spicule nearly longer than aedeagus, sickle-shaped.

**Female.** Similar to male except epistoma less than a quarter length of head, bearing a small median tubercle. Frons flat, bearing short, moderately dense setae; surface shagreened, with moderately sized, deep punctures; with a shallow carina on the median line originating between the eyes and terminating at the epistoma. Mycangia absent on both the gena (Fig. 4a) and vertex. Segments 1-7 of funicle bearing setae on the dorsal margin, these less than length of 2 segments. Anterior pronotal margin rounded (Fig. 6a).

**Specimens examined.** (31M, 35F, 3 unknown sex)

*Type Material.* Lectotype *Camptocerus suturalis*, M (ZMUC); Paralectotypes (**here designated**) *Camptocerus suturalis*, NO LOCALITY: 1M, 3F (MZMC); Holotype *Camptocerus cinctus*, F (ISNB); Lectotype *Camptocerus fasciatus*, NO LOCALITY: M (MZMC); Paralectotypes (**here designated**) *Camptocerus fasciatus*, NO LOCALITY: 1M, 3F, 1 unknown sex (MZMC).

*Other material:* BRAZIL: Amazonas: 69 km N Manaus, (G. Stevens), 7.xii.1979, 1M (USNM); *No specific locality:* 'Brasil' 1F (NHRS). ECUADOR: Napo: Reserva Ethnica Waorani, 1 km S Onkone Gare Camp, -0.652778, -76.433333, 220 m, ex. canopy fogging, (T.L. Erwin et al.), lot 859, x.1994, 1F (USNM); lot 3265, vii.2006, 1F (USNM). FRENCH GUIANA: 'Gourdonville', vii.1907 (E. LeMoult), 2M, 3F (MNHN). GUYANA: [= Region 8]: Iwokrama



**Figure 49.** *Camptocerus suturalis*, 3.6-5.0 mm, male. Lateral (A), dorsal (B); male head anterior (C), anterior oblique (D); female head anterior (E), anterior oblique (F).



Forest, 4.671822, -58.684114, 66 m, ex. *Ocotea oblonga*, 4-9.iii.2007, (Cognato, Hulcr, Smith, Dole, McCall), 11M, 10F (MSUC). PERU: Loreto: 68 km SW from Iquitos to Nauta, Nauta River, 120 m, 7.ii.2005, (A. Petrov), 12M, 7F, 1 unknown sex (MSUC); Madre de Dios: Los Amigos Biological Station, -12.56916, -70.100114, 250 m, ex. *Protium amazonicum* 26.iv.-27.v.2008, (Smith, Hulcr), 2M, 3F (MSUC). SURINAME: No specific locality: 'Surinam', (H. Lund), 1M (ZMUC). VENEZUELA: Amazonas: 'Mt. Duida', 4.xi.1928, 1M (AMNH). NO SPECIFIC LOCALITY: 2F, 1 unknown sex (ZMUC).

**Discussion.** Wood (2007) recognized *Camptocerus cinctus* as a separate species. Examination of the holotypes of *C. cinctus* and *C. suturalis* revealed that *C. cinctus* is a teneral adult of *C. suturalis*.

**Distribution.** Brazil (Amazonas, Pará), Ecuador (Napo), French Guiana, Guyana, Peru (Loreto, Madre de Dios), Suriname, Venezuela (Amazonas).

**Hosts.** *Ocotea oblonga* (Meisn.) Mez (Lauraceae), *Protium amazonicum* Swart (Burseraceae), *Protium* sp.

**Biology.** In Guyana, *Camptocerus suturalis* adults create entrance tunnels within 1 mm of *C. aeneipennis* entrance tunnels. The gallery systems of each species are separated by a thin septum (less than 1mm), allowing fungal mycelium in *C. aeneipennis* galleries to grow into those of *C. suturalis* indicating that *C. suturalis* is likely mycocleptic (Hulcr 2009). Females create an entrance tunnel running in a transverse plane toward the center of the stem. From this tunnel, two circumferential branches are added creating maternal galleries. Galleries follow those of the ambrosia fungus host and the thin septum is maintained. Females lay single eggs along the maternal gallery in wide niches cut at right angles to the gallery and plugged with boring dust. Niches are only created on the surface opposite to the host gallery. Larvae enlarge their cradles with the grain of the wood. Mycocleptism was also observed in Peru with *Camptocerus suturalis* parasitizing fungus from galleries of *C. noel*, *C. pseudoangustior*, *C. aeneipennis* (Smith, pers. obs.) and *C. mandelshtami* (Petrov, pers. comm.). This species has also been observed aggregating in leaves around host trees (Petrov, pers. comm.).

**Discussion.** Due to its mycocleptic habit and position within *Camptocerus* (Fig. 14), *C. suturalis* has likely lost its mycangia.

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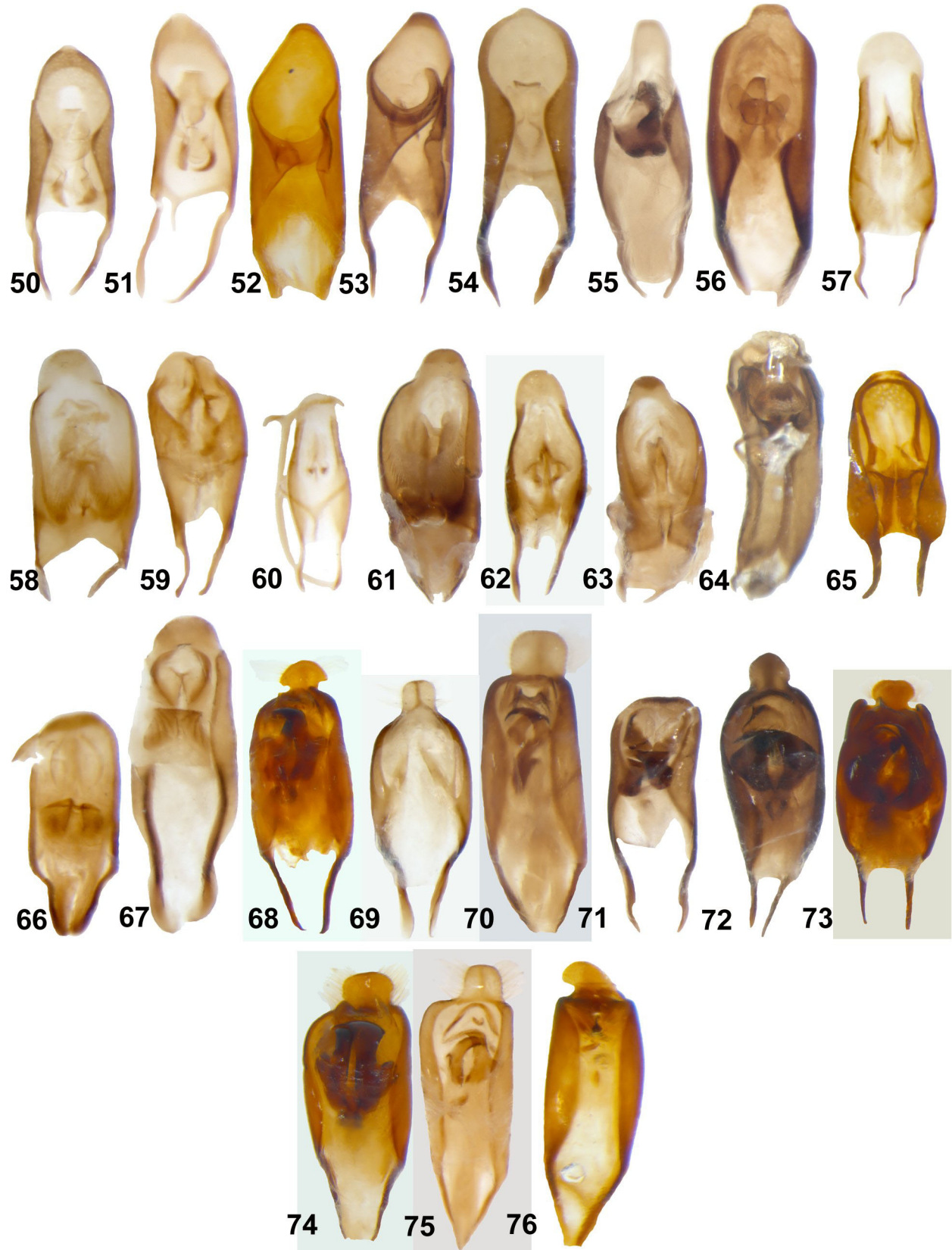


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**Figures 50-76.** Male aedeagus (dorsal view) of *Camptocerus* species. **50)** *C. inoblitus*. **51)** *C. opacicollis*. **52)** *C. auricomus*. **53)** *C. niger*. **54)** *C. occidentalis*. **55)** *C. orientalis*. **56)** *C. rectus*. **57)** *C. charpentierae*. **58)** *C. coccoformus*. **59)** *C. doleae*. **60)** *C. igniculus*. **61)** *C. latipilis*. **62)** *C. mallopterus*. **63)** *C. petrovi*. **64)** *C. satyrus*. **65)** *C. costatus*. **66)** *C. pilifrons*. **67)** *C. quadridens*. **68)** *C. aeneipennis*. **69)** *C. angustior*. **70)** *C. aterrimus*. **71)** *C. distinctus*. **72)** *C. hirtipennis*. **73)** *C. mandelshtami*. **74)** *C. noel*. **75)** *C. pseudoangustior*. **76)** *C. suturalis*.





**Table 1.** Morphological character matrix of 66 characters for 41 species. Characters and states are described in Materials and Methods.

Species	Characters																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<i>Camptocerus aeneipennis</i>	1	0	0	1	0	0	0	1	0	0	1	0	0	3	1	1	0	0	0	3	1	0
<i>C. angustior</i>	1	0	0	1	0	2	1	1	0	0	1	0	0	3	1	1	0	0	0	3	1	0
<i>C. annectens</i>	1	0	?	?	?	?	?	?	?	?	?	?	?	?	?	1	0	2	0	2	2	0
<i>C. aterrimus</i>	1	0	0	0	2	2	0	1	0	0	1	0	0	3	1	1	0	2	0	3	1	0
<i>C. auricomus</i>	1	0	0	0	0	2	3	1	0	3	1	0	1	3	0	1	0	0	0	2	3	0
<i>C. charpentierae</i>	1	0	0	1	0	1	1	1	0	2	1	0	0	1	2	1	0	0	0	2	2	0
<i>C. coccoformus</i>	1	0	0	1	1	1	1	1	0	2	1	0	0	0	2	1	0	0	0	2	2	0
<i>C. costatus</i>	1	0	0	1	0	0	6	1	0	1	1	0	0	3	4	1	0	0	0	0	2	0
<i>C. distinctus</i>	1	0	0	1	0	2	1	1	0	2	1	0	0	2	2	1	0	0	1	3	1	1
<i>C. doleae</i>	1	0	0	1	0	2	1	0	1	2	0	0	0	2	2	1	0	0	0	0	3	0
<i>C. hirtipennis</i>	1	0	0	1	0	0	0	1	0	2	1	0	0	3	1	1	0	0	1	2	1	0
<i>C. igniculus</i>	1	0	0	1	0	1	1	1	1	2	1	0	0	1	2	1	0	0	1	2	2	0
<i>C. inoblitus</i>	1	0	0	1	0	0	2	1	1	2	1	0	0	1	0	1	0	0	0	0	2	1
<i>C. latipilis</i>	1	0	0	1	2	1	1	1	0	2	1	0	0	0	2	1	0	0	0	2	2	1
<i>C. major</i>	1	0	?	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	1	0	2	0
<i>C. mallopterus</i>	1	0	0	1	0	1	1	1	0	2	1	0	0	2	2	1	0	0	0	2	2	0
<i>C. mandelshtami</i>	1	0	0	0	0	2	0	1	0	0	1	0	0	3	1	1	0	0	0	3	1	0
<i>C. niger</i>	1	0	0	0	0	0	3	1	0	3	1	0	1	3	0	1	0	0	0	2	3	1
<i>C. noel</i>	1	0	0	1	0	0	0	1	0	0	1	0	0	3	1	1	0	2	0	3	1	0
<i>C. occidentalis</i>	1	0	0	1	0	0	5	1	0	0	1	0	1	3	1	1	0	0	0	2	3	1
<i>C. opacicollis</i>	1	0	0	1	2	0	2	1	1	2	1	0	0	1	0	1	0	2	0	2	2	1
<i>C. orientalis</i>	1	0	0	0	0	0	3	1	0	3	1	0	1	3	0	1	0	0	0	2	3	0
<i>C. petrovi</i>	1	?	0	1	1	1	4	1	1	2	1	0	0	1	2	1	?	?	?	?	?	1
<i>C. pilifrons</i>	1	0	0	0	0	0	6	1	0	1	1	0	0	3	4	1	0	0	0	0	2	0
<i>C. pseudoangustior</i>	1	0	0	0	0	2	0	1	0	0	1	0	0	3	1	1	0	0	0	3	1	0
<i>C. quadridens</i>	1	0	0	0	0	0	6	1	0	1	1	0	0	3	4	1	0	0	0	0	2	0
<i>C. rectus</i>	1	0	0	0	0	0	2	1	0	3	1	0	1	3	0	1	0	0	0	0	3	1
<i>C. satyrus</i>	1	?	0	1	1	1	1	1	0	2	1	0	0	1	2	1	?	?	?	?	?	0
<i>C. suturalis</i>	1	0	0	1	0	0	0	1	0	2	1	0	0	3	1	1	0	0	0	1	0	0
<i>C. unicornus</i>	1	?	0	0	0	3	2	1	0	3	1	0	1	1	0	1	?	?	?	?	?	1
<i>C. zucca</i>	1	0	0	1	0	0	4	1	1	1	1	0	0	3	4	1	0	0	0	0	2	1
<i>Cnemonyx boliviae</i>	0	0	?	?	?	?	?	?	?	?	?	?	?	?	0	0	1	1	0	2	0	1
<i>C. errens</i>	1	0	0	0	3	0	4	1	0	4	0	0	0	3	0	1	0	2	0	0	0	0
<i>C. insignis</i>	0	0	0	0	0	4	4	0	0	4	0	0	0	3	0	0	1	1	0	2	0	1
<i>C. rugulosus</i>	1	0	0	1	0	0	2	0	0	4	0	0	1	3	0	1	0	0	0	0	0	1
<i>C. vestitus</i>	1	?	0	1	0	0	3	1	0	4	0	0	0	3	0	1	?	?	?	?	?	0
<i>Scolytopsis peruanus</i>	2	0	0	0	0	0	4	2	0	4	2	0	1	3	3	1	1	2	0	3	0	0
<i>Scolytus excavatus</i>	2	1	1	0	0	0	4	0	0	3	0	1	0	0	3	1	0	3	0	4	0	0
<i>S. multistriatus</i>	2	0	1	0	0	0	4	2	0	4	2	0	0	?	3	1	0	2	0	0	0	0
<i>S. propinquus</i>	2	1	1	0	0	0	4	2	0	4	2	1	0	1	3	1	0	1	0	2	0	0
<i>S. schevyrewi</i>	3	0	1	0	0	0	4	2	0	4	0	0	0	2	3	1	0	2	0	0	0	0
<i>S. ventralis</i>	2	0	1	0	0	0	4	2	0	4	2	0	0	2	3	1	0	2	0	0	0	0

**Table 1 (continued).** Morphological character matrix of 66 characters for 41 species. Characters and states are described in Materials and Methods.

Species	Characters																					
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
<i>Camptocerus aeneipennis</i>	1	2	1	1	0	0	1	1	0	1	2	0	1	0	1	0	1	0	0	0	0	0
<i>C. angustior</i>	1	2	1	1	0	1	1	1	0	1	2	0	1	0	1	0	1	0	1	0	0	0
<i>C. annectens</i>	0	?	?	0	0	?	?	4	2	1	1	1	3	?	0	4	1	1	1	1	0	1
<i>C. aterrimus</i>	1	2	1	1	0	1	1	1	0	1	A	0	1	0	1	0	1	0	1	0	0	0
<i>C. auricomus</i>	1	1	0	0	0	0	2	5	2	1	5	1	6	2	0	2	1	0	0	0	0	0
<i>C. charpentierae</i>	1	0	0	0	0	0	0	2	2	1	4	1	2	4	1	1	1	0	0	2	0	0
<i>C. coccoformus</i>	1	1	0	0	0	0	0	2	1	1	2	1	2	3	1	1	1	0	1	2	0	0
<i>C. costatus</i>	0	0	0	0	0	0	0	3	1	1	4	1	C	1	2	8	1	0	1	1	0	0
<i>C. distinctus</i>	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	7	1	0	0	0	0	0
<i>C. doleae</i>	1	1	0	0	0	0	0	2	1	1	A	1	H	4	0	3	1	0	1	2	0	0
<i>C. hirtipennis</i>	1	2	1	0	0	0	1	1	0	1	3	0	1	0	1	0	1	0	1	0	0	0
<i>C. igniculus</i>	0	0	0	0	0	0	0	2	1	1	2	1	2	4	1	1	1	0	0	2	0	0
<i>C. inoblitus</i>	1	0	0	0	0	0	2	4	2	1	6	1	3	2	1	4	1	1	0	0	0	0
<i>C. latipilis</i>	1	0	0	0	0	0	0	2	1	1	7	1	2	4	0	1	1	0	0	2	0	0
<i>C. major</i>	1	?	?	0	0	?	?	4	0	1	1	1	3	?	1	4	1	1	0	0	0	0
<i>C. mallopterus</i>	0	0	0	0	0	0	0	2	1	1	5	1	2	3	1	1	1	0	1	2	0	0
<i>C. mandelstami</i>	1	2	2	1	0	1	1	1	0	1	2	0	1	0	1	0	1	0	0	0	0	0
<i>C. niger</i>	1	1	0	0	0	0	4	5	2	1	5	1	6	2	0	2	1	0	0	2	0	0
<i>C. noel</i>	1	2	1	1	0	0	1	1	0	1	1	0	1	0	1	0	1	0	0	0	0	0
<i>C. occidentalis</i>	1	1	0	0	0	1	4	5	2	1	5	1	6	2	0	2	1	0	1	0	0	0
<i>C. opacicollis</i>	1	1	0	0	0	0	2	4	2	1	1	1	3	2	0	4	1	1	0	1	0	1
<i>C. orientalis</i>	1	1	0	0	0	0	4	5	2	1	5	1	6	2	0	2	1	0	0	0	0	0
<i>C. petrovi</i>	?	1	0	?	0	0	0	2	1	1	7	1	2	4	1	1	1	0	1	2	0	0
<i>C. pilifrons</i>	0	0	0	0	0	0	0	3	1	1	1	1	5	1	2	8	1	0	0	2	0	0
<i>C. pseudoangustior</i>	1	2	2	1	0	1	1	1	0	1	7	0	1	0	1	0	1	0	1	0	0	0
<i>C. quadridens</i>	0	0	0	0	0	0	0	3	1	1	1	0	8	1	2	8	1	0	0	2	1	0
<i>C. rectus</i>	1	1	0	0	0	0	4	5	2	1	5	1	6	2	0	2	1	0	0	0	0	0
<i>C. satyrus</i>	?	1	0	?	0	0	0	2	1	1	7	1	2	4	0	1	1	0	1	2	0	0
<i>C. suturalis</i>	2	2	1	0	0	0	0	1	0	1	5	0	1	0	0	0	1	0	1	1	0	0
<i>C. unicornus</i>	?	1	0	?	0	0	0	7	3	1	1	1	G	F	0	F	1	1	0	0	0	0
<i>C. zucca</i>	0	0	0	0	0	0	0	3	1	1	1	0	C	E	2	8	1	0	0	2	0	1
<i>Cnemonyx boliviae</i>	0	?	?	0	0	?	?	6	1	0	9	1	A	6	0	5	1	1	1	3	0	0
<i>C. errens</i>	0	1	0	0	0	0	2	6	2	0	0	1	7	B	3	B	0	0	0	1	0	2
<i>C. insignis</i>	0	0	0	0	0	0	3	6	1	0	0	1	B	6	1	A	1	1	1	1	0	0
<i>C. rugulosus</i>	0	1	0	0	0	0	2	4	0	1	3	1	4	5	0	6	1	1	0	2	0	1
<i>C. vestitus</i>	?	0	0	?	0	0	2	6	0	1	8	1	4	2	1	D	1	0	1	2	0	1
<i>Scolytopsis peruanus</i>	0	1	0	0	0	0	0	8	1	1	0	2	F	7	1	E	0	1	0	0	0	1
<i>Scolytus excavatus</i>	1	1	3	2	0	0	0	0	1	1	0	2	D	D	0	C	0	0	0	0	0	0
<i>S. multistriatus</i>	0	1	3	2	1	0	0	0	2	1	1	2	0	A	0	9	0	0	0	0	0	0
<i>S. propinquus</i>	0	1	3	2	1	0	0	0	1	1	1	1	9	8	1	C	0	1	0	0	0	1
<i>S. schevyrewi</i>	0	0	3	2	0	0	0	0	2	1	1	2	E	C	0	9	0	1	0	0	0	1
<i>S. ventralis</i>	1	1	3	2	1	0	0	0	2	0	1	2	0	9	0	9	0	1	0	0	0	0

**Table 1 (continued).** Morphological character matrix of 66 characters for 41 species. Characters and states are described in Materials and Methods.

Species	Characters																					
	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
<i>Camptocerus aeneipennis</i>	0	1	0	1	0	2	0	0	2	0	2	0	0	0	1	1	0	1	0	2	1	1
<i>C. angustior</i>	0	1	0	1	0	2	0	0	2	0	2	0	0	0	1	1	0	0	6	1	2	?
<i>C. annectens</i>	?	1	0	0	1	0	1	1	0	0	?	1	0	0	0	?	?	?	?	?	?	?
<i>C. aterrimus</i>	0	2	0	0	0	2	0	0	2	0	2	0	0	0	0	0	0	1	0	1	1	1
<i>C. auricomus</i>	0	0	0	0	3	0	0	3	1	0	0	0	0	0	0	1	0	0	1	3	0	1
<i>C. charpentierae</i>	0	3	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	4	4	1	?
<i>C. coccoformus</i>	0	3	0	0	1	0	0	1	0	0	1	0	0	1	1	0	1	0	5	4	0	?
<i>C. costatus</i>	1	1	0	0	1	0	1	1	0	1	1	0	0	0	1	2	0	0	0	4	1	1
<i>C. distinctus</i>	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	3	0	2	?
<i>C. doleae</i>	0	3	0	0	2	0	0	3	0	0	0	0	0	0	1	0	0	0	3	4	0	?
<i>C. hirtipennis</i>	0	1	0	0	3	1	0	3	0	0	0	0	0	0	0	0	0	1	0	2	1	?
<i>C. igniculus</i>	0	3	0	0	2	0	0	2	0	0	0	0	0	0	1	1	0	0	4	4	1	?
<i>C. inoblitus</i>	0	0	0	0	1	1	1	2	0	0	0	1	0	0	0	0	0	0	3	4	1	1
<i>C. latipilis</i>	0	0	0	0	2	0	0	1	0	0	0	0	0	1	0	0	1	0	B	1	0	?
<i>C. major</i>	?	1	0	0	1	1	1	1	0	?	0	1	0	0	0	?	?	?	?	?	?	1
<i>C. mallopterus</i>	0	3	0	0	3	1	0	3	0	0	0	0	0	0	1	0	0	0	4	4	1	?
<i>C. mandelshtami</i>	0	1	0	0	0	2	0	0	2	0	2	0	0	0	1	1	0	1	6	2	1	1
<i>C. niger</i>	0	0	0	0	3	0	0	3	1	0	0	0	0	0	0	0	0	0	1	3	0	1
<i>C. noel</i>	0	1	0	1	0	2	0	0	2	0	2	0	0	0	1	0	0	1	0	1	1	1
<i>C. occidentalis</i>	0	0	0	0	3	0	1	3	1	0	0	0	0	0	1	1	0	0	3	4	1	?
<i>C. opacicollis</i>	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	1	0	0	3	4	2	1
<i>C. orientalis</i>	0	0	0	0	3	0	0	3	1	0	0	0	0	0	0	1	0	0	3	1	0	?
<i>C. petrovi</i>	0	3	0	0	2	0	?	1	0	0	0	0	0	1	1	0	1	0	2	4	0	?
<i>C. pilifrons</i>	0	1	0	0	2	0	1	2	0	1	0	0	0	0	1	0	1	0	7	0	0	?
<i>C. pseudoangustior</i>	0	2	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	1	0	1	1	1
<i>C. quadridens</i>	1	1	0	0	1	3	1	1	0	0	1	0	0	0	0	1	0	0	4	4	1	1
<i>C. rectus</i>	0	0	0	0	3	0	1	3	1	0	0	0	0	0	0	0	0	0	3	1	0	1
<i>C. satyrus</i>	0	3	0	0	2	0	?	2	0	0	0	0	0	0	0	0	1	1	C	4	0	?
<i>C. suturalis</i>	0	1	0	0	2	1	0	2	0	0	0	0	0	0	2	1	0	0	0	2	0	1
<i>C. unicornus</i>	0	0	0	0	2	0	?	2	0	0	0	1	0	0	1	0	?	?	?	?	?	?
<i>C. zucca</i>	0	1	0	0	2	1	0	1	0	0	1	0	0	0	1	0	?	?	?	?	?	?
<i>Cnemonyx boliviae</i>	0	0	0	0	0	1	2	2	0	0	0	1	0	0	0	3	?	?	?	?	?	?
<i>C. errens</i>	0	1	0	0	1	0	2	2	0	1	0	1	0	0	1	3	0	0	0	3	0	?
<i>C. insignis</i>	0	0	0	0	0	0	2	2	0	0	0	1	0	0	0	3	0	0	0	0	2	0
<i>C. rugulosus</i>	0	1	0	0	1	0	0	2	0	0	0	1	0	0	0	0	0	0	3	4	0	0
<i>C. vestitus</i>	0	0	0	0	4	0	?	3	1	0	0	1	0	0	1	0	?	?	?	?	?	0
<i>Scolytopsis peruanus</i>	0	0	0	0	1	0	1	2	0	0	0	1	1	2	1	1	0	0	A	3	2	0
<i>Scolytus excavatus</i>	0	0	0	0	0	2	1	0	2	0	2	1	2	2	0	1	0	0	0	4	2	0
<i>S. multistriatus</i>	0	0	0	0	1	1	1	1	0	0	0	1	2	2	1	0	?	?	?	?	?	0
<i>S. propinquus</i>	0	0	0	0	0	1	0	1	0	0	1	1	2	2	0	0	0	0	4	4	2	0
<i>S. schevyrewi</i>	0	0	0	0	1	1	0	1	0	0	1	1	2	2	1	0	0	0	9	0	1	0
<i>S. ventralis</i>	0	0	0	0	0	1	1	1	0	0	0	1	2	2	0	0	0	0	8	4	0	0