Papéis Avulsos de Zoologia

Museu de Zoologia da Universidade de São Paulo

Volume 48(16):139-180, 2008 **www.scielo.br/paz** **ISSN impresso: 0031-1047**
ISSN *on-line:* 1807-0205

Cladistic analysis of Hemirhipini with establishment of *Propalaus* gen. nov. (Coleoptera, Elateridae, agrypninae)

Sônia A. Casari[1]

ABSTRACT

*This article includes a cladistic analysis of the tribe Hemirhipini. Are included 20 Hemirhipini genera (*sensu *Casari-Chen 1994),* Saltamartinus *Casari (1996b) (Hemirhipini), 6 genera excluded from Hemirhipini and kept in Agrypninae (formerly Pyrophorinae) (Casari-Chen 1993) and also,* Aphileus *Candèze (1857),* Pyrophorus *Billberg (1820) and* Thoramus *Sharp (1877). The type-species of the majority of genera and all species of the American genera (except* Saltamartinus viduus *(Chevrolat 1867)) are included. This analysis demonstrates that 30 genera belong to Hemirhipini:* Abiphis *Fleutiaux (1926),* Alaolacon *Candèze (1865),* Alaomorphus *Hauser (1900),* Alaus *Eschscholtz (1829),* Aliteus *Candèze (1857),* Anthracalaus *Fairmaire (1888),* Aphileus *Candèze (1857),* Austrocalais *Neboiss (1967),* Calais *Castelnau (1836),* Catelanus *Fleutiaux (1942),* Chalcolepidius *Eschscholtz (1829),* Chalcolepis *Candèze (1857),* Conobajulus *Van Zwaluwenburg (1940),* Coryleus *Fleutiaux (1942),* Cryptalaus *Ôhira (1967),* Eleuphemus *Hyslop (1921),* Eumoeus *Candèze (1874),* Fusimorphus *Fleutiaux (1942),* Hemirhipus *Latreille (1829),* Lacais *Fleutiaux (1942),* Lycoreus *Candèze (1857),* Mocquerysia *Fleutiaux (1899),* Neocalais *Girard (1971),* Pherhimius *Fleutiaux (1942),* Phibisa *Fleutiaux (1942),* Propalaus *gen. nov.,* Pseudocalais *Girard (1971),* Saltamartinus *Casari (1996),* Tetrigus *Candèze (1857) and* Thoramus *Sharp (1877). The species included in* Alaus *do not make a monophyletic group and* Propalaus *gen. nov. is established to include* Alaus alicii *(Pjatakowa 1941) and* A. haroldi *(Candèze 1878). A description of* Propalaus *gen. nov. (type-species:* Chalcolepidius haroldi *Candèze, 1878) and a new key to Hemirhipini genera are also presented.*

Keywords: american species; genera of the world; key to genera; new combinations; type-species.

INTRODUCTION

The difficulties on Elateridae classification have been pointed out since Lacordaire (1857). Even today, the classification of the higher taxa remains in an unsettled state. The same occurs with the Hemirhipini (Agrypninae) where the number of genera arranged into this tribe is uncertain.

The name "Hémirhipides" was used first by Candèze (1857) to denominate a group formed by *Alaus* Eschscholtz (1829), *Calais* Castelnau (1836), *Chalcolepis* Candèze (1857), *Ctenicera* Latreille (1829),

1. Museu de Zoologia, Universidade de São Paulo, Caixa Postal 42.494, 04218-970, São Paulo, SP, Brasil. E-mail: casari@usp.br

Euphemus Castelnau (1836), *Hemirhipus* Eschscholtz (1829), *Lycoreus* Candèze (1857) and *Tetrigus* Candèze (1857). He also established *Aliteus* and *Aphileus* in "Mélanactides". He put *Chalcolepidius* Eschscholtz (1829) in "Chalcolépidiides" together with *Campsosternus* Latreille (1834), *Oistus* Candèze (1857) and *Semiotus* Eschscholtz (1829).

Lacordaire (1857) kept the name "Hémirhipides" to include *Alaus* Eschscholtz, (1829), *Ctenicera* Latreille (1829), *Euphemus* Castelnau (1836) and *Hemirhipus* Eschscholtz (1829). The genera *Iphis* and *Calais,* established by Castelnau (1836), were considered as synonyms of *Alaus. Chalcolepidius* Eschscholtz (1829), *Semiotus* Eschscholtz (1829) and *Campsosternus* Latreille (1834) were kept in the "Chalcolépidiides".

The name "Hémirhipides" was changed to "Alaites" by Candèze (1874), that considered *Alaus,* the most numerous in species and with the widest geographical distribution, as the type of the tribe. He established *Eumoeus,* considered *Calais* as a synonym of *Alaus* and transferred *Aliteus* Candèze (1857) and *Alaolacon* Candèze (1865), originally in "Mélanactides", to "Alaites".

Candèze (1891) included *Anthracalaus* Fairmaire (1888) in "Alaites" and catalogued 11 genera to the tribe: *Alaolacon* Candèze (1865), *Alaus* Eschscholtz (1829), *Aliteus* Candèze (1857) *Anthracalaus* Fairmaire (1888), *Chalcolepis* Candèze (1857), *Ctenicera* Latreille (1829), *Eumoeus* Candèze (1874), *Euphemus* Castelnau (1836), *Hemirhipus* Eschscholtz (1829), *Lycoreus* Candèze (1857) and *Tetrigus* Candèze (1857).

Reitter (1905) working on european Coleoptera included *Alaus* in Hemirhipini and *Tetrigus* in Ludiini.

Schwarz (1906) followed Candèze (1891), also included *Alaomorphus* Hauser (1900) in "Alaites" and transferred *Alaolacon* to the appendix of his work with other "incertae-sedis" genera. He also considered *Ludioctenus* Fairmaire (1893) as a synonym of *Tetrigus.*

Heyne & Tachenberg (1908) kept *Alaus, Ctenicera* and *Hemirhipus* in Alaini and *Chalcolepidius* in Chalcolepidiini.

Hyslop (1917) reduced the tribe to subtribal rank, Hemirhipina, that included the Alaites of Candèze (1891), and together with Chalcolepidiina belonged to Pyrophorini. This position was followed by Leng (1920).

Fleutiaux (1919) raised the status of the group to subfamily Hemirhipinae including *Alaomorphus, Alaus* and *Euphemus.*

The name *Euphemus* was preoccupied by a mollusc (Rafinesque 1815) and was replaced by *Eleuphemus* Hyslop (1921).

Schenkling (1925) catalogued in Hemirhipinae, besides the genera of Schwarz (1906), also *Alaolacon* and *Ludioctenus* Fairmaire (1893). He did not consider the synonymization of Schwarz (1906).

Du Buysson (1926) and Fleutiaux (1947) accepted the synonymization of *Ludioctenus* under *Tetrigus.*

Fleutiaux (1942) treating of "Les Hemirhipini de la région Malgache" established *Coryleus* to *C. desruisseauxi, Phibisa* to two *Ctenicera* species, *Lacais* to four *Alaus* species and *Catelanus, Fusimorphus* and *Pherhimius* to *Hemirhipus* species. He also included in this tribe, *Abiphis, Calais, Lycoreus* and *Mocquerysia.* In (1947) assigned *Anthracalaus* to Ctenicerinae (= Corymbitinae).

Arnett *et al.* (1969) considered Hemirhipini as synonym of Pyrophorini; *Alaus* and *Chalcolepidius* were included in Chalcolepidiini. The tribe Pyrophorini was considered separated from Hemirhipini by Costa (1975).

Laurent (1973) divided the group into subfamilies Hemirhipinae and Alauinae.

Stibick (1979) ressurected the tribes Hemirhipini and Chalcolepidiini.

Casari-Chen (1985) studying the neotropical genera of Hemirhipini transferred *Chalcolepidius* to this tribe. In (1993), based especially on the presence of subapical tooth at mandibles and separated parameres of aedeagus, removed six genera from the tribe: *Alaolacon, Aliteus, Mocquerysia, Eumoeus, Anthracalaus* and *Tetrigus.* According to her, these genera do not make a monophyletic group and they present an uncertain position inside Pyrophorinae (= Agrypninae). She stated that it is quite certain that *Alaolacon* should be removed from this subfamily. In (1994) she presented a generic phylogenetic analysis to the tribe, including 20 genera: *Abiphis, Alaomorphus, Alaus, Austrocalais, Calais, Catelanus, Chalcolepidius, Chalcolepis, Conobajulus, Coryleus, Eleuphemus, Fusimorphus, Hemirhipus, Lacais, Lycoreus, Neocalais, Paracalais, Pherhimius, Phibisa* and *Pseudocalais.* This analysis shows that several genera needed revision and later all american genera were revised (Casari-Chen 1991; Casari 1996a, 1996b, 1998, 1999, 2002a, 2002b) and *Saltamartinus* Casari (1996) was established.

Calder (1990) considered *Aphileus* Candèze (1857) more closely related to Hemirhipini genera than pseudomelanactine genera and suggested that *Pseudomelanactes* Mathieu (1961) is a synonym of *Anthracalaus.* At the end of this paper he presented "a

tentative tribal arrangement of the Australian agrypnine-tetralobine genera" where *Aphileus* was included in Hemirhipini and *Anthracalaus* in Pseudomelanactini. In (1992) Calder & Hayek synonymized *Pseudomelanactes* under *Anthracalaus* and Pseudomelactini under Hemirhipini. Calder (1996), treating of the genera of Australian Elateridae included *Anthracalaus, Aphileus, Austrocalais, Paracalais* and *Tetrigus* in Agrypninae.

Ôhira (1990) considered *Paracalais* Neboiss (1967) as a synonym of *Cryptalaus* Ôhira (1967).

Costa (1992) transferred *Thoramus* Sharp (1877) from Ludiinae to Pyrophorinae (= Agrypninae).

Johnson (2001) stated that "The Hemirhipini includes 28 genera worldwide". In (2002) kept *Anthracalaus* in Pseudomelanactini and *Chalcolepidius* in Hemirhipini, both included in Agrypninae.

Casari (2003) described four new species of *Alaus* and transferred *Chalcolepidius alicii* Pjatakowa (1941) and *C. haroldi* Candèze (1878) to this genus. Herein, *Propalaus* gen. nov., is established to include these two species.

The present analysis demonstrated that Hemirhipini is composed by 30 genera: *Abiphis* Fleutiaux (1926), *Alaolacon* Candèze (1865), *Alaomorphus* Hauser (1900), *Alaus* Eschscholtz (1829), *Aliteus* Candèze (1857), *Anthracalaus* Fairmaire (1888), *Aphileus* Candèze (1857), *Austrocalais* Neboiss (1967), *Calais* Castelnau (1836), *Catelanus* Fleutiaux (1942), *Chalcolepidius* Eschscholtz (1829), *Chalcolepis* Candèze (1857), *Conobajulus* Van Zwaluwenburg (1940), *Coryleus* Fleutiaux (1942), *Cryptalaus* Ôhira (1967), *Eleuphemus* Hyslop (1921), *Eumoeus* Candèze (1874), *Fusimorphus* Fleutiaux (1942), *Hemirhipus* Latreille (1829), *Lacais* Fleutiaux (1942), *Lycoreus* Candèze (1857), *Mocquerysia* Fleutiaux (1899), *Neocalais* Girard (1971), *Pherhimius* Fleutiaux (1942), *Phibisa* Fleutiaux (1942), *Propalaus* gen. nov., *Pseudocalais* Girard (1971), *Saltamartinus* Casari (1996), *Tetrigus* Candèze (1857) and *Thoramus* Sharp (1877).

MATERIAL AND METHODS

The taxa included in this analysis belong to Agrypninae and are listed in Appendix 1. In this study are included the 20 genera of Hemirhipini, *sensu* Casari-Chen (1994), 6 genera excluded from this tribe (Casari-Chen,1993), *Saltamartinus* Casari (1996), *Aphileus* Candèze (1857), tentatively transferred to Hemirhipini by Calder (1990), *Thoramus* Sharp (1877), transferred to Pyrophorinae (= Agrypninae) by Costa (1992), and *Pyrophorus* Bilberg (1820). The type-species of the majority of genera and all species of the American genera (except *Saltamartinus viduus* (Chevrolat 1867)) are included in the analysis. As out groups are used *Alaolacon cyanipennis* Candèze (1865), *Aliteus reichei* (Candèze1857), *Anthracalaus westermanni* (Candèze 1857), *Aphileus lucanoides* Candèze (1857), *Eumoeus murray* Candèze (1874), *Mocquerysia coerulipennis* Fleutiaux (1929), *Pyrophorus divergens* Eschscholtz (1829), *Tetrigus parallelus* Candèze (1857) and *Thoramus wakefieldi* (Sharp 1877).

Cladistic Analysis

One hundred and seven characters were selected, most of which are based on external morphology. Multistate characters were used, always treated as unordered. One hundred twenty two taxa were included in the data matrix representing the Hemirhipini and other Agrypninae genera.

The matrix (Appendix 2) was edited by Nexus program, version 0.5.0 (Page 2001) and the missing data were represented by "?". The trees were conducted using the TNT program (Goloboff *et al.* 2003), and represented through Winclada version 1.00.08 (Nixon 2002). All characters are treated as unweighted. The trees were rooted a posteriori (Nixon & Carpenter 1993), in *Pyrophorus divergens* (Agrypninae, Pyrophorini). The analyses were conducted based on 15000 random addition sequences with 2 trees save per replication. The swapping algorithm used was tree bisection reconnection (TBR).

The branches nomenclature for group of species follows Amorim (1982).

Discussion of Characters

1. Body shape (CI 0.20 RI 0.78): (0) wide and arched; (1) narrow, not arched; (2) fusiform.
   The body in the majority of Hemirhipini is narrowed and not arched; in one group formed by *Catelanus trilineatus* and *Fusimorphus submetallicus* is fusiform, representing a synapomorphy shared by species of this group; in *Lacais* species, three groups of *Chalcolepidius* species, *supremus+, porcatus+* and *aurulentus+, C. ferratovittatus, C. serricornis* and *C. desmaresti,* it is wide and arched.
2. Transversal median region of pronotum (CI 0.33 RI 0.00): (0) as wide or slightly narrower than elytral base; (1) strongly narrower than elytral base.

The Hemirhipini present the transversal median region of pronotum as wide or slightly narrowed than base of elytra, except *Mocquerysia coerulipennis, Alaus latipennis* and *A. thoracopunctatus,* strongly narrower than elytral base.

3. General pubescence (CI 0.37 RI 0.83): (0) simple; (1) scale-like; (2) velvet-like and scale-like; (3) velvet-like and slightly scale-like setae.
Three kinds of setae are present in Hemirhipini: simple, scale-like and velvet-like. Simple setae are thin and piliform; scale-like setae are dorsoventrally flattened, wide and decumbent, with rounded apex and covering the integument color; velvet-like setae are moderately wide, upwardly directed with sharpened apex. One or two kinds of setae are present in each studied species. Simple setae are present in *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Thoramus wakefieldi, Tetrigus parallelus* and one group formed by *Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus* and *Saltamartinus* species. Scale-like setae are present in the majority of the more derived groups of the Hemirhipini; among the more basal, they are present only in *Eleuphemus* species. Velvet-like and scale-like setae are present in *Abiphis nobilis, Lycoreus goudoti, Pseudocalais basilewskyi,* one group of *Alaus* species, *myops*+ and *Alaus tricolor;* velvet-like and slightly scale-like setae represents one synapomorphy shared by *Hemirhipus* species.

4. Thickness of scale-like pubescence (CI 0.40 RI 0.75): (0) fine; (1) moderate ("normal"); (2) strong (wide).
The scale-like seta is considered fine when it is only slightly wider than simple setae; moderate when it is moderately wider than simple setae, and strong when it is very wider than simple setae. Scale-like setae fine are present in *Hemirhipus* species, *Phibisa pupieri* and *Coryleus pectinatus.* The majority of Hemirhipini presents scale-like pubescence with moderate thickness, considered as "normal" and representing a synapomorphy shared by group *Aliteus reichei*+. Scale-like setae wide are present in *Eleuphemus* species and *Alaus candezei.*

5. Pubescence of male pronotum(CI 0.33 RI 0.67): (0) forming longitudinal stripes; (1) forming eye-like spots; (2) forming longitudinal elliptical bands near margins; (3) forming median basal spot; (4) unicolor; (5) forming triangular area near hind angles; (6) forming longitudinal lateral bands not reaching lateral margin; (7) forming irregular small spots; (8) forming basal spots; (9) forming longitudinal median elliptical spot.
The pubescence coloration of the male pronotum is unicolor or forms several patterns in different groups. In three groups of *Chalcolepidius* species, *albiventris*+, *copulatuvittatus*+ and *approximatus*+ (except *angustus*+), *C. tartarus* and *C. virginalis* the pubescence forms longitudinal stripes; in *Eleuphemus* species, *Hemirhipus ochraceipilosus, Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes, Propalaus haroldi* and one group of *Alaus* species, *cinnamomeus*+, forms eye-like spots; in *Hemirhipus* species (except *H. ochraceipilosus*), one group of *Chalcolepidius* species, *erythroloma*+, *C. albisetosus* and *C. villei* forms longitudinal elliptical band near margins; in one group of *Chalcolepidius* species, *angustatus*+, *C. serricornis* and *C. trucuvittatus* forms median basal spot; in *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Thoramus wakefieldi, Tetrigus parallelus,* one group formed by *Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus* and *Saltamartinus* it is unicolor; in *Chalcolepidius validus* and *C. virgatipennis,* forms triangular area near hind angles; in *Lacais glauca,* longitudinal lateral bands not reaching lateral margins; in *Aliteus reichei* and *Lacais nietoi,* irregular small spots; in *Alaomorphus candezei,* basal spots; in *Abiphis nobilis, Lycoreus goudoti* and *Pseudocalais basilewskyi,* longitudinal median spot.

6. Velvet-like pubescence on pronotum (CI 1.0 RI 1.0): (0) forming two longitudinal elliptical spots; (1) forming two eye-like spots; (2) forming one median elliptical spot.
The velvet-like pubescence of the pronotum forms two longitudinal elliptical spots, of varied sizes, in *Hemirhipus* species; in *Pseudocalais basilewskyi,* one group of *Alaus* species, *myops*+ and *A. tricolor,* two eye-like spots; in *Abiphis nobilis* and *Lycoreus goudoti,* one longitudinal median elliptical spot.

7. Two longitudinal elliptical velvet-like spots on pronotum (CI 0.75 RI 0.0): (0) almost as wide as half of pronotum width and reaching both extremities; (1) slightly narrower than half of pronotum width and reaching base; (2) very narrower and shorter than half of pronotum; (3) very small (about 1/5 pronotum length).
The longitudinal elliptical velvet-like spots on pronotum are the different sizes and shapes

and are located in different positions, depending on the species. They are almost as wide as half of pronotum width and reaching both extremities in *Hemirhipus rojasi* and *H. fairmairii;* slightly narrower than half of pronotum width and reaching base in *Hemirhipus lineatus,* representing an autapomorphy to this species; very narrower and shorter than half of pronotum in one group of *Hemirhipus* species, *bimaculatus+,* representing a synapomorphy shared by species of this group; very small, about 1/5 pronotum length in *Hemirhipus ochraceipilosus,* representing an autapomorphy to this species.

8. Pubescence of eye-like spots on pronotum (CI 0.33 RI 0.66): (0) scale-like setae; (1) velvet-like setae.
   The pubescence of the eye-like spots on pronotum is clothed by different kinds of setae: scale-like in *Eleuphemus* species, *Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes, Propalaus haroldi,* three groups of *Alaus* species, *cinnamomeus+, latipennis+* and *calcaripiosus+, A. nobilis* and *A. thoracopunctatus;* velvet-like in *Pseudocalais basilewskyi,* one group of *Alaus* species, *myops+* and *A. tricolor.*
9. Eye-like spots on pronotum (CI 0.75 RI 0.75): (0) without whitish contour; (1) surrounded by narrow whitish band; (2) included in the white lateral band; (3) inside elliptical spots.
   Usually the eye-like spots on pronotum are not surrounded by whitish bands or spots. In one group of *Alaus* species, *myops+* and *A. nobilis,* they are surrounded by narrow whitish band; in *Alaus zunianus* they are included in white lateral bands; in *Alaus patricius* they are inside elliptical spots.
10. White pubescence of elytra (CI 0.25 RI 0.52): (0) continuous or forming uneven spots; (1) forming small patches; (2) white totally; (3) forming longitudinal bands; (4) forming longitudinal bands; (5) forming longitudinal lateral bands.
    The white pubescence of elytra, are continuous covering the elytra totally or forms different patterns. It is continuous or forming uneven patterns in *Eleuphemus fasciatus, Alaomorphus candezei, Lycoreus goudoti, Alaus latipennis, A. myops, A. lusciosus,* one group of *Chalcolepidius species, albisetosus+* and *C. virginalis, C. sulcatus, C. validus, C. erythroloma* and *C. rugatus;* forming small patches in one group of *Alaus* species, *calcaripilosus+,* representing a synapomorphy shared by species of this group; white totally in *Propalaus haroldi,* representing an autapomorphy to this species; forming longitudinal bands in *Alaus unicus,* some *Chalcolepidius* species from groups *supremus+, aurulentus+* and *C. tartarus;* forming longitudinal lateral bands in the majority of *Chalcolepidius* species from group *fasciatus+, C. albiventris, C. truncuvittatus* and *C. porcatus.*
11. Pubescence coloration of male and female (CI 0.33 RI 0.33): (0) similar; (1) different.
    The pubescence in the majority of Hemirhipini is similar in male and female. *Lacais nietoi, L. glauca* and one group of *Chalcolepidius* species, *mexicanus+,* present the coloration of male pubescence different from that of female.
12. Longitudinal lateral stripes band-like of pubescence on pronotum (CI 0.40 RI 0.40): (0) wide and reaching hind angles; (1) moderately wide and reaching hind angles; (2) narrow and reaching hind angles; (3) fused at base; (4) narrowed at extremities.
    In several Hemirhipini species the pubescence of pronotum forms one longitudinal lateral band each side of pronotum. These bands varies in size and shape. They are wide and reach hind angles of pronotum in *Alaus myops, A. zunianus* and *Chalcolepidius corpulentus;* moderately wide and reaching hind angles in *Alaus oculatus,* two groups of *Chalcolepidius* species, *albiventris+* and *approximatus+* and *C. tartarus;* narrow and reaching hind angles in *Lacais glauca, Alaus oculatus, Chalcolepidius truncuvittatus, C. spinipennis, C. virginalis, C. virgatipennis* and *C. fasciatus;* fused at base, representing an autopomorphy to *Chalcolepidius copulatuvittatus;* narrowed at extremities representing a synapomorphy shared by one group of *Chalcolepidius* species, *angustatus+.*
13. Coloration of elytral pubescence (CI 0.25 RI 0.57): (0) unicolor; (1) striped with or without lateral bands; (2) with lateral bands; (3) with spots; (4) with sinuous transverse bands; (5) apical region of different color; (6) with small patches; (7) with bands and spots; (8) with longitudinal elliptical and transverse bands; (9) with longitudinal and transverse bands.
    The coloration of elytral pubescence forms characteristic patterns in several Hemirhipini groups. It is unicolor in *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Thoramus wakefieldi, Tetrigus parallelus,* one group formed by *Catelanus trilineatus* and *Fusimorphus sub-*

metallicus, Hemirhipus ochraceipilosus, H. rojasi, H. bimaculatus, Conobajulus ugiensis, Lacais suturalis, Phibisa pupieri, Coryleus pectinatus, Propalaus and *Chalcolepis* species, *Alaus veracruzanus, A. cinnamomeus, A. sericeus, A. nobilis,* five groups of *Chalcolepidius* species, *mexicanus*+, *dugesi*+, *desmaresti*+, *viridipilis*+ and *lacordairii*+, *C. supremus, C. oxydatus* and *C. rubripennis;* striped with or without lateral bands in one group of *Hemirhipus* species, *fairmairii*+, *Alaus unicus,* three groups of *Chalcolepidius* species, *extenuatuvittatus*+, *albisetosus*+ and *aurulentus*+ (except *erythroloma*+, *C. corpuletus* and *apacheanus*+) and *C. virginalis, C. porcatus* and *C. validus;* with lateral bands in *Neocalais macer,* two groups of *Chalcolepidius* species, *erythroloma*+ and *apachenus*+, and some *Chalcolepidius* species of other different groups; with spots in *Lacais nietoi, Alaus tricolor* and *A. myops;* with sinuous transverse bands in *Pherhimius* species, *Pseudocalais basilewskyi* and *Alaus patricius;* with apical region of different color in one group of *Hemirhipus* species, *apicalis*+ and *Alaomorphus candezei;* with small patches in *Aliteus reichei,* one group formed by *Calais excavatus* and *Cryptalaus prosectus,* two groups of *Alaus* species, *calcaripilosus*+ and *melanops*+ and *A. latipennis;* with bands and spots in *Eleuphemus* species, *Austrocalais pogonodes, Lacais glauca, Lycoreus goudoti* and *Alaus thoracopunctatus;* with longitudinal elliptical and transverse band representing one synapomorphy shared by *Saltamartinus* species; with longitudinal and transverse bands representing one autapomorphy to *Abiphis nobilis.*

14. Epipleura pubescence coloration (CI 0.26 RI 0.38): (0) similar to underside; (1) different from underside; (2) different from underside, pronotum with lateral stripes; (3) different from underside, pronotum and elytra with lateral stripes; (4) partially different from underside.
The pubescence coloration of epipleura is usually similar to underside. It is different from underside and pronotum without lateral stripes in *Lacais* species, one group of *Alaus* species, *cinnamomeus*+, *A. tricolor* and *Chalcolepidius aurulentus;* different from underside and pronotum with lateral stripes in *Chalcolepidius copulatuvittatus, C. validus, C. approximatus* and *C. rostainei;* different from underside, pronotum and elytra with lateral stripes in one group of *Chalcolepidius* species, *limbatus*+, *C. tartarus* and *C. corpulentus;* partially different from underside, pronotum without stripes in one group of *Chalcolepidius* species, *extenuatuvittatus*+ and *C. virgatipennis.*
15. Pubescence of ventrites (CI 0.25 RI 0.00): (0) unicolor; (1) with white patches.
Only the ventrites of *Alaomorphus candezei, Chalcolepidius tartarus, C. approximatus* and *C. apacheanus* present white patches, especially near lateral margins.
16. Coloration of pronotal integument (CI 0.62 RI 0.70): (0) unicolor; (1) forming three longitudinal bands; (2) forming two elliptical or rounded spots; (3) with longitudinal median band; (4) forming eye-like spots; (5) forming one median elliptical spot.
The integument of pronotum is usually unicolor; it forms three longitudinal bands in *Pherhimius dejeani* and *Catelanus trilineatus;* two elliptical or rounded spots in *Eleuphemus* species, one group of *Hemirhipus* species, *bimaculatus*+ and *Conobajulus ugiensis;* longitudinal median band, representing an autapomorphy to *Propalaus alicii;* eye-like spots, representing an autapomorphy to *Alaus calacaripilosus;* one median elliptical spot, representing an autapomorphy to *Abiphis nobilis.*
17. Frons (CI 0.36 RI 0.50): (0) not carinate; (1) carinate; (2) slightly carinate; (3) incompletelly carinate; (4) not carinate and forming a rounded fold.
The frons is usually not carinate: the ridge between frons and nasal are absent. In *Thoramus wakefieldi,* one group formed by *Pherhimius, Catelanus, Fusimorphus* and *Saltamartinus* species, it is carinate and the ridge is present. In *Eleuphemus* species, *Hemirhipus bimaculatus* and *H. fairmairii,* it is slightly carinate, forming a very weak ridge; in *Anthracalaus westermanni, Tetrigus parallelus, Hemirhipus hougeti* and *Pseudocalais basilewskyi,* it is incompletely carinate, and the ridge is absent at middle of frons. In *Phibisa pupieri* the frons is not carinate but the anterior margin is folded, representing an autapomorphy to this species.
18. Fore angles of frons (CI 0.28 RI 0.68): (0) normal; (1) raised; (2) slightly prominent.
In the majority of the studied species, the fore angles of frons are almost horizontal, not raised, considered as normal. In *Saltamartinus perroudi, Austrocalais pogonodes, Chalcolepis* species, one group of *Alaus* species, *latipennis*+, *A. unicus* and *A. calcaripilosus,* the fore angles are raised; it is slightly prominent in *Hemirhipus* species, representing a synapomorphy shared by species of this genus.

19. Basal region of frons (CI 0.50 RI 0.88): (0) smooth; (1) with median tubercle.
In the majority of studied species the frons is smooth; *Saltamartinus decorus* and *Hemirhipus* species present a small tubercle at median basal region of frons.
20. Nasal (CI 0.23 RI 0.75): (0) very short; (1) high; (2) absent; (3) sloped.
The nasal is absent when the frons is at same level that the base of labrum; representing a synapomorphy shared by all Hemirhipini. It is very short in one and more derived group, formed by *Propalaus, Alaus* and *Chalcolepidius* species; it is high in a group formed by *Thoramus wakefield, Tetrigus parallelus,* and *Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* and *Lacais* species, *Pseudocalais basilewskyi, Propalalus alicii, Alaus sericeus, A. nobilis, A. calcaripilosus* and *A. zunianus.* In two groups, it is inclined from dorsal region of frons to basal region of labrum, considered as sloped: one group formed by *Calais excavatus* and *Cryptalaus prosectus* and other, by *Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri* and *Coryleus pectinatus.*
21. Number of antennomeres of male (CI 0.20 RI 0.83): (0) 11; (1) 12.
The antennae of male in the majority of studied species have 11 antennomeres. In three groups, the antennae have 12 antennomeres: *Eumoeus murray, Mocquerysia coerulipennis, Eleuphemus fasciatus* and *E. funerarius; Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* species; and *Lacais* species (except *L. suturalis*), *Alaomorphus candezei, Abiphis nobilis* and *Phibisa pupieri.*
22. Antennal shape of male (CI 0.22 RI 0.74): (0) serrate; (1) strongly serrate; (2) pectinate; (3) flabellate; (4) biflabellate.
The antennae are usually serrate. They are considered strongly serrate when the antennomeres are prominent lateroexternally representing an intermediary state between pectinate and serrate. Antennae strongly serrate are present in *Anthracacalus westermanni, Propalaus haroldi,* one group of *Alaus* species, *sericeus+,* two groups of *Chalcolepidius* species, *supremus+* and *rubripennis+* (except *porcatus+*); pectinate in *Propalaus alicii, Chalcolepidius mexicanus, C. dugesi* and *C. inops;* flabellate in one group formed by *Tetrigus parallelus,* and *Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* species, one group formed by *Lacais* species (except *L. suturalis*), *Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti, Alaus patricius, Chalcolepidius viridipennis* and *C. smaragdinus;* biflabellate representing a synapomorphy shared by group formed by *Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Eleuphemus* species.
23. Antennae (CI 0.60 RI 0.70): (0) serrate, pectinate or flabellate from 3rd antennomere; (1) serrate, pectinate or flabellate from 4th antennomere.
The antennae shapes, serrate, pectinate or flabellate, start at 3rd or 4th antennomere. They start at 3rd antennomere in two groups, one formed by *Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis* and *Eleuphemus* species, and other by *Pherhimius, Catelanus, Fusimorphus* and *Saltamartinus* species, *Aliteus reichei, Conobajulus ugiensis, Calais excavatus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes,* one group formed by *Pseudocalais basilewskyi, Propalaus, Chalcolepis* and *Alaus* (except group *sericeus+*) and many *Chalcolepidius* species, especially from group *desmaresti+.* They start at 4th antennomere in *Anthracalaus westermanni, Aphileus lucanoides, Thoramus wakefieldi, Tetrigus parallelus, Hemirhipus* species, *Crypatalaus prosectus,* one group formed by *Lacais* species, *Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti, Propalaus* species, one group of *Alaus* species, *sericeus+,* two groups of *Chalcolepidius* species, *ferratuvittatus+* and *viridipilis+, C. albiventris, C. virginalis* and *C. inops.*
24. 3rd antennomere of male (CI 0.29 RI 0.72): (0) triangular-elongate; (1) triangular-short; (2) transverse; (3) transverse with spiniform appendix; (4) flabellate; (5) transverse, prominent laterally; (6) biflabellate; (7) elongate.
The 3rd antennomere is variable in shape and is characteristic in several groups. It is elongate and triangular in the majority of species, especially those of *Alaus* and *Chalcolepidius;* it is short and triangular in *Anthracalaus westermanni, Calais excavatus, Propalalus haroldi,* one group of *Chalcolepis* species, *similis+, Alaus unicus,* two groups of *Chalcolepidius* species, *supremus+* and *viridipilis+, C. rubripennis* and *C. virginalis;* wider than long, designated as transverse, in *Thoramus wakefieldi, Tetrigus parallelus* and some species of *Chalcolepidius;* transverse, prominent laterally forming an spiniform appendix in a group formed by *Lacais* species, *Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri, Coryleus pectina-*

tus and *Lycoreus goudoti, Propalalus alicii, Alaus nobilis* and *A. patricius;* flabellate, representing a synapomorphy shared by group formed by and *Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* species; transverse and prominent laterally in *Cryptalaus prosectus,* one group of *Alaus* species, *sericeus+;* biflabellate, representing a synapomorphy shared by group formed by *Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Eleuphemus fasciatus* and *E. funerarius;* elongate, representing an autapomorphy to *Aphileus lucanoides.*

25. 3rd antennomere (CI 0.15 RI 0.67): (0) shorter than 4th; (1) longer than 4th; (2) as long as 4th.
Usually the 3rd antennomere is shorter than 4th; it is longer than 4th in *Aphileus lucanoides,* one group formed by *Alaolacon cyanipennis* and *Mocquerysia coerulipennis, Catelanus trilineatus, Aliteus reichei, Chalcolepis austerus,* one group of *Chalcolepidius* species, *lafargi+, C. lacordairii* and *C. fabricii;* 3rd as long as 4th in *Eumoeus murray, Eleuphemus* species, two groups, one formed by *Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* species, and other by *Lacais* species, *Alaomorphus candezei, Abiphis nobilis* and *Phibisa pupieri.*
26. Mandibles (CI 1.00 RI 1.00): (0) very long, prominent; (1) short, not promient.
Usually the mandibles are short and not prominent; in *Aphileus lucanoides* they are very long and prominent, representing an autapomorphy to this species.
27. Subapical tooth of mandible (CI 0.33 RI 0.71): (0) present; (1) absent.
Usually the subapical tooth of mandibles is absent; it is present in the basal groups: *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Thoramus wakefieldi* and *Aliteus reichei.*
The presence of subapical tooth of mandibles was used by Casari-Chen (1993, 1994) to remove some genera from Hemirhipini. The absence of subapical tooth of mandibles was considered a synapomorphy to the tribe.
28. Length of thorax (CI 1.00 RI 1.00): (0) normal; (1) long in relation to abdomen.
The thorax is long in relation to abdomen length only in *Lacais* species, representing a synapomorphy shared by species of this genus.
29. Luminescent vesicles of pronotum (CI 1.00 RI 1.00): (0) present; (1) absent.
In Hemirhipini the luminescent vesicles are absent, representing a synapomorphy shared by all members of this tribe.
30. Medioanterior margin of pronotum (CI 0.40 RI 0.85): (0) straight or slightly sinuous; (1) raised forming two teeth; (2) sinuous.
The anterior margin of pronotum is usually straight or slightly sinuous. It is raised forming two teeth near middle in three groups: one formed by *Calais excavatus* and *Crypatalus prosectus,* the second by *Pseudocalais basilewskyi, Propalaus* species and *Chalcolepis* species and the third by *Alaus* group *nobilis+* and *Alaus thoracopunctatus;* it is sinuous in *Hemirhipus* species, representing a synapomorphy shared by species of this genus.
31. Lateral margins of pronotum (CI 0.15 RI 0.66): (0) slightly sinuous; (1) sinuous; (2) rounded; (3) almost straight; (4) straight.
The majority of studied species, especially *Chalcolepidius* species, presents lateral margins of pronotum slightly sinuous. They are sinuous in *Anthracalaus westermanni, Alaus tricolor* and *Chalcolepidius rubripennis;* rounded in *Tetrigus parallelus, Calais excavatus, Neocalais macer, Alaomorphus candezei,* one group formed by *Coryleus pectinatus* and *Lycoreus goudoti,* some species of *Alaus* and one group of *Chalcolepidius* species, *dugesi+;* almost straight in *Mocquerysia coerulipennis, Eleuphemus* species, one group formed by *Thoramus wakefieldi* and *Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* species, *Conobajulus ugiensis,* one group formed by *Pseudocalais basilewskyi, Propalaus* species, *Chalcolepis* species and one group of *Alaus* species, *cinnamomeus+.*
32. Lateral margins of pronotum (CI 1.00 RI 1.00): (0) raised forming a ridge; (1) not raised.
The lateral margins of pronotum are usually not raised; in *Chalcolepis* species they are raised in a narrow band forming like a brim, representing a synapomorphy shared by species of this genus.
33. Hind angles of pronotum (CI 0.15 RI 0.52): (0) backwardly or slightly divergent; (1) divergent; (2) strongly divergent.
The hind angles of pronotum are usually backwardly or slightly divergent. They are divergent in *Anthracalus westermanni, Aliteus reichei,* one group formed by *Neocalais macer, Austrocalais pogonodes, Lacais* species, *Alaomorphus candezei* and *Phibisa pupieri, Alaus veracruzanus* and two groups of *Alaus* species, *sericeus+* and *calcaripilosus+;* and strongly divergent in *Aphileus lucanoi-*

des, Mocquerysia coerulipennis, Chalcolepis species, *Alaus tricolor* and *A. thoracopunctatus.*

34. Hind angles of pronotum (CI 0.27 RI 0.85): (0) unicarinate; (1) not carinate; (2) carina bifurcate; (3) raised but not forming a carina.
The hind angles of pronotum of the majority of Hemirhipini are not carinate. The basal groups, *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Alaolacon cyanipennis,* one group formed by *Mocquerysia coerulipennis, Thoramus wakefieldi, Tetrigus parallelus, Pherhimius dejeani, Fusimorphus submetallicus, Saltamartinus* species, and *Hemirhipus* species, *Aliteus reichei,* one group formed by *Conobajulus ugiensis, Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Austrocalais pogonodes, Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti, Alaus patricius,* one group of *Alaus* species, *calcaripilosus+,* one group of *Chalcolepidius* species, *dugesi+,* present one carina at middle; *Pherhimius fascicularis* presents carina bifurcate, representing an autapomorphy to this species; hind angles raised but not forming a ridge in *Eleuphemus* species, *Propalaus haroldi, Chalcolepis* and *Alaus* species.

35. Apex of hind angles of pronotum (CI 1.00 RI 1.00): (0) normal; (1) constricted.
Only *Fusimorphus submetallicus* presents constricted apex of hind angles of pronotum, representing an autapomorphy to this species; in the remaining Hemirhipini the apex of hind angles of pronotum is slightly narrowed apicad.

36. Convexity of pronotum (CI 0.17 RI 0.44): (0) slight or moderate; (1) stronger at middle; (2) stronger medioanteriorly; (3) forming longitudinal median ridge; (4) strongly convex from sutures; (5) moderately convex from sutures.
The pronotum of the majority of Hemirhipini is slightly or moderately convex from sutures. In some groups, the convexity varies in intensity and in location. It is stronger convex at middle, but not forming a longitudinal median ridge in *Austrocalalis pogonodes, Propalaus haroldi, Chalcolepis* species (except *C. similis*), *Alaus latipennis,* two groups of *Chalcolepidius* species, *dugesi+* and *boucardi+, C. copulatuvittatus* and *C. rubripennis;* stronger convex medioanteriorly and the convexity decreases basad in *Pseudocalais basilewskyi* and *Chalcolepidius inops;* stronger convex at middle forming a longitudinal median ridge in *Neocalais macer, Abiphis nobilis, Phibisa pupieri, Propalaus alicii, Chalcolepis similis* and *Chalcolepidius desmaresti;* strongly convex from sutures in one group formed by *Eumoeus murray, Alaolacon cyanipennis* and *Eleuphemus* species, *Tetrigus parallelus, Fusimorphus submetallicus, Hemirhipus* species, *Cryptalaus prosectus, Alaomorphus candezei, Coryleus pectinatus* and some *Alaus* species; moderately convex from sutures in *Mocquerysia coerulipennis* and *Aliteus reichei.*

37. Pronotum (CI 0.60 RI 0.83): (0) without furrow; (1) slightly grooved longitudinal medially; (2) with two longitudinal grooves; (3) grooved at middle near base
The pronotum of Hemirhipini is usually slight-, moderate- or strongly convex from the sutures, but in some groups the pronotum presents longitudinal grooves near middle. The pronotum is slightly grooved longitudinal medially in one group formed by *Eumoeus murray, Alaolacon cyanipennis Mocquerysia coerulipennis* and *Eleuphemus* species and one group of *Alaus* species, *melanops+;* with two longitudinal grooves near middle in *Neocalais macer* and one group formed by *Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti;* grooved at middle near base in *Calais excavatus,* representing an autapomorphy to this species.

38. Pronotum (CI 1.00 RI 1.00): (0) without carinae; (1) bearing median tranverse carina near base.
In *Neocalais macer* the pronotum presents a short transverse carina near base, representing an autapomorphy to this species.

39. Median basal tubercle of pronotum (CI 0.21 RI 0.77): (0) transverse; (1) transverse with carina; (2) elongate; (3) triangular elongate or indistinct; (4) raised and rounded.
The majority of Hemirhipini, including *Aphileus lucanoides,* one group formed by *Alaolacon cyanipennis* and *Mocquerysia coerulipennis, Tetrigus parallelus, Conobajulus ugiensis,* one group of *Alaus* species, *melanops+,* and one group of *Chalcolepidius* species, *desmaresti+,* have median basal tubercle of pronotum triangular elongate or indistinct. In *Anthracalaus westermanni, Eumoeus murray, Eleuphemus* species, *Thoramus wakefieldi, Catelanus trilineatus, Fusimorphus submetallicus, Aliteus reichei, Cryptalaus prosectus, Neocalais macer, Lacais* species, *Lycoreus goudoti, Chalcolepis* species and *Alaus* species (except *A. tricolor,* and group *melanops+*), the median basal tubercle of pronotum is transverse; in one group of *Chalcolepidius* species, *dugesi+,* it is transverse with transverse carina; in a

group formed by *Pherhimius, Saltamartinus* and *Hemirhipus* species, *Calais excavatus, Austrocalais pogonodes,* one group formed by *Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri* and *Coryleus pectinatus,* one group formed by *Pseudocalais basilewskyi* and *Propalaus* species, *Alaus tricolor* and one group of *Chalcolepidius* species, *supremus+,* it is elongate.

40. Posterior margin of pronotum (CI 0.33 RI 0.89): (0) rounded at middle; (1) prominent and notched at middle; (2) prominent and straight at middle; (3) notched at middle.
In all *Chalcolepis* and *Chalcolepidius* species the posterior margin of pronotum is prominent and notched at middle. In the remaining Hemirhipini, the posterior margin of pronotum is not prominent and notched at middle, except, *Aphileus lucanoides, Alaomorphus candezei* and *Propalaus haroldi,* with posterior region prominent and straight at middle, and one group formed by *Catelanus trilineatus* and *Fusimorphus submetallicus, Lacais species, Lycoreus goudoti* and *Propalaus alicii,* posterior region rounded at middle.

41. Prosternum (CI 0.15 RI 0.73): (0) slightly convex from sutures; (1) moderately convex from sutures; (2) strongly convex from sutures; (3) strongly convex, flat longitudinally and grooved laterally.
The convexity of prosternum is variable and starts at sutures or prosternum is slight groove laterally and convexity starts more internally. Prosternum slightly convex and convexity starting from sutures is present in *Aphileus lucanoides, Thoramus wakefieldi, Tetrigus parallelus,* one group formed by *Pherhimius, Catelanus, Fusimorphus,* and *Saltamartinus* species, *Lacais* species, *Pseudocalais basilewskyi,* one group of *Alaus* species, *calcaripilosus+,* and one group of *Chalcolepidius* species, *supremus+.* Prosternum moderately convex starting from sutures is present in *Mocquerysia coerulipennis* and some *Alaus* species; strongly convex starting from sutures, in *Anthracalaus westermanni, Eumoeus murray, Hemirhipus* species, *Aliteus reichei,* one group formed by *Conobajulus ugiensis, Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes, Alaomorphus candezei* and some *Alaus* species; strongly convex, flat longitudinally and grooved laterally in a group formed by *Alaolacon cyanipennis* and *Eleuphemus* species, one group formed by *Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti,* one group formed by *Propalaus* and *Chalcolepis* species, one group of *Alaus* species, *nobilis+,* and one large group of *Chalcolepidius* species, *desmaresti+.*

42. Prosternum (CI 1.00 RI 1.00): (0) gradually widened anteriad; (1) widened frontally; (2) widened at median region.
The prosternum is usually slightly and gradually widened anteriad. In *Pseudocalais basilewskyi* it is strongly widened frontally and in *Alaomorphus candezei,* strongly widened at median region, representing an autapomorphy to each species.

43. Notosternal suture (CI 0.26 RI 0.85): (0) straight; (1) slightly sinuous; (2) moderately to strongly sinuous; (3) straight and slightly curved near apex; (4) semicircular.
The notosternal suture is straight in *Aphileus lucanoides, Thoramus wakefieldi,* one group formed by *Pherhimius, Catelanus, Fusimorphus* and *Saltamartinus* species, *Aliteus reichei,* one group formed by *Conobajulus ugiensis, Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Lacais* species, *Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti,* one group formed by *Propalaus* and *Chalcolepis* species and *Alaus* species (except *A. nobilis, A. tricolor* and *A. zunianus*); slightly sinuous in *Anthracalaus westermanni,* one group formed by *Alaolacon cyanipennis* and *Mocquerysia coerulipennis, Tetrigus parallelus,* one group of *Alaus* species, *nobilis+, A. zunianus,* one group of *Chalcolepidius* species, *supremus+, C. jansoni, C. rubripennis, C. viridipilis, C. chalcantheus* and *C. boucardi;* moderately to strongly sinuous in *Eumoeus murray, Eleuphemus* species, *Austrocalais pogonoides, Pseudocalais basilewskyi,* one group of *Chalcolepidius* species, *virginalis+, C. desmaresti, C. tartarus* and *C. smaragdinus;* straight or slightly curved near apex in *Hemirhipus* species, representing a synapomorphy shared by species of this genus; semicircular in *Alaomorphus candezei,* representing an autapomorphy to this species.

44. Prosternal channel (CI 0.09 RI 0.81): (0) absent; (1) present.
The notosternal sutures are, in several Hemirhipini groups, opened frontally forming a channel. Prosternal channel is present in *Anthracalaus westermanni, Mocquerysia coerulipennis, Eleuphemus* species, *Aliteus reichei,* one group formed by *Calais excavatus* and *Cryptalaus prosectus, Neocalais macer,* one group formed by *Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus, Lycoreus goudoti, Propalaus* species, *Alaus*

veracruzanus, A. latipennis and one large group of *Chalcolepidius* species, *rubripennis+.* In the remaining Hemirhini the prosternal channel is absent.

45. Hypomera (CI 1.00 RI 1.00): (0) "normal"; (1) grooved near sutures; (2) slightly grooved near sutures.
The Hemirhipini hypomera are punctuated and slightly concave in whole surface, considered as "normal". In *Eleuphemus* species, they are from moderate- to strongly grooved near notosternal sutures, representing a synapomorphy shared by species of this genus; in *Phibisa pupieri,* slightly grooved near notosternal sutures, representing an autapomorphy to this species.
46. Apex of prosternal spine (CI 1.00 RI 1.00): (0) with tooth; (1) rounded.
In all studied Hemirhipini the prosternal spine presents rounded apex, representing a synapomorphy shared by all groups of this tribe. This state had already been used as a synapomorphy for the tribe by Casari-Chen (1994).
47. Basal region of prosternal spine (CI 1.00 RI 1.00): (0) flat or slightly grooved; (1) bearing longitudinal elongate groove.
The basal region of prosternal spine of Hemirhipini is flat or slightly grooved between procoxae; *Alaomorphus candezei* has a longitudinal elongate groove in this area, representing an autapomorphy to this species.
48. Borders of mesosternal cavity (CI 0.22 RI 0.46): (0) horizontal; (1) declivous; (2) elevate at base.
The borders of mesosternal cavity of the majority of Hemirhipini are horizontal; in *Aphileus lucanoides, Catelanus trilineatus,* one group formed by *Calais excavatus* and *Cryptalaus prosectus, Lacais* and *Chalcolepis* species, *Alaus nobilis, A. latipennis* and *A. plebejus* are declivous; in *Conobajulus ugiensis* are elevate at base, representing an autapomorphy to this species.
49. Borders of mesosternal cavity horizontal (CI 0.27 RI 0.62): (0) horizontal in whole length; (1) excavate at middle; (2) horizontal and slightly declivous frontally; (3) horizontal and moderately declivous frontally; (4) horizontal and strongly declivous frontally; (5) horizontal with thick margins at base.
Among the Hemirhipini with borders of mesosternal cavity horizontal, in *Pherhimius* species, the borders are horizontal in whole length, representing a synapomorphy shared by species of this genus; in *Anthracalaus westermanni, Eumoeus murray, Tetrigus parallelus, Fusimorphus submetallicus, Saltamartinus* species, *Aliteus reichei,* one group formed by *Neocalais macer* and *Austrocalais pogonodes, Alaomorphus candezei* and *Alaus calcaripilosus* are excavate at middle; in *Alaolacon cyanipennis, Eleuphemus* species, *Thoramus wakefieldi,* one group formed by *Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti* and some species of *Alaus* and some of *Chalcolepidius* are horizontal and slightly declivous frontally; in *Pseudocalais basilewskyi* and the majority of *Chalcolepidius* species are horizontal and moderately declivous frontally; in *Mocquerysia coerulipennis, Propalaus* species, *Alaus cinnamomeus, A. tricolor* and one group *Alaus* species, *lusciosus+,* are horizontal and strongly declivous frontally; in *Hemirhipus* species are horizontal with margins thickend at base, representing a synapomorphy shared by species of this genus.
50. Meso-mestasternal suture (CI 0.50 RI 0.98): (0) present; (1) absent or obsolete.
In the majority of Hemirhipini the mesosternum is separated from metasternum by a suture behind the mesosternal cavity. This suture is absent or obsolete in *Phibisa pupieri* and *Chalcolepidius* species.
Meso-metastenal suture absent or obsolete was used by Casari (2002b) as a synapomorphy shared by *Chalcolepidius* species.
51. Metasternal median suture (CI 0.66 RI 0.00): (0) "normal", without furrow or carina; (1) with transverse anterior carina; (2) furrowed near base; (3) forming an elliptical anterior cavity.
In the majority of Hemirhipini the metasternal median suture is straight, with the same width in whole its length, considered as "normal". In *Calais excavatus* it presents a short tranverse carina anteriorly, behind meso-metasternal suture, representing an autapomorphy to this species; in *Cryptalaus prosectus* and *Austrocalais pogonodes* it is furrowed near base; in *Pherhimius fascicularis* it is furrowed at base or it forms an elliptical anterior cavity.
52. Median anterior region of metasternum (CI 1.00 RI 1.00): (0) flat; (1) forming a prominence between mesocoxae.
In the Hemirhipini the median anterior region of metasternum, near mesocoxae, is flat; only in *Conobajulus ugiensis* this area is raised forming a rounded prominence, representing an autapomorphy to this species.
53. Metacoxal plate (CI 0.33 RI 0.88): (0) narrowed laterally; (1) widened laterally.

In the majority of Hemirhipini the metacoxal plate is narrowed laterally. In one group formed by *Tetrigus parallelus* and *Pherhimius, Catelanus, Fusimorphus, Saltamartinus* and *Hemirhipus* species, *Alaomorphus candezei* and *Pseudocalais basilewskyi* it is widened laterally.

54. Free margin of metacoxal plate (CI 0.25 RI 0.71): (0) straight; (1) with wide lobe; (2) with small lobe.
In the majority of Hemirhipini the free margin of metacoxal plate is straight. In *Aphileus lucanoides, Tetrigus parallelus* and one group formed by *Pherhimius, Catelanus, Fusimorphus* and *Saltamartinus* species it presents one wide lobe; in *Eumoeus murray, Hemirhipus* species, *Conobajulus ugiensis, Cryptalaus prosectus* and *Alaomorphus candezei* it presents one small lobe.
55. Scutellum (CI 0.25 RI 0.93): (0) horizontal or declivous; (1) angular.
In the majority of Hemirhipini the scutellum is horizontal or declivous. In *Fusimorphus submetallicus, Hemirhipus* species and one large group of *Chalcolepidius* species, *viridipilis+,* the scutellum is folded forming an angle.
56. Scutellum horizontal or declivous (CI 0.27 RI 0.58): (0) subhexagonal; (1) subpentagonal; (2) subquadrangular; (3) subrectangular; (4) vase-like; (5) triangular.
Among the Hemirhipini with scutellum horizontal or slightly declivous, the majority is subpentagonal in shape. In *Eumoeus murray, Lacais* species and *Alaus lusciosus* it is subhexagonal; in *Anthracalaus westermanni* and *Eleuphemus* and *Propalaus* species it is subquadrangular; in *Aphileus lucanoides, Alaolacon cyanipennis, Phibisa pupieri, Alaus unicus, A. sericeus* and *A. zunianus,* it is subrectangular; in *Calais excavatus,* a large group of *Chalcolepidius* species, *supremus+,* and *C. rubripennis,* it is vase-like; in *Mocquerysia coerulipennis,* it is triangular, representing an autapomorphy to this species.
57. Declivity of scutellum (CI 0.20 RI 0.60): (0) slight or moderate; (1) strong.
The declivity of not folded scutellum is variable and usually is slightly or moderately declivous. In two groups of *Chalcolepidius* species, *extenuatuvittatus+* and *mexicanus+,* and *C. rubripennis* it is strongly declivous.
58. Horizontal area of scutellum angular (CI 1.00 RI 1.00): (0) elliptical; (1) subtrapezoidal; (2) rounded.
The shape of the horizontal area of angular scutellum is variable. In *Hemirhipus* species it is elliptical; in a large group of *Chalcolepidius* species, *viridipilis+,* subtrapezoidal, representing a synapomorphy shared by the species of this group; in *Fusimorphus submetallicus,* rounded, representing an autapomorphy to this species.
59. Posterior margin of scutellum (CI 0.17 RI 0.61): (0) strongly notched at middle; (1) slightly notched at middle; (2) prominent at middle; (3) rounded; (4) sinuous; (5) straight.
The shape of posterior margin of scutellum is variable among the Hemirhipini. It is strongly notched at middle in *Lacais* species, *Abiphis nobilis, Coryleus pectinatus* and *Propalaus alicii;* slightly notched at middle in *Hemirhipus* species, *Calais excavatus, Phibisa pupieri, Lycoreus goudoti, Propalaus haroldi, Alaus tricolor,* one large group of *Chalcolepidius* species, *jansoni+,* and some other species of this genus; prominent at middle in *Aphileus lucanoides, Thoramus wakefieldi, Tetrigus parallelus, Pherhimius* and *Saltamartinus* species, *Aliteus reichei, Conobajulus ugiensis, Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes, Pseudocalais basilewskyi, Chalcolepis* species and some species of *Alaus* and some of *Chalcolepidius;* rounded in one group formed by *Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis, Eleuphemus* species, *Fusimorphus submetallicus, Alaomorphus candezei, Alaus* species (except *A. tricolor, A. latipennis, A. patricius, A. calcaripilosus* and *A. thoracopunctatus*), one group of *Chalcolepidius* species, *supremus+;* sinuous in *Chalcolepidius desmaresti;* straight in *Anthracalaus westermanni,* representing an autapomorphy to this species.
60. Wedge cell of hind wing (CI 1.00 RI 1.00): (0) present; (1) absent.
The wedge cell of hind wing is present only in *Alaolacon cyanipennis,* representing an autapomorphy to this species.
61. Number of sclerotizations at apex of hindwing (CI 0.50 RI 0.85): (0) one; (1) two, almost same size; (2) two, one longer; (3) three.
The hindwing of the majority of Hemirhipini presents two sclerotizations at apex,one longer than other. The hindwing of *Aphileus lucanoides, Hemirhipus* species, *Lacais glauca* and *L. suturalis* has one sclerotization; *Anthracalaus westermanni,* one group formed by *Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis* and *Eleuphemus* species, *Thoramus wakefieldi, Pherhimius* species and *Aliteus reichei,* two sclerotizations, both almost of the same size; *Tetrigus*

parallelus, three sclerotizations, representing an autapomorphy to this species.

62. Lateral margins of elytra (CI 0.50 RI 0.00): (0) straight or slightly rounded; (1) strongly rounded.
The majority of the Hemirhipini has lateral margins of elytra straight or slightly rounded. In *Aphileus lucanoides* and *Conobajulus ugiensis* the lateral margins of elytra are strongly rounded.

63. Interstices (CI 0.17 RI 0.72): (0) strong or moderately convex; (1) alternate; (2) irregular; (3) flat.
The majority of the Hemirhipini presents elytra with interstices strong or moderately convex. The interstices are alternate in *Catelanus trilineatus, Hemirhipus* species, *Propalalus haroldi* and *Chalcolepis* species, *Alaus veracruzanus,* one group of *Alaus* species, *cinnamomeus*+*, Chalcolepidius pruinosus, C. obscurus* and *C. silbermanni;* variable in different areas of elytra considered as irregular, in *Chalcolepidius forreri,* representing an autapomorphy to this species; flat in *Anthracalaus westermanni, Aphileus lucanoides, Mocquerysia coerulipennis,* one group formed by *Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus, Saltamartinus* species, *Conobajulus ugiensis, Austrocalais pogonoides, Alaomorphus candezei,* one large group of *Alaus* species, *sericeus*+*, Chalcolepidius lenzi, C. smaragdinus* and one group of *Chalcolepidius* species, *apacheanus*+.

64. Third elytral interstice (CI 1.00 RI 1.00): (0) flat or convex in all length; (1) raised near base forming one tubercle; (2) raised near base forming one longitudinal ridge; (3) raised near base forming one dentiform tubercle; (4) expanded laterally forming one flattened tubercle.
The third interstice of elytrum is flat or convex in the majority of studied Hemirhipini. In *Conobajulus ugiensis* it is raised near base forming a tubercle, representing an autapomorphy to this species; in *Austrocalais pogonodes* it is raised near base forming a longitudinal ridge, representing an autapomorphy to this species; in *Cryptalaus prosectus* it is raised near base forming a dentiform tubercle, representing an autapomorphy to this species; in *Alaomorphus candezei* it is expanded laterally forming a flattened tubercle, representing an autapomorphy to this species.

65. Apex of elytrum (CI 0.33 RI 0.71): (0) rounded; (1) truncate.
The apex of elytrum of the majority of Hemirhipini is rounded. It is truncate in one group formed by *Conobajulus ugiensis, Calais excavatus* and *Cryptalaus prosectus, Austrocalais pogonodes* and one group of *Alaus* species, *nobilis*+.

66. Sutural spine of elytrum (CI 0.06 RI 0.40): (0) absent; (1) present.
The sutural spine of apex of elytrum is absent in the majority of Hemirhipini. It is present in *Tetrigus parallelus,* one group formed by *Catelanus trilineatus* and *Fusimorphus submetallicus, Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes, Coryleus pectinatus, Pseudocalais basilewskyi, Chalcolepis* species, one group of *Alaus* species, *nobilis*+*, A. thoracopunctatus* and some *Chalcolepidius* species.

67. Lateroapical spine of elytrum (CI 0.33 RI 0.33): (0) absent; (1) present.
The lateroapical spine of apex of elytrum is absent in the majority of Hemirhipini. It is present in *Calais excavatus, Austrocalais pogonodes* and one group of *Alaus* species, *latipennis*+.

68. Tibial spurs (CI 0.33 RI 0.90): (0) present; (1) absent.
The tibial spurs are absent in the majority of Hemirhipini. It is present in *Anthracalaus westermanni, Aphileus lucanoides,* one group formed by *Eumoeus murray, Alaolacon cyanipennis, Mocquerysia coerulipennis* and *Eleuphemus* species, *Thoramus wakefieldi,* one group formed by *Catelanus trilineatus, Fusimorphus submetallicus* and *Saltamartinus* species and *Hemirhipus* species.

69. Basal setae of claws (CI 1.00 RI 1.00): (0) present; (1) absent.
All Hemirhipini present setae at base of claws.

70. Apex of last ventrite of female (CI 0.20 RI 0.89): (0) rounded; (1) truncate with fringe of spatulate setae.
The apex of last ventrite of female is rounded or truncate. When truncate, it is clothed with a dense fringe of spatulate setae. Apex truncate with fringe of spatulate setae is present in one group formed by *Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Austrocalais pogonodes, Lacais species, Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti,* one group formed by *Pseudocalais basilewskyi* and *Propalaus* species, *Alaus veracruzanus, A. unicus, A. tricolor, A. patricius,* group *calcaripilosus*+, and *Chalcolepidius* species.

71. Anterior tibiae of male (CI 0.30 RI 0.89): (0) without ornamentations or with stout setae; (1)

bearing spines; (2) bearing fringe of short cilia; (3) bearing fringe of long cilia.

The anterior tibiae of male do not present ornamentations in the majority of Hemirhipini. In *Aphileus lucanoides, Propalaus alicii, Alaus* species (except *A. cinnamomeus*) and one large group of *Chalcolepidius* species, *supremus+,* they present spines; in some (few) *Chalcolepidius* species they present a fringe of short cilia; in one large group of *Chalcolepidius* species, *virginalis+,* a fringe of long cilia.

72. Median tibiae of male (CI 0.50 RI 0.93): (0) without ornamentations or with stout setae; (1) bearing spines; (2) bearing fringe of long cilia; (3) bearing fringe of short cilia.

The median tibiae of male do not present ornamentations in the majority of Hemirhipini. In *Aphileus lucanoides, Alaus calcaripilosus* and one large group of *Chalcolepidius* species, *supremus+,* they present spines; in one large group of *Chalcolepidius* species, *porcatus+,* they present a fringe of long cilia; in *Chalcolepidius tartarus,* a fringe of short cilia, representing an autapomorphy to this species.

73. Fourth tarsomere (CI 1.00 RI 1.00): (0) simple; (1) lamellate.

In all studied Hemirhipini the fourth tarsomere are not lamellate.

74. Ventral region of last tarsomere of male (CI 0.75 RI 0.96): (0) with short setae; (1) with fringe of long cilia; (2) with fringe of short cilia; (3) with fringe of long cilia at distal half of tarsomeres.

In the majority of Hemirhipini the ventral region of last tarsomere of male is clothed with short setae. In one large group of *Chalcolepidius* species, *virginalis+,* they have a fringe of long cilia; in *Chalcolepidius tartarus,* a fringe of short cilia, representing an autapomorphy to this species; in *Chalcolepidius fasciatus,* a fringe of long cilia only at distal half of tarsomere, representing an autapomorphy to this species.

75. Shape of sternite 8 of male (CI 0.30 RI 0.76): (0) triangular or trapezoidal; (1) subpentagonal; (2) semielliptical; (3) band-like.

The shape of the sternite 8 of male is variable and in the majority of Hemirhipini it is band-like. In *Tetrigus parallelus, Catelanus trilineatus,* one group formed by *Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Lacais* species, *Alaomorphus candezei, Abiphis nobilis* and *Phibisa pupieri, Propalaus alicii, Alaus* species (except *A. patricius*) and one group of *Chalcolepidius* species, *desmaresti+,* triangular or trapezoidal; in *Lycoreus goudoti, Pseudocalais basilewskyi, Alaus patricius, Chalcolepidius tartarus* and *C. boucardi,* semielliptical.

76. Distal margin of sternite 8 male (CI 0.18 RI 0.72): (0) notched; (1) strongly notched; (2) prominent at middle; (3) rounded.

The distal margin of sternite 8 of male is notched at middle in *Anthracaclaus westermanni, Eumoeus murray, Pherhimius species, Catelanus trilineatus, Saltamartinus scriptus, Hemirhipus* species, *Propalaus alicii* and some species of *Chalcolepidius;* strongly notched at middle in *Eleuphemus funerarius,* representing an autapomorphy to this species; prominent at middle in *Tetrigus parallelus, Alaomorphus candezei, Chalcolepis* species and several species of *Chalcolepidius* from groups *supremus+* and *desmaresti+;* rounded in a group formed by *Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Lacais* species, *Abiphis nobilis, Phibisa pupieri,* and *Lycoreus goudoti, Pseudocalais basilewskyi* and *Alaus* species.

77. Melanized area of sternite 8 of male (CI 0.20 RI 0.77): (0) entire; (1) broken; (2) absent.

The sternite 8 of male is translucent and presents one melanized band near margins.This area is entire when it runs near anterior, lateral and posterior margins without interruptions, present in *Neocalais macer, Alaomorphus candezei, Abiphis nobilis, Alaus sericeus, A. plebejus, A. oculatus* and one large group of *Chalcolepidius* species, *desmaresti+*. This area is broken or divided in parts in the majority of studied Hemirhipini; it is absent and whole sternite is translucent in *Phibisa pupieri* and *Chalcolepidius mexicanus.*

78. Melanized broken area of sternite 8 of male(CI 0.42 RI 0.70): (0) U-shaped; (1) divided in three parts; (2) broken median basally; (3) broken median distally; (4) U-inverted; (5) divided in two parts; (6) narrow transverse basal band.

When the melanized area is broken, it presents variable shapes. It is U-shaped when is absent at base, present in *Tetrigus parallelus, Pherhimius fascicularis,* one group formed by *Calais excavatus* and *Crypatalus prosectus, Lacais* species, one group formed by *Pseudocalais basilewskyi, Propalaus alicii* and *Chalcolepis* species, *Alaus veracruzanus, A. unicus, A. tricolor* and *A. patricius;* it is divided in three parts in *Pherhimius dejeani, Alaus myops, A. lusciosus* and some *Chalcolepidius* species of group *ferratovittatus+;* it is broken median basally in *Catelanus trilineatus, Saltamartinus scriptus, Lycoreus goudoti* and some *Chalco-*

lepidius species of group *supremus+;* it is broken median distally in *Alaus melanops,* representing an autapomorphy to this species; it is U-shaped inverted when it is absent near anterior margin, in *Anthracalaus westermanni, Eumoeus murray, Hemirhipus* species and *Alaus zunianus;* divided in two parts in *Alaus calcaripilosus* and *A. thoracopunctatus;* as one narrow transverse band near basal margin, in *Eleuphemus funerarius.*

79. Distal margin of tergite 9 of male (CI 0.27 RI 0.66): (0) slightly notched; (1) moderately notched; (2) strongly notched; (3) rounded.
The distal margin of tergite 9 of male is moderately notched in the majority of Hemirhipini. It is slightly notched in *Thoramus wakefieldi, Catelanus trilineatus, Calais excavatus, Pseudocalais basilewskyi* and *Propalaus alicii;* strongly notched in *Anthracaclaus westermanni, Eumoeus murray, Eleuphemus funerarius* and one group of *Chalcolepidius* species, *desmaresti+;* rounded in two groups of *Chalcolepidius* species, *obscurus+* and *aurulentus+.*

80. Position of basal piece of aedeagus (CI 0.50 RI 0.97): (0) above parameres base; (1) dorsally, on basal fourth of parameres.
The basal piece of aedeagus is above the parameres base in the majority of studied Hemirhipini. It is dislocated dorsally on basal fourth of parameres in *Alaomorphus candezei* and one large group of *Chalcolepidius* species, *desmaresti+.*

81. Parameres (CI 0.33 RI 0.66): (0) fused; (1) separated.
The parameres of aedeagus are fused in the majority of Hemirhipini. They are separated in basal groups, *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Mocquerysia coerulipennis, Thoramus wakefieldi* and *Tetrigus parallelus.*
The presence of separated parameres was used by Casari-Chen (1994) to remove some genera from Hemirhipini. The presence of parameres fused was considered a synapomorphy to the tribe.

82. Parameres fused (CI 0.16 RI 0.73): (0) fused em large area; (1) fused in short area.
In the majority of Hemirhipini with parameres fused, the fusion occurs in a large area; fusion in a short area occurs in *Eleuphemus funerarius, Catelanus trilineatus, Fusimorphus submetallicus, Saltamartinus scriptus, Hemirhipus* species, *Cryptalaus prosectus, Phibisa pupieri, Alaus unicus* and one group of *Alaus* species, *thoracopunctatus+,* and *A. oculatus.*

83. Subapical region of parameres (CI 1.00 RI 1.00): (0) unciform without small teeth; (1) not unciform.
All studied Hemirhipini present subapical region of parameres not unciform, representing a synapomorphy shared by all tribe. This character had already been considered as a synapomorphy to tribe by Casari-Chen (1994).

84. Subapical region of parameres not unciform (CI 0.50 RI 0.83): (0) spearhead-like; (1) cleft laterally; (2) slightly securiform; (3) slightly securiform with dorsolateral tooth; (4) securiform; (5) securiform with tooth; (6) spatula like; (7) with uncus dorsal; (8) almost straight.
The subapical region of the parameres of the Hemirhipini aedeagus are of variable shapes, but never unciform. They are spearhead-like in a large group of *Chalcolepidius* species, *supremus+,* representing a synapomorphy shared by species of this group; cleft laterally in a very large group of *Chalcolepidius* species, *desmaresti+;* slightly securiform in *Aphileus lucanoides, Cryptalaus prosectus, Lacais* species, *Alaus veracruzanus* and *A. plebejus;* slightly securiform with dorsolateral tooth in *Chalcolepis* species, representing a synapomorphy shared by species of this genus; securiform in *Eumoeus murray,* and one group formed by *Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus* and *Saltamartinus scriptus;* securiform with tooth in *Calais excavatus, Lycoreus goudoti, Pseudocalais basilewskyi, Propalaus alicii,* two groups of *Alaus* species, *cinnamomeus+* and *thoracopunctatus+* and *Alaus sericeus;* spatula like in *Thoramus wakefieldi* and *Hemirhipus* species; with uncus dorsal in one group of *Alaus* species, *nobilis+,* representing a synapomorphy shared by species of this group; almost straight in *Mocquerysia coerulipennis* and *Eleuphemus funerarius.*

85. Lateral cleft of parameres (CI 0.66 RI 0.66): (0) moderately long; (1) short; (2) inverted.
The lateral cleft of parameres usually starts near apex and goes inclined upwards to median direction. The cleft is moderately long in a large group of *Chalcolepidius* species, *desmaresti+,* representing a synapomorphy shared by species of this group; short in *Conobajulus ugiensis* and *Chalcolepidius boucardi.* In *Neocalais macer, Alaomorphus candezei* and *Pseudocalais basilewskyi* the cleft is inverted: it is inclined downwards to median direction.

86. Apex of region delimited by lateral cleft of parameres (CI 0.62 RI 0.57): (0) with truncate apex;

(1) with rounded apex; (2) with excavated apex; (3) rounded in one angle; (4) with triangular apex; (5) preceeded by lobe.

The lateral cleft delimits a subapical area of parameres that presents apex of different shapes. It has truncate apex in a large group of *Chalcolepidius* species, *viridipilis+,* representing a synapomorphy shared by species of this group; rounded apex in a group of *Chalcolepidius* species, *desmaresti+,* and *C. rubripennis* and *C. chalcantheus;* excavated apex in *Conobajulus ugiensis, Chalcolepidius virgatipennis* and *C. erythroloma;* apex with one lateral angle rounded in *Chalcolepidius virginalis* and *C. webbi;* triangular apex in one group formed by *Neocalais macer, Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus, Lycoreus goudoti* and *Alaomorphus candezei,* representing a synapomorphy shared by species of this group; cleft preceeded by lobe in *Pseudocalais basilewskyi,* representing an autapomorphy to this species.

87. Subapical region of area delimited by lateral cleft of parameres (CI 0.87 RI 0.85): (0) narrow with truncate apex; (1) narrow with rounded apex; (2) flat and concave; (3) spoon-like apex; (4) short with dorsal uncus; (5) wide; (6) triangular; (7) sharpened.

The area delimited by lateral cleft presents different shapes. It is narrow with truncate apex in *Chalcolepidius inops* and one group of *Chalcolepidius* species, *apacheanus+;* narrow with rounded apex in in a group of *Chalcolepidius* species *desmaresti+,* representing a synapomorphy to species of this group; narrow flat and concave in one group of *Chalcolepidius* species, *virgatipennis+,* representing a synapomorphy shared by this group of species; narrow with spoon-like apex in *Chalcolepidius chalcantheus,* representing an autapomorphy to this species; short with dorsal uncus in *Chalcolepidius virginalis,* representing an autapomorphy to this species; wide in one group of *Chalcolepidius* species, *viridipilis+,* representing a synapomorphy shared by species of this group; triangular in *Neocalais macer, Alaomorphus candezei* and *Pseudocalais basilewskyi;* sharpened in *Conobajulus ugiensis,* representing an autapomorphy to this species.

88. Basal region of median lobe (CI 0.33 RI 0.66): (0) straight or slightly rounded; (1) constricted; (2) with tooth or lobe.

The aedeagus of the majority of the Hemirhipini presents basal region of median lobe straight or slightly rounded. Basal region of median lobe constricted is present in one group of *Alaus* species, *cinnamomeus+,* and *A. tricolor;* with tooth or lobe in *Pherhimius* and *Hemirhipus* species and *Pseudocalais basilewskyi.*

89. Basal region of median lobe without constriction (CI 1.00 RI 1.00): (0) without ornamentations; (1) with lobe; (2) with tooth and lobe.

When median lobe of aedeagus is not constricted, usually it does not present ornamentation. It presents one lobe each side in *Hemirhipus* species (except *H. elegantissimus*), representing a synapomorphy shared by species of this genus, and tooth and lobe in *Hemirhipus elegantissimus,* representing an autapomorphy to this species.

90. Median lobe (CI 0.46 RI 0.68): (0) gradually narrowed apicad; (1) constricted near middle; (2) narrowed near middle; (3) narrowed near base; (4) almost straight; (5) widened in distal half; (6) widened near base.

The median lobe of Hemirhipini presents different shapes. It is gradually narrowed apicad in *Anthracalaus westermanni, Aphileus lucanoides, Eumoeus murray, Mocquerysia coerulipennis, Eleuphemus funerarius, Thoramus wakefieldi, Tetrigus parallelus, Pherhimius* species, *Saltamartinus scriptus,* one group formed by *Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Lacais species, Alaomorphus candezei, Abiphis nobilis* and *Phibisa pupieri, Propalaus alicii, Alaus* species (except *A. calcaripilosus, A. myops* and *A. oculatus*), one large group of *Chalcolepidius* species, *desmaresti+,* and some other species of this genus; constricted near middle in *Lycoreus goudoti,* one group of *Chalcolepidius species, mexicanus+,* and *C. angustus;* narrowed near middle in *Conobajulus ugiensis* and *Chalcolepis* species; narrowed near base in *Catelanus trilineatus* and *Pseudocalais basilewskyi;* almost straight in *Fusimorphus submetallicus,* representing an autapomorphy to this species; widened at distal half in *Alaus calcaripilosus,* representing an autapomorphy to this species; widened near base in *Hemirhipus* species, *Alaus myops* and *A. oculatus.*

91. Median lobe (CI 0.66 RI 0.97): (0) without lateral teeth; (1) with lateral teeth; (2) with dorsolateral small teeth.

In the majority of Hemirhipini, the median lobe of aedeagus is not toothed laterally. It presents lateral teeth in *Pseudocalais basilewskyi, Propalaus alicii* and one very large group of *Chalcolepidius* species, *desmaresti+;* small dorsolateral teeth in *Chalcolepidius boucardi,* representing an autapomorphy to this species.

92. Number of teeth of median lobe (CI 0.33 RI 0.33): (0) under 20; (1) above 30.
The *Chalcolepidius* species of group *desmaresti+* present median lobe toothed laterally with about 20 teeth each side; median lobe with more than 30 teeth each side is found in *Pseudocalais basilewskyi, Propalaus alicii, Chalcolepidius jansoni* and *C. viridipilis.*

93. Width of median lobe base/parameres (CI 0.16 RI 0.59): (0) 0.35-0.44; (1) 0.45-0.50; (2) 0.51-0.60; (3) 0.61-0.70; (4) 0.71-0.80.
The relation between the width of the median lobe base and the width of the parameres, at same point, varies from 0.35 to 0.44 in *Thoramus wakefieldi, Pherhimius fascicularis, Lacais* species, *Alaomorphus candezei, Propalaus alicii, Alaus lusciosus* and a very large group of *Chalcolepidius* species, *desmaresti+;* from 0.45 to 0.50 in *Eleuphemus funerarius,* one group formed by *Tetrigus parallelus, Pherhimius dejeani, Catelanus trilineatus, Saltamartinus* and *Hemirhipus* species, *Neocalais macer, Phibisa pupieri, Alaus sericeus,* two groups of *Alaus* species, *calcaripilosus+* and *melanops+,* one group of *Chalcolepidius* species, *ferratuvittatus+, C. exulatus* and *C. serricornis;* from 0.51 to 0.60 in *Fusimorphus submetallicus,* one group of *Hemirhipus* species, *apicalis+, Calais excavatus,* one group formed by *Pseudocalais basilewskyi, Chalcolepis* species and *Alaus species,* and a group of *Chalcolepidius* species, *mexicanus+;* from 0.61 to 0.70 in *Aphileus lucanoides, Eumoeus murray, Conobajulus ugiensis, Cryptalaus prosectus,* one group formed by *Abiphis nobilis, Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti, Alaus unicus, A. patricius* and *Chalcolepidius angustatus;* from 0.71 to 0.80 in *Anthracalaus westermanni* and *Alaus tricolor.*

94. Sternite 8 of female (CI 0.80 RI 0.93): (0) triangular; (1) subquadrangular or transverse; (2) pentagonal; (3) rounded; (4) trapezoidal.
The sternite 8 of female in the majority of Hemirhipini is subquadrangular or transverse. The sternite 8 triangular represents one synapomorphy shared by majority of Hemirhipini, excluding only the more basal clades representing the genera *Anthracalaus, Aphileus* and one group representing *Eumoeus, Alaolacon, Mocquerysia* and *Eleuphemus.* Sternite subquadrangular represents one synapomorphy for a large group of Hemirhipini genera: *Conobajulus, Calais, Cryptalaus, Neocalais, Austrocalais, Lacais, Alaomorphus, Abiphis, Phibisa, Coryleus, Lycoreus, Pseudocalais, Propalaus, Chalcolepis, Alaus* and *Chalcolepidius.* Sternite pentagonal in *Aphileus lucanoides* and *Eleuphemus fasciatus;* rounded in a group formed by *Alaolacon cyanipennis* and *Mocquerysia coerulipennis* and *Thoramus wakefieldi.*

95. Sternite 8 of female (CI 0.20 RI 0.0): (0) wider than long; (1) longer than wide or as long as wide.
In the majority of Hemirhipin the sternite 8 of female are wider then long. In *Mocquerysia coerulipennis, Eleuphemus fasciatus* and *Thoramus wakefieldi* it is longer than wide or as long as wide.

96. Median region of distal margin of sternite 8 of female (CI 0.50 RI 0.88): (0) notched; (1) rounded; (2) prominent at middle.
In the majority of studied Hemirhipini the distal margin of sternite 8 of female is notched. It is rounded in one group formed by *Alaolacon cyanipennis* and *Mocquerysia coerulipennis* and *Thoramus wakefieldi;* prominent at middle in *Aphileus lucanoides, Eleuphemus fasciatus* and one group formed by *Tetrigus parallelus, Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus, Saltamartinus* and *Hemirhipus* species and *Aliteus reichei.*

97. Distal margin of sternite 8 of female notched (CI 0.22 RI 0.55): (0) widely and strongly notched; (1) widely and moderately notched; (2) widely and slightly notched; (3) narrow and strongly notched; (4) narrow and moderately notched; (5) narrow and slightly notched.
When distal margin of sternite 8 of female is notched, the identation presents different sizes. It is is wide and deep in a group of *Alaus* species, *calcaripilosus+,* and *A. unicus,* one group of *Chalcolepidius* species, *chalcantheus+, C. forreri* and *C. mocquerysi;* wide and moderately deep in *Lacais* species, *Alaus patricius,* one large group of *Chalcolepidius* species, *desmaresti+,* and *C. oxydatus;* wide and slightly deep in *Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes,* one group formed by *Pseudocalais basilewskyi, Propalaus, Chalcolepis* species (except *C. luczotii*) and *Alaus* species, one group of *Chalcolepidius* species, *eschscholtzi+, C. inops, C. cyaneus* and *C. fryi;* narrow and strongly deep in *Calais excavatus, Phibisa pupieri, Lycoreus goudoti* and one group of *Chalcolepidus* species, *mexicanus+, C. extenuatuvittatus;* narrow and moderately deep in *Abiphis nobilis, Alaus latipennis* and *Chalcolepidius dugesi;* narrow and slightly deep in *Coryleus pectinatus, Chalcolepis luczotii* and *Alaus zunianus.*

98. Relation width X spiculum gastrale of sternite 8 of female (CI 0.18 RI 0.62): (0) 0.25-0.50; (1) 0.51-0.75; (2) 0.76-1.0; (3) 1.01-1.25; (4) 1.26-1.50.
The relation between the width of the sternite 8 of female and the length of the spiculum gastrale varies from 0.25 to 0.50 in *Tetrigus parallelus, Fusimorphus submetallicus, Hemirhipus* species and *Alaus melanops;* from 0.51 to 0.75 in *Mocquerysia coerulipennis, Eleuphemus fasciatus, Thoramus wakefieldi, Pherhimius* species, *Catelanus trilineatus, Aliteus reichei,* a groups formed by *Calais excavatus* and *Cryptalaus prosectus, Chalcolepis esplendidus, Alaus latipennis* and a group of *Alaus* species, *thoracopunctatus+;* from 0.76 to 1.0 in *Alaolacon cyanipennis, Austrocalais pogonodes, Lacais nietoi,* one group formed by *Phibisa pupieri, Coryleus pectinatus* and *Lycoreus goudoti, Propalaus haroldi, Chalcolepis* species (except *C. splendidus*), *Alaus unicus, A. tricolor, A. patricius* and *A. plebejus,* two groups of *Chalcolepidius* species, *supremus+* (except *albisetosus+*) and *desmaresti+* (except *chalcantheus+* and *inops+*) from 1.01 to 1.25 in *Aphileus lucanoides, Neocalais macer,* a group of *Lacais* species, *glauca+, Abiphis nobilis,* three groups of *Chalcolepidius* species, *albisetosus+, chalcantheus+* and *inops+, C. gossipiatus, C. serricornis, C. spinipennis, C. rubripennis, C. zonatus, C. mocquerysii* and *C. rugatus;* from 1.26 to 1.50 in *Alaus calcaripilosus* and one group of *Chalcolepidius* species, *boucardi+.*
99. Relation sternite 8 X spiculum gastrale length (CI 0.15 RI 0.51): (0) 0.20-0.40; (1) 0.41-0.6; (2) 0.61-0.80; (3) 0.81-1.0; (4) 1.01-1.20; (5) 1.21-1.40; (6) 1.41-160; (7) 1.61-180; (8) 1.81-2.0; (9) above 2.1.
The relation between the length of the sternite 8 of female and the length of the spiculum gastrale varies from 0.20 to 0.40 in one group formed by *Tetrigus parallelus, Catelanus trilineatus, Fusimorphus submetallicus, Saltamartinus* and *Hemirhipus* species and *Alaus melanops;* from 0.41 to 0.6 in one group formed by *Alaolacon cyanipennis* and *Mocquerysia coerulipennis, Thoramus wakefieldi, Pherhimius* species, *Aliteus reichei,* one group formed by *Conobajulus ugiensis, Calais excavatus* and *Cryptalaus prosectus,* one group formed by *Neocalais macer, Austrocalais pogonodes, Lacais* species, *Alaomorphus candezei, Abiphis nobilis, Phibisa pupieri* and *Lycoreus goudoti,* one group formed by *Pseudocalais basilewskyi, Propalaus, Chalcolepis* and *Alaus* species and several *Chalcolepidius* species, especially from groups *mexicanus+* and *desmaresti+;* from 0.61 to 0.80 in *Coryleus pectinatus* and several *Chalcolepidius* species, especially from groups *mexicanus+* and *desmaresti+;* from 0.81 to 1.0 in *Aphileus lucanoides, Eleuphemus fasciatus, Chalcolepidius virgatipennis* and *C. eschscholtzi.*
100. Ovipositor (CI 0.50 RI 0.42): (0) "normal"; (1) short and wide; (2) cuneiform; (3) long; (4) short and wide with dilated apex.
The ovipositor is considered "normal" when it is long, with about four times the coxites length, almost the same width as vagina and the coxites have rounded apex. This kind of ovipositor is present in the majority of studied Hemirhipini. It is short and wide in n *Pherhimius fascicularis, Alaus calcaripilosus, Chalcolepidius chalcantheus* and *C. smaragdinus,* it is about two time the coxites length, very wider than ovipositor and coxites with rounded apex; in one groups of *Alaus* species, *thoracopunctatus+,* it is long with coxites cuneiform, representing a synapomorphy shared by species of this group; in *Aphileus lucanoides* it is short and wide with dilated apex, representing an autapomorphy to this species.
101. Ovipositor (CI 1.00 RI 1.00): (0) without styli; (1) with styli.
All studied Hemirhipini present ovipositor without styli.
102. Sclerotized pieces of openings of colleterial glands (CI 0.25 RI 0.76): (0) present; (1) absent.
The majority of studied Hemirhipini presents two sclerotized pieces at openings of colleterial glands. They are absent in *Mocquerysia coerulipennis,* one group formed by *Thoramus wakefieldi, Tetrigus parallelus, Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus, Saltamartinus* and *Hemirhipus* species.
103. Shape of sclerotized pieces of openings of colleterial glands (CI 0.57 RI 0.92): (0) elliptical and opened; (1) elliptical and closed; (2) elongate; (3) funil-like; (4) triangular.
The shapes of the sclerotized pieces are variable and in the majority of Hemirhipini are elliptical and opened laterally. They are elliptical and closed in *Pherhimius dejeani* and one large group of *Chalcolepidius* species *desmaresti+;* they are elongate in *Eleuphemus fasciatus* and *Alaus tricolor;* funil-like in *Anthracalaus westermanni,* representing an autapomorphy to this species; triangular in *Aphileus lucanoides,* representing an autapomorphy to this species.

104. Sclerotized piece of openings of colleterial glands (CI 0.37 RI 0.56): (0) without teeth; (1) with one row of teeth; (2) with some rows of teeth at base; (3) with several rows of teeth in 1/3; (4) with many rows of teeth in 1/2 of diameter; (5) greater-like; (6) with small teeth.
The sclerotized pieces at openings of colleterial glands do not have teeth in *Anthracalaus westermanni, Aphileus lucanoides, Lacais* species (except *L. glauca*), *Chalcolepis* species (except *C. austerus*), *Alaus thoracopunctatus* and one group of *Chalcolepidius* species, *supremus*+. The majority of species has one row of teeth that represents a synapomorphy to a large group of Hemirhipini that excludes only *Anthracalaus* and *Aphileus.* Sclerotized pieces with some rows of teeth at base is present in *Chalcolepidius porcatus, C. silbermanni* and *C. rostainei;* with several rows of teeth disposed in 1/3 of the area of the pieces in *Chalcolepidius chalcantheus* and *C. boucardi;* with many rows of teeth disposed in ½ of the diameter of the pieces in *Chalcolepidius viridipilis, C. tartarus, C. smaragdinus* and *C. inops;* with many small teeth, greater-like, in *Chalcolepidius desmaresti,* representing an autapomorphy to this species; with several small teeth in *Pherhimius dejeani,* representing an autapomorphy to this species.
105. Bursa copulatrix (CI 0.22 RI 0.88): (0) elongate; (1) elongate, very narrow; (2) rounded.
The bursa copulatrix is elongate and moderately wide in *Anthracalaus westermanni, Aphileus lucanoides, Calais excavatus, Lacais* species, one group formed by *Coryleus pectinatus* and *Lycoreus goudoti, Pseudocalais basilewskyi, Chalcolepis* and *Alaus* species, one group of *Chalcolepidius* species, *supremus*+ (except *rubripennis*+) several species not observed; *C. desmaresti* and *C. jansoni*); elongate and very narrow in *Eleuphemus fasciatus,* one group formed by *Thoramus wakefield, Tetrigus parallelus, Pherhimius* species, *Catelanus trilineatus, Fusimorphus submetallicus,* probably *Saltamartinus* and *Hemirhipus* species, *Aliteus reichei* and *Propalaus haroldi;* rounded in *Mocquerysia coerulipennis, Cryptalaus prosectus,* one group formed by *Neocalais macer* and *Austrocalais pogonodes,* one group formed by *Abiphis nobilis* and *Phibisa pupieri* and one group of *Chalcolepidius* species, *rubripennis*+.
106. Spiny areas of bursa copulatrix (CI 0.20 RI 0.42): (0) present; (1) absent.
The bursa copulatrix of the majority of Hemirhipini presents some spiny areas. In *Aphileus lucanoides, Mocquerysia coerulipennis, Eleuphemus fasciatus, Aliteus reichei,* group formed by *Calais excavatus* and *Cryptalaus prosectus, Alaus latipennis* and *A. oculatus* bursa copulatrix does not have spines.
107. Number of spiny areas of bursa copulatrix (CI 0.31 RI 0.71): (0) one longitudinal; (1) one longitudinal and two rounded lateral; (2) totally spiny ventrally or dorsally; (3) small dorsal area; (4) totally spiny; (5) two spiny areas; (6) one longitudinal dorsal covering all basal area.
Bursa copulatrix with one longitudinal and elongate spiny area is present in *Chalcolepis austerus, C. similis, Alaus* species (except *A. veracruzanus, A. cinnamomeus, A. sericeus, A. nobilis, A. latipennis, A. patricius* and *A. oculatus*), *Chalcolepidius extenuatuvittatus, C. gossipiatus, C. rubripennis* and *C. inops;* one longitudinal and two lateral rounded spiny areas in *Lacais glauca,* a group of *Chalcolepis* species, *luczotii*+, two groups of *Chalcolepidius* species, *desmaresti*+ and *virginalis*+, *C. mexicanus* and *C. serricornis;* totally spiny, dorsally and ventrally in *Coryleus pectinatus, Pseudocalais basilewskyi, Alaus patricius,* one group of *Chalcolepidus* species, *attenuatus*+ and *C. spinipennis;* spiny in one dorsal small area in *Lacais nietoi,* one group of *Chalcolepidius* species, *viridipilis*+, and *C. dugesi;* totally spiny in *Anthracalaus westermanni, Thoramus wakefieldi, Pherhimius* species, one group formed by *Catelanus trilineatus* and *Fusimorphus submetallicus, Hemirhipus* species, *Austrocalais pogonodes, Lacais suturalis,* one group formed by *Abiphis nobilis* and *Phibisa pupieri* and *Lycoreus goudoti;* two spiny areas in *Tetrigus parallelus,* representing an autapomorphy to this species; one longitudinal dorsal spiny area covering all basal area in *Neocalais macer* and *Propalaus haroldi.*

RESULTS AND DISCUSSION

The cladistic analysis resulted in two equally parsimonious trees. Both trees have CI 30, RI 74 and length = 924. The only difference between the two topologies is the position of *Chalcolepidius corpulentus:* in one tree it is the sister-group of *limbatus*+ and in other, it forms a polytomy with *((C. approximatus) (C. bomplandi) (C. rostainei))*

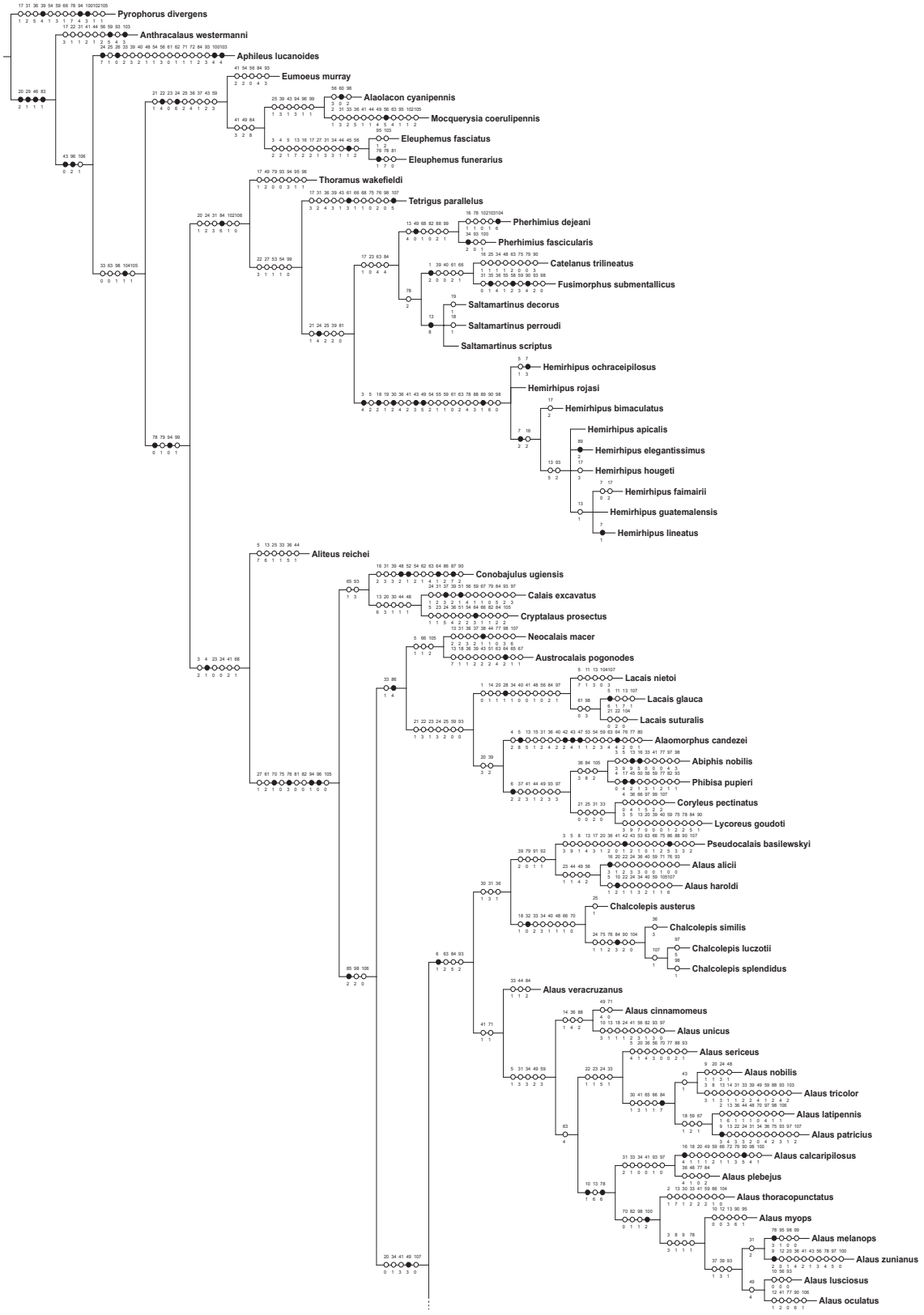


FIGURE 1A: Consensus tree of two more parsimonius trees to Hemirhipini genera (L 924 CI 28 RI 37). All characters were weighted equally. (open circles = homoplasies; black circles = synapomorphies).

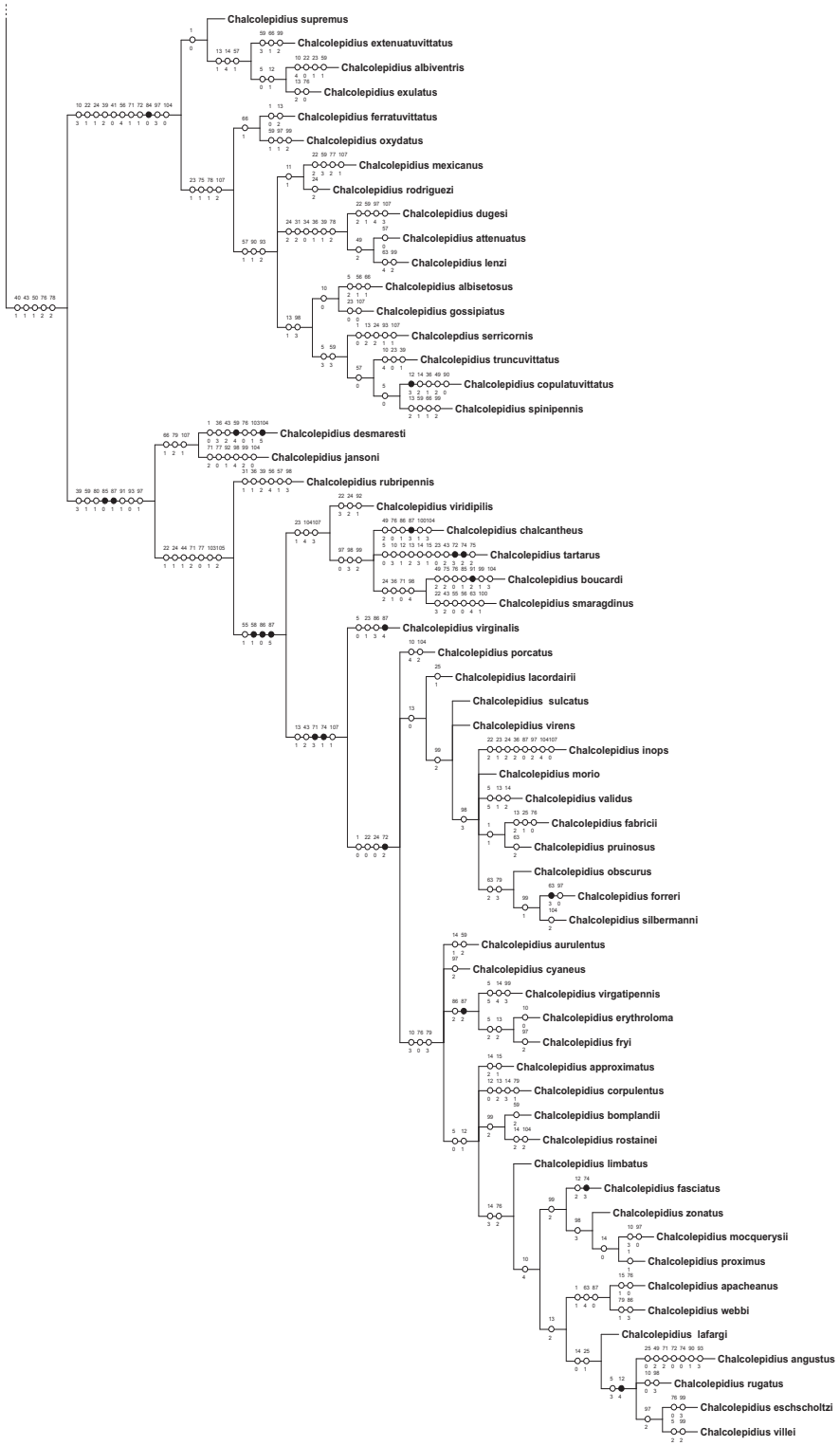
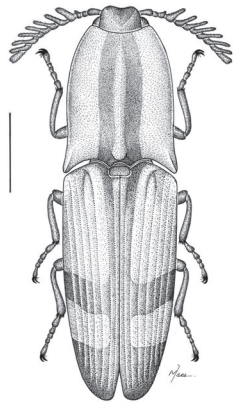
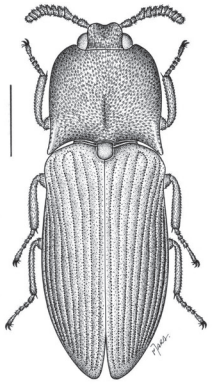
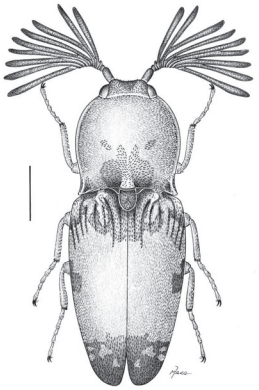
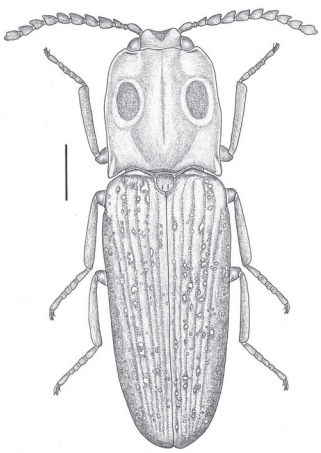


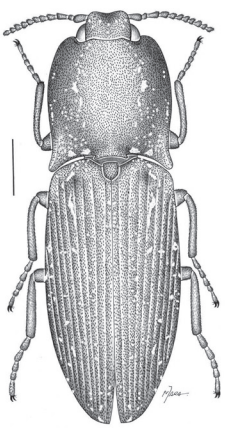
FIGURE 1B: Consensus tree of two more parsimonius trees to Hemirhipini genera (L 924 CI 28 RI 37). All characters were weighted equally. (open circles = homoplasies; black circles = synapomorphies).

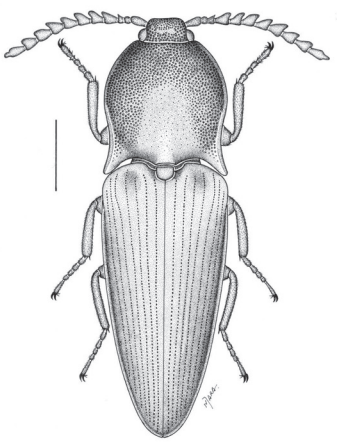


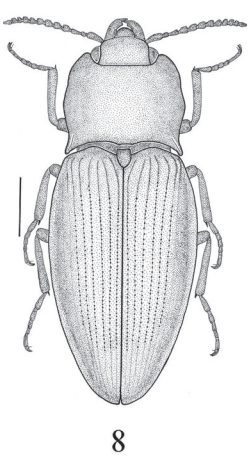


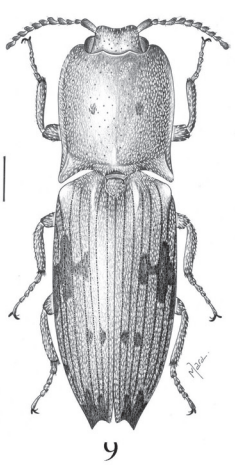


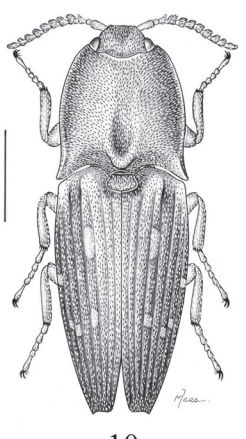




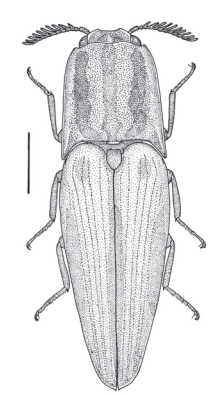




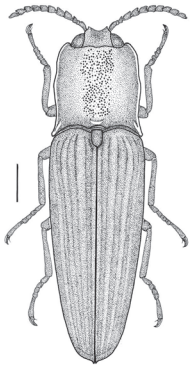




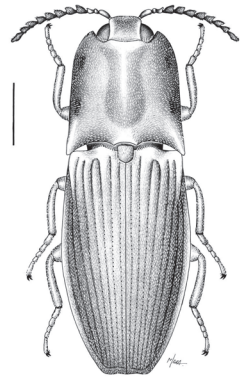
FIGURES 2-10: Habitus: **2,** *Abiphis nobilis* (Illiger 1800); **3,** *Alaolacon cyanipennis* Candèze 1865; **4,** *Alaomorphus candezei* Hauser 1900; **5,** *Alaus oculatus* (Linnaeus 1758); **6,** *Aliteus reichei* (Candèze 1857); **7,** *Anthracalaus westermanni* (Candèze 1857); **8,** *Aphileus lucanoides* Candèze 1857; **9,** *Austrocalais pogonodes* Neboiss 1967; **10,** *Calais excavatus* (Fabricius 1801). Bars = 5 mm.



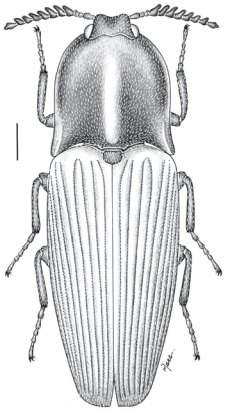
11



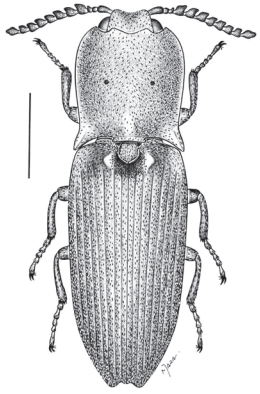
12



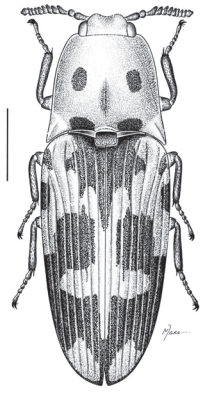
13



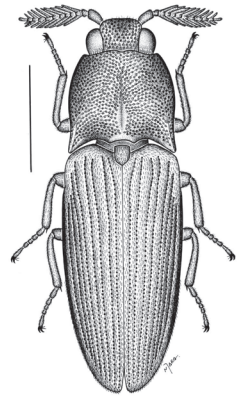
14



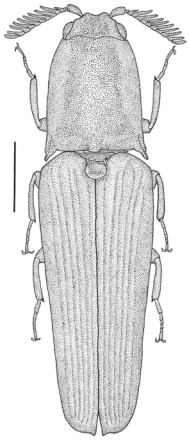
15



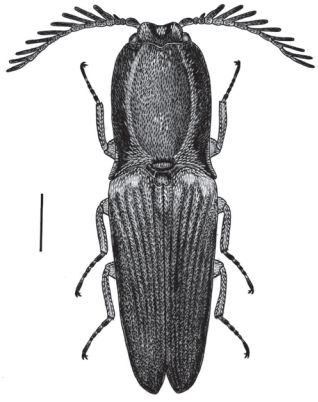
16



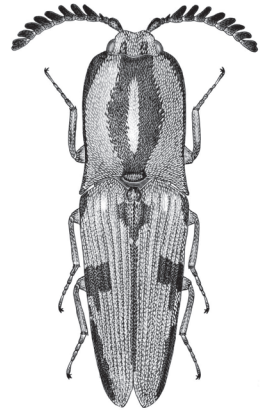
17



18

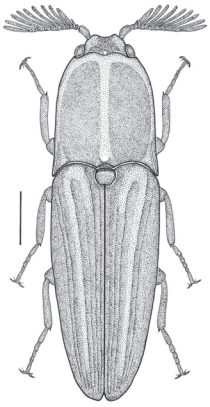


19

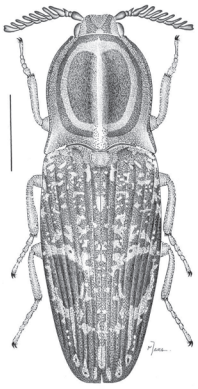


20

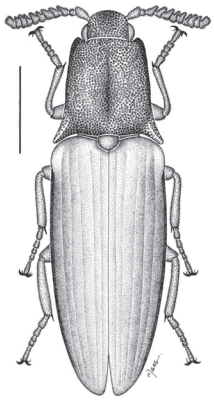
FIGURES 11-20: Habitus: **11,** *Catelanus trilineatus* (Castelnau 1836); **12,** *Chalcolepis luczotii* Candèze 1857; **13,** *Conobajulus ugiensis* Van Zwaluwenburg 1940; **14,** *Coryleus pectinatus* (Fairmaire 1897); **15,** *Cryptalaus prosectus* (Candèze 1857); **16,** *Eleuphemus fasciatus* (Drury 1782); **17,** *Eumoeus murray* Candèze 1874; **18,** *Fusimorphus submentallicus* (Fleutiaux 1924); **19, 20,** *Lacais glauca* (Castelnau 1836) (male, female). Bars = 5 mm, except Figs. 19, 20 = 2 mm.



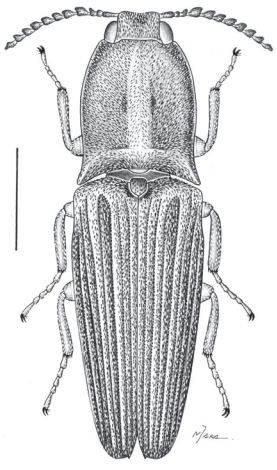
21



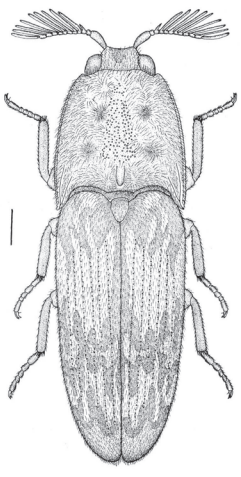
22



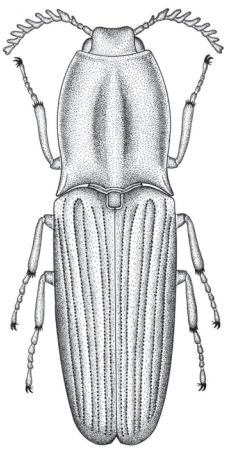
23



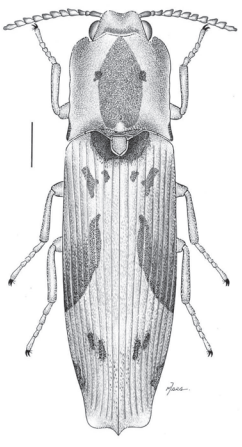
24



25

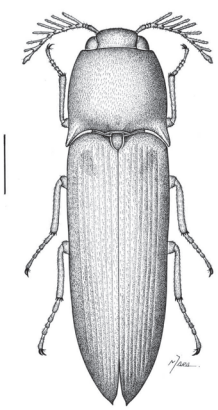


26

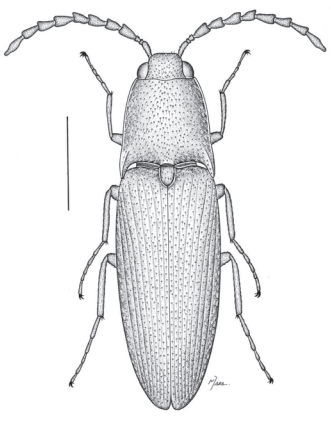


27

28

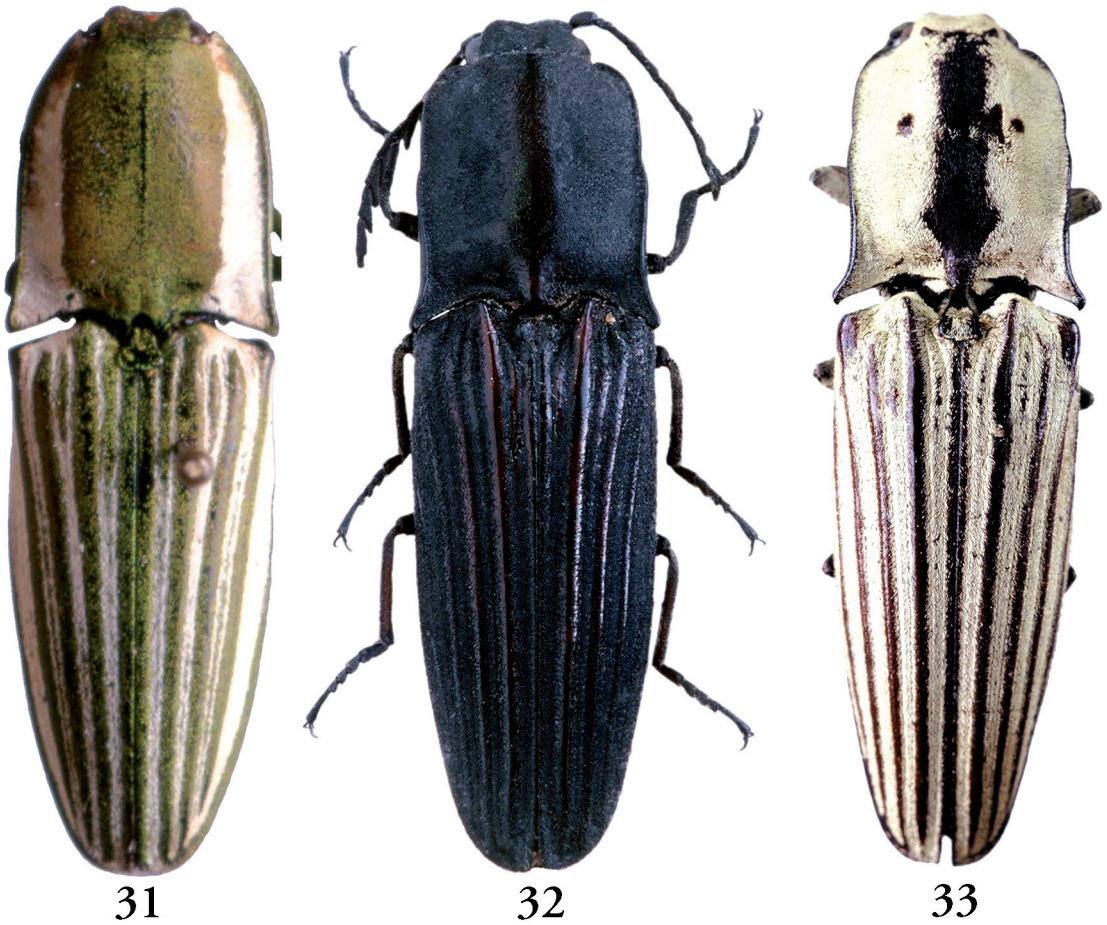


29



30

FIGURES 21-30: Habitus: **21,** *Hemirhipus apicalis* Candèze 1857; **22,** *Lycoreus goudotii* (Castelnau 1836); **23,** *Mocquerysia coerulipennis* Fleutiaux 1929; **24,** *Neocalais macer* (Candèze 1878); **25,** *Pherhimius fascicularis* (Fabricius 1787); **26**, *Phibisa pupieri* (Fleutiaux 1903); **27,** *Pseudocalais basilewskyi* (Mouchet 1949); **28,** *Saltamartinus decorus* (Candèze 1857); **29,** *Tetrigus parallelus* Candèze 1857; **30,** *Thoramus wakefieldi* (Sharp 1877). Bars = 5 mm, except Fig. 22 = 10 mm.



FIGURES 31-33: Habitus: **31,** *Chalcolepidius zonatus* Eschscholtz, 1829; **32,** *Propalaus alicii* (Pjatakowa, 1941); **33,** *Propalaus haroldi* (Candèze, 1878). Length, respectively: 31, 25 and 26 mm.

(limbatus+)). The consensus tree is represented by Figs. 1A, 1B.

Based on the cladistic analysis, the position of *Alaolacon, Aliteus, Anthracalaus, Eumoeus, Mocquerysia* and *Tetrigus,* removed from the tribe and not included in any suprageneric group, was corroborated inside the tribe Hemirhipini. Besides, it is demonstrated that *Aphileus* and *Thoramus* also belong to this tribe.

Casari (1996) presented a cladistic analysis to *Alaus* species, but in (2003) she included seven species in this genus. The present analysis revealed that the genus *Alaus* does not make a monophyletic group, and two species, *Alaus alicii* and *A. haroldi,* are more related to *Pseudocalais basilewskyi* than to other *Alaus* species. *Propalaus* gen. nov. is established to include these two species.

Based on the present analysis, the tribe Hemirhipini is characterized by synapomorhies: 20(2) nasal absent; 29(1) luminescent vesicles absent; 46(1) apex of prosternal spine rounded; 83(1) subapical region of parameres of aedeagus not unciform. The characters 46(1) and 83(1) were used by Casari-Chen (1994). It is formed by 30 genera: *Abiphis, Alaolacon, Alaomorphus, Alaus, Aliteus, Anthracalaus, Aphileus, Austrocalais, Calais, Catelanus, Chalcolepidius, Chalcolepis, Conobajulus, Coryleus, Eleuphemus, Eumoeus, Fusimorphus, Hemirhipus, Lacais, Lycoreus, Mocquerysia, Neocalais, Paracalais, Pherhimius, Phibisa, Propalaus* gen. nov., *Pseudocalais, Saltamartinus, Tetrigus, Thoramus.*

The *Propalaus* gen. nov. is the sister-group of *Pseudocalais basilewskyi* and it is defined by homoplasies: 23(1) antennae serrate or pectinate from 4th antennomere; 44(1) prosternal channel present; 49(4) borders of mesosternal cavity horizontal and strongly declivous frontally; 56(2) scutellum subquadrangular. Besides, pubescence white ventrally, median anterior margin of pronotum raised forming two teeth and interstices alternate.

Propalaus gen. nov.
(Figs. 32, 33)

Type-species: *Chalcolepidius haroldi* Candèze, 1878.

Pubescence scale-like, dorsally black or whitish with brown small spots and narrow stripes and white ventrally. Frons not carinate. Antennae pectinate or strongly serrate; 3rd antennomere transverse, prominent laterally. Pronotum with lateral margins straight; strongly convex longitudinal medially; anterior margin with two small tubercles or two small teeth near middle; hind angles divergent and not carinate. Prosternal spine compressed laterally with cuneiform apex. Notosternal sutures straight; prosternal channel present. Borders of mesosternal cavity horizontal and strongly declivous frontally. Scutellum strongly declivous with posterior margin notched. Anterior tibiae with small spines; tibial spurs absent. Free margin of metacoxal plate straight. Interstices alternate; apices of elytra conjointly rounded.

This genus includes two species: *P. alicii* (Pjatakowa, 1941) and *P. haroldi* (Candèze, 1878).

– Integument black, median region of pronotum and interstices wine-red; pubescence black dorsally and white ventrally; anterior margin of pronotum forming two small tubercles near middle; mesosternal cavity U-shaped; meso-metasternal suture weak. Bolivia. (Fig. 32) ..... *P. alicii*
– Integument black or reddish-brown; pubescence grayish- or yellowish-white; pronotum with two small rounded brown patches; higher interstices with sparser and brownish pubescence; anterior margin of pronotum forming two tubercles near middle; mesosternal cavity V-shaped; meso-metasternal suture well defined. Ecuador. (Fig. 33) ..... *P. haroldi*

A key to the genera of Hemirhipini

1. Antennae of male with 12 antennomeres and female with 11 2
1'. Antennae with 11 antennomeres in both sexes 13
2(1). Antennae biflabellate in male and pectinate in female 3
2'. Antennae flabellate in both sexes or only in male 5
3(2). Integument black; pubescence scale-like wide, ashen with black spots on pronotum and elytra; subapical tooth of mandible absent; frons slightly carinate; pronotum moderately punctuate; hypomeral region strongly grooved near prosternal sutures; lateral margins of pronotum straight, gradually narrowed anteriad from hind angles apex; hind angles of pronotum backwards or slightly divergent and not carinate (Fig. 16). Senegal, Guinea, Ivory Coast, Sierra Leone, Benin, Central African Republic, Congo, Gabon, Tanzania, Democratic Republic of Congo, Angola, Mozambique ..... *Eleuphemus* Hyslop, 1921
3'. Integument dark- or reddish-brown; pubescence simple and thin; frons not carinate or slightly carinate; subapical tooth of mandible present; pronotum densely and coarsely punctuated; hypomera not grooved near prosternal sutures; lateral margins of pronotum straight with hind angles strongly divergent or slightly sinuous; hind angles of pronotum divergent and carinate 4
4(3'). Integument dark-brown with hind angles of pronotum, antennae and legs reddish-brown; frons not carinate or slightly carinate; prothorax strongly narrower than elytra; pronotum grooved longitudinal medially; lateral margins of pronotum straight; hind angles strongly divergent; prosternal channnel present; prosternum moderately convex from sutures; median basal tubercle triangular elongate or indistinct; free margin of metacoxal plate straight; borders of mesosternal cavity horizontal and strongly declivous frontally; scutellum triangular; interstices flat (Fig. 23). Madagascar ..... *Mocquerysia* Fleutiaux, 1899
4'. Integument reddish-brown; frons not carinate; prothorax as wide or slightly narrower than elytra; pronotum grooved longitudinal medially at base; lateral margins of pronotum slightly sinuous; hind angles of pronotum backwards or slightly divergent; prosternal channel absent; prosternum strongly convex from sutures; median basal tubercle transverse; free margin of metacoxal plate with small lobe; borders of mesosternal cavity excavate at middle; scutellum subpentagonal; interstices convex (Fig. 17). India, Indonesia ..... *Eumoeus* Candèze, 1874
5(2'). Antennae flabellate in both sexes; pubescence simple or scale-like and velvet-like 6
5'. Antennae flabellate in male and pectinate in female; pubescence scale-like or scale-like and velvet-like .. 10

6(5). Body fusiform; pubescence simple, fine; integument bright; unicolor or from yellow to ferrugineous with back spots or bands; sutural spine of elytra present 7

6'. Body elliptical; pubescence scale-like and velvet-like or simple and thick, colorful and covering integument color; sutural spine of elytra absent 8

7(6). Unicolor; integument from dark-brown to black, with metallic bright; prothorax narrower than elytra; apex of hind angles of pronotum constricted; hind angles of pronotum carinate; borders of mesosternal cavity horizontal; scutellum folded (Fig. 18). French Guiana, Brazil ..... *Fusimorphus* Fleutiaux, 1942

7'. Bicolor; integument bright with glabrous appearance, yellowish or ferrugineous with longitudinal black bands on pronotum and elytra; prothorax as wide as elytra; apex of hind angles straight; hind angles of pronotum not carinate; borders of mesosternal cavity declivous; scutellum declivous (Fig. 11). Brazil ..... *Catelanus* Fleutiaux, 1942

8(6'). Integument black and/or ferrugineous/red and black; general pubescence velvet-like and scale-like; pubescence forming longitudinal elliptical bands on pronotum, not reaching hind angles; frontal carina incomplete or absent; basal region of frons bearing median tubercle; notosternal sutures straight and slightly curved near apex; free margin of metacoxal plate with small lobe; scutellum folded or angular; interstices alternate (Fig. 21). Mexico, Guatemala, Colombia, Venezuela, Peru, French Guiana, Brazil (from Amazonas to Santa Catarina), Argentina, Uruguay ..... *Hemirhipus* Latreille, 1825

8'. Integument different from above; general pubescence simple, thick, long and dense; frons carinate; basal region of frons smooth; notosternal sutures straight; free margin of metasternal plate with wide lobe; scutellum declivous; interstices flat 9

9(8'). Integument reddish- and yellowish-brown; elytra with sinuous transverse bands giving a marbled appearance; hind angles of pronotum with bifid carina; borders of mesosternal cavity horizontal in whole length; tibial spurs absent (Fig. 25). Southeast of United States of America, Mexico, Dominican Republic, Belize, Panama, French Guiana, Brazil (from Amazonas to Santa Catarina), Paraguay, Argentina, Uruguay ..... *Pherhimius* Fleutiaux, 1942

9'. Integument dark-brown, reddish-brown and yellow; elytra with longitudinal elliptical basal and transverse apical bands; borders of mesosternal cavity excavate at middle; hind angles of pronotum unicarinate; tibial spurs present (Fig. 28). Mexico, Nicaragua, Suriname, Brazil ..... *Saltamartinus* Casari, 1996

10(5'). Integument black; scale-like pubescence thick, white with black spots at base of pronotum, sides and apices of elytra; pubescence of sternites with white patches; lateral margins of pronotum rounded; prosternum widened at median region; notosternal sutures semicircular; prosternal channel absent; basal region of prosternal spine bearing longitudinal elongate groove; metasternum with wide groove parallel mesocoxal cavity; free margin of metacoxal plate with small lobe; elytra striate only basally; third interstice expanded laterally forming a flattened tubercle (Fig. 4). Kenya ..... *Alaomorphus* Hauser, 1900

10'. Integument and pubescence different from above, never with scale-like pubescence thick; pubescence of sternites unicolor; lateral margins of pronotum sinuous; prosternum gradually widened anteriad; notosternal sutures straight; prosternal channel present or absent; prosternal spine without groove; metasternum without groove parallel metacoxal cavity; free margin of metacoxal plate straight; elytra totally striate; 3rd interstice different from above 11

11(10'). Integument black, reddish-brown or ferrugineous; pubescence scale-like, black and white; thorax long in relation to abdomen; convexity of pronotum gradual; median basal tubercle of pronotum transverse; prosternal channel absent; borders of mesosternal cavity declivous; scutellum subhexagonal (Figs. 19, 20). Mexico, Guatemala, Costa Rica, Nicaragua, Belize, Panama, Colombia, Suriname, French Guiana, north of Brazil, Peru ..... *Lacais* Fleutiaux, 1942

11'. Integument and pubescence different form above; convexity of pronotum forming longitudinal median ridge, with one longitudinal groove each side; median basal tubercle of pronotum elongate; prosternal channel present; borders of mesosternal cavity horizontal; scutellum of other shape 12

12(11'). Bicolor, integument from orange to ferrugineous with black spots or bands; pronotal integument forming median elliptical spot, covered by velvet-like pubescence; general pubescence velvet-like and

scale-like; pubescence scale-like ferrugineous and velvet-like black, accompaining integument color; elytra striped with or without lateral bands; frons not carinate, not forming fold; meso-metasternal suture present; scutellum subpentagonal (Fig. 2). Madagascar ..... *Abiphis* Fleutiaux, 1926

12'. Unicolor, integument black or ferrugineous, without spots or bands; pronotum only with scale-like pubescence, fine, grayish or yellowish; frons not carinate and forming a rounded fold; meso- metasternal suture absent or obsolete; scutellum subrectangular (Fig. 26). Comoro Islands, Mozambique ..... *Phibisa* Fleutiaux, 1942

13(1'). Antennae flabellate in both sexes 14

13'. Antennae serrate, strongly serrate or pectinate 16

14(13). Unicolor, integument from red- to dark-brown; pubescence simple and dense; body narrow, almost parallel; frons incompletely carinate; 3rd antennomere simple, tranverse; lateral margins of pronotum slightly rounded; pronotum strongly convex from sutures; median basal tubercle of pronotum transverse; notosternal sutures slightly sinuous; elytra gradually narrowed at apex with sutural spine (Fig. 29). Japan, China, Korea, Philippines, India, Sri Lanka, Turkey, Lebanon, Sumatra, New Guinea, Australia..... *Tetrigus* Candèze, 1857

14'. Unicolor or bicolor, integument of varied colors; pubescence scale-like or scale-like and velvet-like; body elliptical; frons not carinate; 3rd antennomere with spiniform appendix; lateral margins of pronotum sinuous; pronotum forming a longitudinal median ridge; median basal tubercle of pronotum elongate; elytra with apex truncate and rounded; sutural spine of elytra absent or very small..... 15

15(14'). Integument totally black or with reddish elytra; pubescence scale-like, fine and greysh; nasal sloped; hind angles of pronotum backwards or slightly divergent; free margin of metacoxal plate straight; elytra with apex widely rounded with small sutural spine (Fig. 14). Comoro Islands ..... *Coryleus* Fleutiaux, 1942

15'. Integument black; pubescence scale-like and velvet-like, black and white; pronotum with velvet-like pubescence making a large discal spot divided or not at middle; nasal very short; hind angles of pronotum divergent; free margin of metacoxal plate with small lobe; elytra with apex widely rounded without sutural spine (Fig. 22). Madagascar ..... *Lycoreus* Candèze, 1857

16(13'). Pubescence simple; unicolor; subapical tooth of mandible present..... 17

16'. Pubescence scale-like or scale-like and velvet-like; unicolor or bicolor; subapical tooth of mandible absent..... 20

17(16). Mandibles very long, prominent; 3rd antennomere elongate; lateral margins of pronotum rounded with hind angles strongly divergent; interstices flat; lateral margin of elytra strongly rounded (Fig. 8). Australia..... *Aphileus* Candèze, 1857

17'. Mandibles not prominent; 3rd antennomere of other shape; lateral margins of pronotum straight or slightly rounded with hind angles slightly divergent or backwards; interstices convex or flat; lateral margins of elytra straight or slightly rounded..... 18

18(17'). Integument brownish or dark-brown; frons carinate; nasal high; borders of mesosternal cavity horizontal and slightly declivous frontally; scutellum subpentagonal; tarsi long, usually longer than tibiae (Fig. 30). New Zealand..... *Thoramus* Sharp, 1877

18'. Integument different from above; frons not carinate or incompletely carinate; nasal absent; scutellum of other shape; tarsi of moderate length, shorter than tibiae..... 19

19(18'). Elliptical; integument black; elytra with blue or green metallic bright; frons not carinate; prosternum strongly convex, flat longitudinally and grooved laterally; prosternal channel absent; pronotum grooved longitudinal medially near base; scutellum subrectangular; posterior margin of scutellum rounded; wedge cell of hind wing present; elytra slightly narrowed to apex; interstices convex (Fig. 3). Thailand, Malaysia..... *Alaolacon* Candèze, 1865

19'. Fusiform; integument black and bright; frons incompletely carinate; prosternum strongly convex from sutures; prosternal channel present; pronotum moderately convex, not grooved longitudinal-medially; scutellum subquadrangular; posterior margin of scutellum straight; elytra gradually narrowed to apex; interstices flat (Fig. 7). China, Laos, Vietnam, Java, New Guinea, Australia..... *Anthracalaus* Fairmaire, 1888

20(16'). Pubescence velvet-like and scale-like; prosternal channel absent 21

20'. Pubescence only scale-like; prosternal channel present or absent.....22

21(20). Pubescence scale-like of varied coloration, black, white, yellow and several tonalities of brown; velvet-like or scale-like pubescence forming two elliptical or rounded spots on pronotum, of varied sizes; prosternal channel absent; median basal tubercle transverse (Fig. 5). Canada, United States of America, Mexico, Bahamas, Cuba, Jamaica, Dominican Republic, Guatemala, Belize, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, French Guiana, Brazil, Peru..... .....*Alaus* Eschscholtz, 1829

21'. Body elongate with sides almost parallel; pubescence scale-like of several tonalities of brown; pronotum with median elliptical spot dark-brown; frons incompletely carinate; nasal high; lateral margins of pronotum straight; pronotum stronger convex medioanteriorly; medioanterior margin of pronotum raised forming two teeth; prosternum widened frontally; metacoxal plate widened laterally; apex of elytra truncate with lateral angles rounded and sutural spine well developed (Fig. 27). Cameroon, Central African Republic, Democratic Republic of Congo, Tanzania, Gabon, Angola..... ..... *Pseudocalais* Girard, 1971

22(20'). Integument reddish-brown; pronotum with an elliptical discal dark spot; pubescence unicolor, yellowish; lateral margins of pronotum straight from apex of hind angles; pronotum slightly grooved longitudinal medially; hind angles of pronotum backwards; median basal tubercle triangular elongate or indistinct; borders of mesosternal cavity raised at base; median anterior region of metasternum forming a prominence between mesocoxae; free margin of metacoxal plate with small lobe; lateral margins of elytra strongly rounded; third interstice raised near base forming a tubercle (Fig. 13). Fiji and Solomon Islands ..... *Conobajulus* Van Zwaluwenberg, 1940

22'. Integument and pubescence coloration different from above; lateral margins of pronotum variable; pronotum not grooved or groove different from above; lateral margins and hind angles of pronotum variable; median anterior region of metasternum not prominent; median basal tubercle of pronotum of other shape; borders of mesosternal cavity not raised at base; median anterior region of metasternum not prominent between mesocoxae; free margin of metacoxal plate without lobe (except *Cryptalaus*); lateral margins of elytra not rounded; 3rd interstice different from above 23

23(22'). Integument black; pubescence black with small white spots dorsally; 3rd antennomere almost two times longer than 4th; subapical tooth of mandible present; convexity of pronotum moderate from sutures; median basal tubercle of pronotum rounded; borders of mesosternal cavity horizontal (Fig. 6). South Africa, Indonesia (Java)..... *Aliteus* Candèze, 1857

23'. Integument and pubescence of varied color; 3rd antennomere shorter than above; subapical tooth of mandible absent; convexity of pronotum variable; median basal tubercle of other shape; borders of mesosternal cavity horizontal or declivous 24

24(23'). Pubescence brownish with dark-brown or black spots; pronotum with two small rounded and elytra with lateral dark pubescent spots; pronotum longer than wide, with transversal median carina near base; lateral margins of pronotum sinuous; convexity of pronotum forming longitudinal median ridge; prosternal channel present; interstices convex; apex of elytra rounded with sutural spine (Fig. 24). Niger, Sierra Leone, Ivory Coast, Ghana, Togo, Cameroon, Central African Republic, Democratic Republic of Congo, Gabon, Angola, Uganda, Tanzania,.....*Neocalais* Girard, 1971

24'. Pubescence different from above; length of pronotum variable, without transversal median carina near base; lateral margins of pronotum variable; convexity of pronotum different from above; prosternal channel present or absent; interstices flat or convex; apices of elytra different from above.....25

25(24'). Integument dark-brown; pubescence with several tonalities of brown; dark pubescence forming two rounded spots on pronotum and a lateral median large spot each elytron; medianterior margin of pronotum sinuous; median basal tubercle of pronotum elongate; notosternal sutures sinuous; metasternal median suture furrowed near base; third interstice raised near base forming a longitudinal ridge; apex of elytra notched with lateroapical and sutural spines; last ventrite of male with truncate apex (Fig. 9). Australia.....*Austrocalais* Neboiss, 1967

25'. Integument and pubescence different from above; medianterior margin of pronotum of other shape; median basal tubercle of pronotum elongate or transverse; notosternal sutures straight; metasternal median suture furrowed or not near base; 3rd interstice different from above; apex of elytra different from above; last ventrite of male with rounded apex.....26

26(25'). Body narrow; integument from reddish- to dark-brown; pubescence brownish of varied tonalities, making regular or irregular patterns; pronotum with 0-4 rounded or elliptical discal darker spots; 3rd antennomere of male transverse with spiniform appendix; metasternal median suture furrowed near base; free margin of metacoxal plate with small lobe; third interstice raised near base forming a dentiform tubercle; apex of elytra notched with lateral angle rounded and sutural spine present (Fig. 15). Australia..... *Cryptalaus* Neboiss, 1967

26'. Body wide and arched or almost parallel; integument and pubescence color different from above; 3rd antennomere of male triangular; metasternal median suture not furrowed near base; free margin of metacoxal plate straight; 3rd interstice different from above; apex of elytra different from above ..27

27(26'). Integument from reddish- to dark-brown; pubescence black with rusty yellowish-brown setae forming irregular patches; pronotum with longitudinal elliptical groove near base; hind angles of pronotum carinate; borders of mesosternal cavity declivous; metasternal median suture with transversal anterior carina; elytra with apex truncate with lateral spine (Fig. 10). India, Senegal, Guinea, Liberia, Ivory Coast, Ghana, Benin, Cameroon, Gabon, Congo, Democratic Republic of Congo, Tanzania, Angola, South Africa ..... *Calais* Castelnau, 1836

27'. Integument and pubescence different from above; pronotum not grooved or grooved of other shape; median basal tubercle of pronotum of other shape; hind angles of pronotum not carinate; borders of mesosternal cavity horizontal; metasternal median suture without carina; apex of elytra different from above 28

28(27'). Integument black and/or reddish; pubescence scale-like, unicolor, white or black dorsally and white ventrally; antennae strongly serrate or pectinate from 4th antennomere; lateral margins of pronotum straight, with hind angles divergent; pronotum strongly convex longitudinal medially and grooved laterally; median basal tubercle of pronotum elongate; medioanterior margin of pronotum raised forming two teeth; prosternal channel present; scutellum subquadrangular; interstices alternate; apex of elytra conjointly rounded (Figs. 32, 33). Ecuador and Bolivia ..... *Propalaus* gen. nov.

28'. Integument and pubescence coloration different from above; antennae serrate or pectinate from 3rd antennomere; lateral margins of pronotum variable; pronotum with convexity variable; prosternal channel absent; scutellum of other shape; interstices variable; apex of elytra different from above.. 29

29(28'). Pubescence scale-like unicolor, ochrish; fore angles of frons strongly elevate forming a tooth-like; lateral margins of pronotum straight and forming a ridge; convexity of pronotum stronger at middle; posterior margin of pronotum prominent and notched at middle; medioanterior margin of pronotum prominent at middle; meso- metasternal suture present; borders of mesosternal cavity declivous; apex of last ventrite of female rounded; sutural spine of elytra present (Fig. 12). Mexico, Guatemala, Honduras, Costa Rica, Nicaragua, Panama, Colombia, Venezuela, Trinidad and Tobago (Trinidad), French Guiana, Brazil, Ecuador, Peru ..... *Chalcolepis* Candèze, 1857

29'. Pubescence scale-like, uni- or bicolor, different from above; if yellowish-ochre, with lateral ferrugineous bands on pronotum and elytra; fore angles of frons not raised; lateral margins of pronotum slightly sinuous and not forming ridge; convexity of pronotum moderate and gradual; medioanterior margin of pronotum straight or slightly sinuous; meso- metasternal suture absent or obsolete; borders of mesosternal cavity horizontal; apex of last ventrite of female truncate with fringe of spatulate setae; apex of elytra variable (Fig. 31). United States of America, Mexico, Guatemala, Belize, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Cuba, Jamaica, Virgin Islands, Haiti, Dominican Republic, Puerto Rico, Trinidad and Tobago, Venezuela, Colombia, Guyana, Suriname, French Guiana, Brazil, Ecuador, Peru, Bolivia, Chile, Paraguay, Argentina, Uruguay..... *Chalcolepidius* Eschscholtz, 1829

RESUMO

*Esse artigo apresenta uma análise cladística da tribo Hemirhipini. Estão incluídos na análise, 20 gêneros de Hemirhipini (*sensu *Casari-Chen 1994),* Saltamartinus *Casari (1996b) (Hemirhipini), 6 gêneros excluídos de Hemirhipini e mantidos em Pyrophorinae (= Agrypninae) (Casari-Chen 1993) e também,* Aphileus *Candèze (1857),* Pyrophorus *Billberg (1820) e* Thoramus *Sharp (1877). As espécies-tipo da maioria dos gêneros e todas as espécies dos gêneros Americanos (exceto* Saltamartinus viduus *(Chevrolat 1867)) foram analisadas. Essa análise demonstrou que 30 gêneros pertencem a Hemirhipini:* Abiphis *Fleutiaux (1926),* Alaolacon *Candèze (1865),*

Alaomorphus *Hauser (1900),* Alaus *Eschscholtz (1829),* Aliteus *Candèze (1857),* Anthracalaus *Fairmaire (1888),* Aphileus *Candèze (1857),* Austrocalais *Neboiss (1967),* Calais *Castelnau (1836),* Catelanus *Fleutiaux (1942),* Chalcolepidius *Eschscholtz (1829),* Chalcolepis *Candèze (1857),* Conobajulus *Van Zwaluwenburg (1940),* Coryleus *Fleutiaux (1942),* Cryptalaus *Ôhira (1967),* Eleuphemus *Hyslop (1921),* Eumoeus *Candèze (1874),* Fusimorphus *Fleutiaux (1942),* Hemirhipus *Latreille (1829),* Lacais *Fleutiaux (1942),* Lycoreus *Candèze (1857),* Mocquerysia *Fleutiaux (1899),* Neocalais *Girard (1971),* Pherhimius *Fleutiaux (1942),* Phibisa *Fleutiaux (1942),* Propalaus *gen. nov.,* Pseudocalais *Girard (1971),* Saltamartinus *Casari (1996),* Tetrigus *Candèze (1857) e* Thoramus *Sharp (1877). As espécies incluídas em* Alaus *não formam um grupo monofilético e o gênero* Propalaus *gen. nov. foi estabelecido para incluir* Alaus alicii *(Pjatakowa 1941) e* A. haroldi *(Candèze 1878). A descrição de* Propalaus *gen. nov. (espécie-tipo:* Chalcolepidius haroldi *Candèze, 1878) e uma nova chave para os gêneros de Hemirhipini também estão presentes.*

Palavras-chave: espécies americanas; espécies-tipo; gêneros do mundo; novas combinações.

ACKNOWLEDGEMENTS

To Peterson Lásaro Lopes (Museu de Zoologia, Universidade de São Paulo- MZUSP) by helping with the NDE, TNT and Winclada programs and by discussions on some characters. To Marcelo Duarte (MZUSP) by incentive and valuable suggestions; Paul Johnson (South Dakota State University) by suggestions; Airton de Almeida Cruz (MZUSP) by scanning the diapositives concerning Figs. 31-33; three referees by construtive comments and suggestions. To CNPq for grant.

REFERENCES

Amorim, D.S. 1982. Classificação por sequenciação: uma proposta para denominação dos ramos retardados. *Revista Brasileira de Zoologia,* 1(1):1-9.

Arnett, R.H.; Mignot, E.C. & Smith, E.H. 1969. North American Coleoptera fauna: notes on Pyrophorinae, Elateridae. *The Coleopterists' Bulletin,* 23:9-15.

Buysson, H. Du. 1926. Tableau de détermination des Élatérides de la faune franco-rhéname. *Miscellanea Entomologica Castanet-Tolosan,* 1910-1926:1208.

Calder, A.A. & Von Hayek, C.M.F. 1992. A reappraisal and revision of the genus *Anthracalaus* Fairmaire (Coleoptera: Elateridae). *Entomologica Scandinavica,* 23:11-62.

Calder, A.A. 1990. *Anthracalaus australis* Fleutiaux, a little-known Australian Elateridae (Coleoptera: Elateridae), with a key to related genera. *Invertebrate Taxonomy,* 3:551-563.

Calder, A.A. 1996. *Click Beetles. Genera of the Australian Elateridae (Coleoptera).* CSIRO Publishing, Melbourne. Monographs on Invertebrate Taxonomy, v. 2, 401p.

Candèze, E. 1857. Monographie des Élatérides. Tome premier. *Mémoires de la Societé Royale des Sciences de Liège,* 12:1-400, 7 pls.

Candèze, E. 1874. Révision de la Monographie des Élatérides. *Mémoires de la Societé Royale des Sciences de Liège,* 4(2):1-218.

Candèze, E. 1891. *Catalogue Méthodique des élatérides connus en 1890.* Liège, H. Vaillant-Carmanne, 246 p.

Casari, S.A. 1996a. Systematics and phylogenetic analysis of *Alaus* Eschscholtz, 1829 (Coleoptera, Elateridae). *Revista Brasileira de Entomologia,* 40(2):249-298.

Casari, S.A. 1996b. Revision of *Pherhimius* Fleutiaux, 1942 with establishment of *Saltamartinus,* new genus (Coleoptera, Elateridae, Pyrophorinae, Hemirhipini). *Papéis Avulsos de Zoologia,* 39(21):379-403.

Casari, S.A. 1998. Revision of *Hemirhipus* Latreille, 1825 (Coleoptera, Elateridae). *Revista Brasileira de Entomologia,* 41(2-4):317-334.

Casari, S.A. 1999. Three new species of *Chalcolepis* Candèze, 1857 (Col. Elateridae: Agrypninae: Hemirhipini). *Annales de la Societé Entomologique de France,* N.S., 35(2):203-215.

Casari, S.A. 2002a. *Catelanus* and *Fusimorphus* (Coleoptera, Elateridae, Agrypninae). *Iheringia,* Série Zoologia, 92(3):85-93.

Casari, S.A. 2002b Review of the genus *Chalcolepidius* Eschscholtz, 1829 (Coleoptera, Elateridae, Agrypninae). *Revista Brasileira de Entomologia,* 46(3):263-428.

Casari, S.A. 2003. New species of *Alaus* Eschscholtz, 1829 (Coleoptera: Elateridae, Agrypninae, Hemirhipini). *Annales de la Societé Entomologique de France,* N.S., 39(4):315-333.

Casari-Chen, S.A. 1985. Sistemática e evolução dos Hemirhipini Neotropicais (Pyrophorinae, Elateridae, Coleoptera). *Revista Brasileira de Entomologia,* 29(3/4):383-423.

Casari-Chen, S.A. 1991. Systematics and phylogenetic analysis of *Lacais* Fleutiaux, 1942 (Coleoptera, Elateridae, Pyrophorinae, Hemirhipini). *Revista Brasileira de Entomologia,* 35(4):773-794.

Casari-Chen, S.A. 1993. Systematics and evolution of Hemirhipini from Old World and Australia. I. Genera removed from tribe (Coleoptera, Elateridae, Pyrophorinae). *Revista Brasileira de Entomologia,* 37(2):223-262.

Casari-Chen, S.A. 1994. Systematics and evolution of Hemirhipini from Old World and Australia. II. Phylogeny of the tribe including the American genera (Coleoptera, Elateridae, Pyrophorinae). *Revista Brasileira de Entomologia,* 38(1):161-252.

Castelnau, F.L.N.C. Laporte Comte de. 1836. Études entomologiques, ou descriptions d'insectes nouveaux et observations sur la synonymie. *Revue Entomologique,* 4:5-60.

Costa, C. 1975. Systematics and evolution of the tribes Pyrophorini and Heligmini, with description of Campyloxeninae, new subfamily (Coleoptera, Elateridae). *Arquivos de Zoologia,* 26(2):49-188.

Costa, C. 1992. Larva and pupa of *Thoramus laevithorax* (White, 1846) and the systematic position of the genus *Thoramus* Sharp, 1877 (Coleoptera, Elateridae, Pyrophorinae). *Revista Brasileira de Entomologia,* 36(1):223-227.

Fleutiaux, E. 1919. Insectes Coléoptères XIII. Elateridae, Trixagidae et Melasidae. In: *Voyage de Ch. Alluaud et R. Jeannel em Afrique Orientale (1911-1912). Résultats Scientifiques.* Pris: Librairie des Sciences Naturelles, p. 1-119.

Fleutiaux, E. 1942. Sur certains Hémirhipides (Col. Elateridae). *Annales de la Societé Entomologique de France,* 111:91-108.

Fleutiaux, E. 1947. Révision des Élatèrides (Coléoptères) de l'Indochine française. *Notes d'Entomologie Chinoise,* 11(8):233-240.

Goloboff, P.; Farris, J. & Nixon, K. 2003. *T.N.T. Tree analysis using new technology.* Program and documentation, available from the authors at: <www.zmuc.dk/public/phylogeny>

Heyne, A. & Taschenberg, O. 1908. *Die exotischen Käfer in Wort und Bilt, 27 Lieferungen. Leipzing,* 262 p., 39 pl.

Hyslop, J.A. 1917. The phylogeny of the Elateridae based on larval characters. *Annals of Entomological Society of America,* 10(1-4):241-263.

Johnson, P.J. 2001. A new species of *Cryptalaus* from Fiji, with taxonomic and distributional notes and a key to the Hemirhipini of Eastern Melanesia and Polynesia (Coleoptera: Elateridae). *Proceedings of Hawaiian Entomological Society,* 35:1-12.

Lacordaire, J.T. 1857. Genera des Coléoptères… Librairie Encyclopédique de Roret, Paris, v. 4, 579 p.

Laurent, L. 1973. Coleoptera: Elateridae. In: Hanstrom, B., Brinck, P. & Rudebeck, G. (Eds.), *South African animal life. Results of the Lund University expedition in 1950-1951.* Sweedish Natural Science Research, Stockholm, v.15, p.12-39, 3 Figs.

Leng, C.W. 1920. *Catalogue of the Coleoptera of America, North of Mexico.* Mount Vernon, New York, 470 p.

Nixon, K.C. & Carpenter, J.M. 1993. On out groups. *Cladistics,* 9:413-426.

Nixon, K.C. 2002. *Winclada (BETA) ver. 1.00.08.* Published by the author, Ithaca, NY.

Ôhira, H. 1990. Notes on the genus *Paracalais* and its allied genera. *Gekkan-Mushi,* 234:19-21.

Page, R. 2001. *NDE (Nexus Data Editor for Windows) ver. 0.5.0.* Published by the author, Glasgow, United Kingdom.

Reitter, E. 1905. Bestimmungstabellen der Europaischen Coleoptera: Elateridae I. *Verhandlungen Naturhistorischen,* 56:1-122.

Schenkling, S. 1925. Elateridae I. In: Schenkling, S., *Coleopterorum Catalogus auspiciis et auxilio W. Junk.* W. Junk, Berlin, Pars 80, p. 1-263.

Schwarz, O.C.E. 1906. Coleoptera Fam. Elateridae. In: Wystman, P. (Ed.), *Genera Insectorum.* P. Wystman, Bruxelles, 46A, p. 1-112.

Stibick, N.L. 1979. Classification of Elateridae (Coleoptera). Relationships and classification of the subfamilies and tribes. *Pacific Insects,* 20(2-3):145-186.

Recebido em: 12.12.2007
Aceito em: 25.08.2008
Publicado em: 30.09.2008

Apoio:
CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico
CAPES
Ministério da Educação
Ministério da Ciência e Tecnologia
BRASIL UM PAÍS DE TODOS GOVERNO FEDERAL

APPENDIX 1: List of Agrypninae species included in the analysis (geographical distribution parenthesized).

Abiphis nobilis (Illiger 1800) (Madagascar)
Alaolacon cyanipennis Candèze 1865 (Malaysia)
Alaomorphus candezei Hauser 1900 (Kenya)
Alaus alicii (Pjatakowa 1941) (Bolivia)
Alaus calcaripilosus Casari 1996 (Mexico)
Alaus cinnamomeus Casari 2003 (Peru)
Alaus haroldi (Candèze 1878) (Ecuador, Peru)
Alaus latipennis Casari 2003 (Dominican Republic)
Alaus lusciosus (Hope 1832) (United States of America)
Alaus melanops LeConte 1863 (Canada, United States of America)
Alaus myops (Fabricius 1801) (Canada, United States of America)
Alaus nobilis Sallé 1855 (Dominican Republic)
Alaus oculatus (Linnaeus 1758) (Canada, United States of America)
Alaus patricius (Candèze 1857) (United States of America, Bahamas, Cuba, Jamaica, Dominican Republic)
Alaus plebejus Candèze 1874 (Mexico, Belize, Nicaragua, Costa Rica, Panama, Venezuela, French Guiana, Brazil)
Alaus sericeus Casari 2003 (Mexico)
Alaus thoracopunctatus Casari 2003 (Guatemala, Honduras)
Alaus tricolor (Olivier 1790) (Dominican Republic, Nicaragua, Venezuela)
Alaus unicus (Fleutiaux 1910) (Panama, Colombia, Venezuela, Brazil)
Alaus veracruzanus Casari, 1996 (Mexico)
Alaus zunianus Casey 1893 (United States of America)
Aliteus reichei (Candèze1857) (Indonesia (Java), South Africa)
Anthracalaus westermanni (Candèze 1857) (Indonesia (Java))
Aphileus lucanoides Candèze 1857 (Australia)
Austrocalais pogonodes Neboiss 1967 (Australia)
Calais excavatus (Fabricius 1801) (India, Senegal, Guinea, Liberia, Ivory Coast, Ghana, Benin, Cameroon, Gabon, Congo, Democratic Republic of Congo, Tanzania, Angola, South Africa)
Catelanus trilineatus (Castelnau 1836) (Brazil)
Chalcolepidius albisetosus Casari 2002 (Ecuador)
Chalcolepidius albiventris Casari 2002 (Mexico)
Chalcolepidius angustatus Candèze 1857 (Mexico)
Chalcolepidius apacheanus Casey 1891 (United States of America, Mexico)
Chalcolepidius approximatus Erichson 1841 (Mexico)
Chalcolepidius attenuatus Erichson 1841 (Mexico)
Chalcolepidius aurulentus (Candèze 1874) (Colombia, Venezuela, Guyana, Suriname, French Guiana, Ecuador, Brazil, Peru, Bolivia, Argentina, Paraguay)
Chalcolepidius bomplandii Guérin-Méneville 1844 (Mexico, Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Guyana)
Chalcolepidius boucardi Candèze 1874 (Mexico)
Chalcolepidius chalcantheus Candèze 1857 (Guatemala, Panama, Colombia, Venezuela, Brazil, Ecuador, Peru, Argentina)
Chalcolepidius copulatuvittatus Casari 2002 (Venezuela)
Chalcolepidius corpulentus Candèze 1874 (Venezuela, Brazil, Peru, Bolivia, Paraguay, Argentina)
Chalcolepidius cyaneus Candèze 1881 (West Indies (Jamaica, Virgin Islands), Colombia, Venezuela, Trinidad and Tobago, Guyana, Suriname, Brazil)
Chalcolepidius desmaresti Chevrolat 1835 (Mexico, Guatemala, Honduras, Costa Rica, Panama, Colombia)
Chalcolepidius dugesi Candèze 1886 (Mexico)
Chalcolepidius erythroloma Candèze 1857 (Hawaiian Island (Oahu), Ecuador, Chile, Peru)
Chalcolepidius eschscholtzi Chevrolat 1833 (Mexico)
Chalcolepidius extenuatuvittatus Casari 2002 (Venezuela)
Chalcolepidius exulatus Candèze 1874 (Venezuela, Brazil)
Chalcolepidius fabricii Erichson 1841 (Colombia, Venezuela, Ecuador)
Chalcolepidius fasciatus Casari 2002 (Mexico)
Chalcolepidius ferratuvittatus Casari 2002 (Colombia, Ecuador)
Chalcolepidius forreri Candèze 1886 (Mexico)
Chalcolepidius fryi Candèze 1874 (Peru)
Chalcolepidius gosipiatus Guérin-Méneville 1844 (Guatemala, Costa Rica, Panama, Colombia, Venezuela, Brazil, Ecuador)
Chalcolepidius inops Candèze 1886 (Mexico, Guatemala, Costa Rica)
Chalcolepidius jansoni Candèze 1874 (Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Peru)
Chalcolepidius lacordairii Candèze 1857 (United States of America, Mexico, Guatemala, Costa Rica, Honduras, Nicaragua, El Salvador, Panama)
Chalcolepidius lafargi Chevrolat 1835 (Mexico, Costa Rica, West Indies)
Chalcolepidius lenzi Candèze 1886 (United States of America, Mexico)
Chalcolepidius limbatus (Fabricius 1777) (West Indies (Virgin Islands), Trinidad and Tobago, Venezuela, Colombia, Peru, Ecuador, French Guiana, Guyana, Brazil, Bolivia, Argentina, Paraguay, Uruguay)
Chalcolepidius mexicanus Castelnau 1836 (Mexico, Nicaragua)
Chalcolepidius mocquerysii Candèze 1857 (Guatemala, Belize, Colombia, Venezuela, Suriname, Peru)
Chalcolepidius morio Candèze 1857 (Mexico)
Chalcolepidius obscurus Castelnau 1836 (West Indies (Guadeloupe, St. Vicent, Virgin Islands), Cuba)

APPENDIX 1 (Continued): List of Agrypninae species included in the analysis (geographical distribution parenthesized).

Chalcolepidius porcatus (Linnaeus 1767) (West Indies (Guadeloupe), Colombia, Venezuela, Guyana, Suriname, French Guiana, Brazil, Peru)
Chalcolepidius proximus Casari 2002 (Mexico)
Chalcolepidius pruinosus Erichson 1841 (Mexico)
Chalcolepidius rodriguezi Candèze 1886 (Guatemala)
Chalcolepidius rostainei Candèze 1889 (Brazil)
Chalcolepidius rubripennis LeConte 1861 (United States of America, Mexico)
Chalcolepidius rugatus Candèze 1857 (Mexico, Belize, Guatemala, Honduras)
Chalcolepidius serricornis Casari 2002 (Mexico)
Chalcolepidius silbermanni Chevrolat 1835 (Mexico, Belize, Guatemala, Honduras, Nicaragua, El Salvador, Costa Rica, Panama, Colombia, Venezuela, Trinidad and Tobago, Haiti, Dominican Republic, Puerto Rico, West Indies (Guadaloupe, Jamaica))
Chalcolepidius smaragdinus LeConte 1854 (United States of America, Mexico)
Chalcolepidius spinipennis Casari 2002 (Mexico)
Chalcolepidius sulcatus (Fabricius 1777) (West Indies (Virgin Islands))
Chalcolepidius supremus Casari 2002 (Venezuela)
Chalcolepidius tartarus Fall 1898 (United States of America)
Chalcolepidius truncuvittatus Casari 2002 (Mexico)
Chalcolepidius validus Candèze 1857 (West Indies: Martinique, Guadeloupe, Dominica, Saint Lucia)
Chalcolepidius villei Candèze 1878 (Colombia, Ecuador, Bolivia)
Chalcolepidius virens (Fabricius 1787) (West Indies (Barbados, Grenade), Trinidad and Tobago, Venezuela, Colombia, Guyana, Suriname, Brazil, Ecuador, Peru, Bolivia)
Chalcolepidius virgatipennis Casari 2002 (Mexico)
Chalcolepidius virginalis Candèze 1857 (Mexico)
Chalcolepidius viridipilis (Say 1825) (United States of America, Mexico)
Chalcolepidius webbi LeConte 1854 (United States of America, Mexico)
Chalcolepidius zonatus Eschscholtz 1829 (French Guiana, Colombia, Ecuador, Brazil, Bolivia, Argentina)
Chalcolepis austerus Casari 1999 (Guatemala, Costa Rica, Panama)
Chalcolepis luczotii Candèze 1857 (Mexico, Guatemala, Costa Rica, Honduras, Nicaragua, Panama, Colombia, Venezuela, Trinidad and Tobago, Ecuador)
Chalcolepis similis Casari 1999 (Costa Rica, Panama, Trinidad and Tobago, Venezuela, Colombia, French Guiana, Brazil, Ecuador, Peru)
Chalcolepis splendidus Casari 1999 (Mexico, Guatemala, Honduras, Panama)
Conobajulus ugiensis Van Zwaluwenburg 1940 (Fiji and Solomon Islands)
Coryleus pectinatus (Fairmaire 1897) (Comoro Islands)
Cryptalaus prosectus (Candèze 1857) (Australia)
Eleuphemus fasciatus (Drury 1782) (Senegal, Guinea, Sierra Leone, Benin, Gabon, Congo, Democratic Republic of Congo)
Eleuphemus funerarius (Bertoloni 1854) (Congo, Tanzania, Mozambique)
Eumoeus murray Candèze 1874 (India, Indonesia (Java))
Fusimorphus submetallicus (Fleutiaux 1924) (French Guiana, Brazil)
Hemirhipus apicalis Candèze 1857 (Colombia, Peru, French Guiana, Brazil, Argentina)
Hemirhipus bimaculatus Candèze 1857 (Mexico, Guatemala, Colombia)
Hemirhipus elegantissimus Candèze 1881 (Argentina, Uruguay)
Hemirhipus faimairii Candèze 1857 (Colombia, Venezuela, Brazil)
Hemirhipus guatemalensis Fleutiaux 1940 (Guatemala)
Hemirhipus hougeti (Candèze 1889) (Argentina, Uruguay)
Hemirhipus lineatus (Olivier 1790) (Brazil, Argentina, Paraguay, Uruguay)
Hemirhipus ochraceipilosus Fleutiaux 1942 (French Guiana)
Hemirhipus rojasi Candèze 1857 (Guatemala, Colombia, Venezuela)
Lacais glauca (Castelnau 1836) (Suriname, French Guiana, Brazil, Peru)
Lacais nietoi (Sallé 1873) (Mexico, Guatemala, Belize)
Lacais suturalis (Champion 1894) (Nicaragua, Costa Rica, Panama, Colombia)
Lycoreus goudotii (Castelnau 1836) (Madagascar)
Mocquerysia coerulipennis Fleutiaux 1929 (Madagascar)
Neocalais macer (Candèze 1878) (Ivory Coast, Ghana, Gabon)
Pherhimius dejeani (Candèze 1857) (Brazil)
Pherhimius fascicularis (Fabricius 1787) (United States of America, Mexico, Dominican Republic, Belize, Panama, French Guiana, Brazil, Argentina, Paraguay, Uruguay)
Phibisa pupieri (Fleutiaux 1903) (Comoro Islands)
Pseudocalais basilewskyi (Mouchet 1949) (Cameroon, Central African Republic, Democratic Republic of Congo, Tanzania, Gabon, Angola)
Pyrophorus divergens Eschscholtz 1829 (Colombia, Venezuela, Suriname, Peru, Brazil, Paraguay)
Saltamartinus decorus (Candèze 1857) (Mexico, Nicaragua)
Saltamartinus perroudi (Candèze 1874) (Brazil)
Saltamartinus scriptus (Candèze 1900) (Suriname)
Tetrigus parallelus Candèze 1857 (India)
Thoramus wakefieldi (Sharp 1877) (New Zealand)

APPENDIX 2: Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Pyrophorus divergens	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0
Tetrigus parallelus	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	3	0	0	1	0	3	1	2	0	1	1
Catelanus trilineatus	2	0	0	–	4	–	–	–	–	–	0	–	0	0	0	1	1	0	0	1	1	3	0	4	1	1	1
Alaus alicii	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	3	0	0	0	1	0	2	1	3	0	1	1
Alaus calcaripilosus	1	0	1	1	1	–	–	0	0	–	0	–	6	0	0	4	0	1	0	1	0	0	0	0	0	1	1
Alaus cinnamomeus	1	0	1	1	1	–	–	0	0	–	0	–	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus haroldi	1	0	1	1	1	–	–	0	0	2	0	–	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Alaus latipennis	1	1	1	1	1	–	–	0	0	0	0	–	6	0	0	0	0	1	0	0	0	1	1	5	0	1	1
Alaus lusciosus	1	0	2	1	1	1	–	1	1	0	0	2	6	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus melanops	1	0	2	1	1	1	–	1	1	1	0	–	6	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus myops	1	0	2	1	1	1	–	1	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus nobilis	1	0	1	1	1	–	–	0	1	–	0	–	0	0	0	0	0	0	0	1	0	1	1	3	0	1	1
Alaus oculatus	1	0	2	1	1	1	–	1	1	1	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus patricius	1	0	1	1	1	–	–	0	3	–	0	–	4	0	0	0	0	1	0	0	0	3	1	3	0	1	1
Alaus plebejus	1	0	1	1	1	–	–	0	0	1	0	–	6	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus sericeus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	1	0	1	1	5	0	1	1
Alaus thoracopunctatus	1	1	1	1	1	–	–	0	0	1	0	–	7	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus tricolor	1	0	2	1	1	1	–	1	0	–	0	–	3	1	0	0	0	0	0	0	0	1	1	5	0	1	1
Alaus unicus	1	0	1	1	1	–	–	0	0	3	0	–	1	1	0	0	0	1	0	0	0	0	0	1	0	1	1
Alaus veracruzanus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alaus zunianus	1	0	2	1	1	1	–	1	2	1	0	0	6	0	0	0	0	0	0	1	0	0	0	0	0	1	1
Chalcolepidius albisetosus	1	0	1	1	2	–	–	–	–	0	0	–	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius albiventris	0	0	1	1	0	–	–	–	–	4	0	1	1	4	0	0	0	0	0	0	0	0	1	1	0	1	1
Chalcolepidius angustatus	0	0	1	1	3	–	–	–	–	4	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius apacheanus	1	0	1	1	0	–	–	–	–	4	0	1	2	3	1	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius approximatus	0	0	1	1	0	–	–	–	–	3	0	1	1	2	1	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius attenuatus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	1	2	0	1	1
Chalcolepidius aurulentus	0	0	1	1	4	–	–	–	–	–	0	–	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius bomplandii	0	0	1	1	0	–	–	–	–	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius boucardi	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	1	2	0	1	1
Chalcolepidius chalcantheus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius copulatuvittatus	1	0	1	1	0	–	–	–	–	3	0	3	1	2	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius corpulentus	0	0	1	1	0	–	–	–	–	3	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius cyaneus	0	0	1	1	4	–	–	–	–	3	0	–	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius desmaresti	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius dugesi	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	2	1	2	0	1	1
Chalcolepidius erythroloma	0	0	1	1	2	–	–	–	–	0	0	–	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius eschscholtzi	0	0	1	1	3	–	–	–	–	–	0	4	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Chalcolepidius extenuatuvittatus	0	0	1	1	4	–	–	–	–	–	0	–	1	4	0	0	0	0	0	0	0	?	0	?	0	1	1
Chalcolepidius exulatus	0	0	1	1	0	–	–	–	–	3	0	1	2	4	0	0	0	0	0	0	0	1	0	1	0	1	1
Chalcolepidius fabricii	1	0	1	1	4	–	–	–	–	–	0	–	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Chalcolepidius fasciatus	0	0	1	1	0	–	–	–	–	4	0	2	1	3	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius ferratuvittatus	0	0	1	1	4	–	–	–	–	–	0	–	2	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius forreri	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	?	0	?	0	1	1
Chalcolepidius fryi	0	0	1	1	2	–	–	–	–	–	0	–	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius gossipiatus	1	0	1	1	4	–	–	–	–	0	0	–	1	0	0	0	0	0	0	0	0	1	0	1	0	1	1
Chalcolepidius inops	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	2	1	2	0	1	1
Chalcolepidius jansoni	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius lacordairii	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Chalcolepidius lafargi	0	0	1	1	0	–	–	–	–	4	0	1	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Chalcolepidius lenzi	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	1	2	0	1	1
Chalcolepidius limbatus	0	0	1	1	0	–	–	–	–	3	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius mexicanus	1	0	1	1	4	–	–	–	–	3	1	–	0	0	0	0	0	0	0	0	0	2	1	1	0	1	1
Chalcolepidius mocquerysii	0	0	1	1	0	–	–	–	–	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius morio	0	0	1	1	4	–	–	–	–	–	0	–	?	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius obscurus	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius oxydatus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius porcatus	0	0	1	1	4	–	–	–	–	4	0	–	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius proximus	1	0	1	1	0	–	–	–	–	4	0	1	1	0	0	0	0	0	0	0	0	?	0	?	0	1	1
Chalcolepidius pruinosus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius rodriguezi	1	0	1	1	4	–	–	–	–	–	1	–	0	0	0	0	0	0	0	0	0	1	1	2	0	1	1

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Chalcolepidius rostainei	0	0	1	1	0	–	–	–	–	–	0	1	1	2	0	0	0	0	0	0	0	?	0	?	0	1	1
Chalcolepidius rubripennis	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1
Chalcolepidius rugatus	0	0	1	1	3	–	–	–	–	0	0	4	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Chalcolepdius serricornis	0	0	1	1	3	–	–	–	–	3	0	–	2	0	0	0	0	0	0	0	0	1	1	2	0	1	1
Chalcolepidius silbermanni	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius smaragdinus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	3	1	2	0	1	1
Chalcolepidius spinipennis	1	0	1	1	0	–	–	–	–	3	0	2	2	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius sulcatus	0	0	1	1	4	–	–	–	–	0	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius supremus	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1
Chalcolepidius tartarus	1	0	1	1	0	–	–	–	–	3	0	1	2	3	1	0	0	0	0	0	0	1	0	1	0	1	1
Chalcolepidius truncuwittatus	1	0	1	1	3	–	–	–	–	4	0	2	1	0	0	0	0	0	0	0	0	?	0	?	0	1	1
Chalcolepidius validus	0	0	1	1	5	–	–	–	–	0	0	–	1	2	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius villei	0	0	1	1	2	–	–	–	–	–	0	–	2	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Chalcolepidius virens	0	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius virgatipennis	0	0	1	1	5	–	–	–	–	3	0	2	1	4	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius virginalis	1	0	1	1	0	–	–	–	–	0	0	2	1	0	0	0	0	0	0	0	0	1	1	1	0	1	1
Chalcolepidius viridipilis	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	0	0	3	1	2	0	1	1
Chalcolepidius webbi	1	0	1	1	0	–	–	–	–	4	0	1	2	3	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepidius zonatus	0	0	1	1	0	–	–	–	–	4	0	1	1	3	0	0	0	0	0	0	0	0	0	0	0	1	1
Chalcolepis austerus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
Chalcolepis luczotii	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1
Chalcolepis similis	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1
Chalcolepis splendidus	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1
Fusimorphus submentallicus	2	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	1	0	0	1	1	3	0	4	2	1	1
Hemirhipus apicalis	1	0	3	0	2	0	2	–	–	–	0	–	5	0	0	2	0	2	1	1	1	3	1	4	2	1	1
Hemirhipus bimaculatus	1	0	3	0	2	0	2	–	–	–	0	–	0	0	0	2	2	2	1	1	1	3	1	4	2	1	1
Hemirhipus elegantissimus	1	0	3	0	2	0	2	–	–	–	0	–	5	0	0	2	0	2	1	1	1	3	1	4	2	1	1
Hemirhipus faimairii	1	0	3	0	2	0	0	–	–	–	0	–	1	0	0	2	2	2	1	1	1	3	1	4	2	1	1
Hemirhipus guatemalensis	1	0	3	0	2	0	2	–	–	–	0	–	1	0	0	2	?	?	1	?	1	3	1	4	2	1	1
Hemirhipus hougeti	1	0	3	0	2	0	2	–	–	–	0	–	5	0	0	2	3	2	1	1	1	3	1	4	2	1	1
Hemirhipus lineatus	1	0	3	0	2	0	1	–	–	–	0	–	1	0	0	2	1/3	2	1	1	1	3	1	4	2	1	1
Hemirhipus ochraceipilosus	1	0	3	0	1	0	3	–	–	–	0	–	0	0	0	0	0	2	1	1	1	3	1	4	2	1	1
Hemirhipus rojasi	1	0	3	0	2	0	0	–	–	–	0	–	0	0	0	0	0	2	1	1	1	3	1	4	2	1	1
Lacais glauca	0	0	1	1	6	–	–	–	–	–	1	2	7	1	0	0	0	0	0	1	1	3	1	3	2	1	1
Lacais nietoi	0	0	1	1	7	–	–	–	–	–	1	–	3	1	0	0	0	0	0	1	1	3	1	3	2	1	1
Lacais suturalis	0	0	1	1	4	–	–	–	–	–	0	–	0	1	0	0	0	0	0	1	0	2	1	3	2	1	1
Pherhimius dejeani	1	0	0	–	4	–	–	–	–	–	0	–	4	0	0	1	1	0	0	1	1	3	0	4	2	1	1
Pherhimius fascicularis	1	0	0	–	4	–	–	–	–	–	0	–	4	0	0	0	1	0	0	1	1	3	0	4	2	1	1
Saltamartinus decorus	1	0	0	–	4	–	–	–	–	–	0	–	8	0	0	0	1	0	1	1	1	3	0	4	2	1	1
Saltamartinus perroudi	1	0	0	–	4	–	–	–	–	–	0	–	8	0	0	0	1	1	0	1	1	3	0	4	2	1	1
Saltamartinus scriptus	1	0	0	–	4	–	–	–	–	–	0	–	8	0	0	0	1	0	0	1	1	3	0	4	2	1	1
Eleuphemus fasciatus	1	0	1	2	1	–	–	0	0	0	0	–	7	0	0	2	2	0	0	2	1	4	0	6	2	1	1
Eleuphemus funerarius	1	0	1	2	1	–	–	0	0	–	0	–	7	0	0	2	2	0	0	2	1	4	0	6	2	1	1
Alaomorphus candezei	1	0	1	2	8	–	–	–	–	0	0	–	5	0	1	0	0	0	0	3	1	3	1	3	2	1	1
Coryleus pectinatus	1	0	1	0	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	3	0	3	1	3	0	1	1
Lycoreus goudoti	1	0	2	1	9	2	–	–	–	0	0	–	7	0	0	0	0	0	0	0	0	3	1	3	0	1	1
Abiphis nobilis	1	0	2	1	9	2	–	–	–	–	0	–	9	0	0	5	0	0	0	3	1	3	1	3	2	1	1
Phibisa pupieri	1	0	1	0	4	–	–	–	–	–	0	–	0	0	0	0	4	0	0	3	1	3	1	3	2	1	1
Neocalais macer	1	0	1	1	1	–	–	0	0	–	0	–	2	0	0	0	0	0	0	2	0	0	0	0	0	1	1
Pseudocalais basilewskyi	1	0	2	1	9	1	–	1	0	–	0	–	4	0	0	0	3	0	0	1	0	0	0	0	0	1	1
Calais excavatus	1	0	1	1	4	–	–	–	–	–	0	–	6	0	0	0	0	0	0	3	0	0	0	1	0	1	1
Conobajulus ugiensis	1	0	1	1	4	–	–	–	–	–	0	–	0	0	0	2	0	0	0	2	0	0	0	0	0	1	1
Cryptalaus prosectus	1	0	1	1	1	–	–	0	0	–	0	–	6	0	0	0	0	0	0	3	0	0	1	5	0	1	1
Austrocalais pogonodes	1	0	1	1	1	–	–	0	0	–	0	–	7	0	0	0	0	1	0	2	0	0	0	0	0	1	1
Alaolacon cyanipennis	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	2	?	?	0	?	1	1	0
Aliteus reichei	1	0	1	1	7	–	–	–	–	–	0	–	6	0	0	0	0	0	0	2	0	0	0	0	1	1	0
Mocquerysia coerulipennis	1	1	0	–	4	–	–	–	–	–	0	–	0	0	0	0	0/2	0	0	2	1	4	0	6	1	1	0
Eumoeus murray	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	2	1	4	0	6	2	1	0
Anthracalaus westermanni	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	3	0	0	2	0	1	1	1	0	1	0
Aphileus lucanoides	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	0	0	0	2	0	0	1	7	1	0	0
Thoramus wakefieldi	1	0	0	–	4	–	–	–	–	–	0	–	0	0	0	0	1	0	0	1	0	0	1	2	0	1	0

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Pyrophorus divergens	0	0	0	2	1	1	0	0	5	0	0	4	3	0	0	1	0	0	0	0	0	1	0	0	0	0	1
Tetrigus parallelus	0	1	0	2	1	0	0	0	4	0	0	3	3	0	0	1	0	0	1	0	0	1	0	0	0	1	1
Catelanus trilineatus	0	1	0	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	–	0	0	0	1	1
Alaus alicii	0	1	1	3	1	0	1	0	3	0	0	2	0	3	0	0	1	0	1	0	0	4	0	0	0	0	0
Alaus calcaripilosus	0	1	0	2	1	1	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	1	0	0	0	0	0
Alaus cinnamomeus	0	1	0	3	1	0	3	0	4	0	0	0	3	1	0	0	0	0	1	0	0	4	0	0	0	0	0
Alaus haroldi	0	1	1	3	1	0	3	0	1	0	0	2	2	3	0	0	1	0	1	0	0	4	0	0	0	0	0
Alaus latipennis	0	1	1	3	1	1	3	0	1	0	0	0	3	3	0	0	1	0	1	0	1	–	0	0	0	0	0
Alaus lusciosus	0	1	0	3	1	0	3	0	0	1	0	3	3	1	0	0	0	0	1	0	0	4	0	0	0	0	0
Alaus melanops	0	1	0	2	1	0	3	0	0	1	0	3	3	1	0	0	0	0	1	0	0	2	0	0	0	0	0
Alaus myops	0	1	0	3	1	0	3	0	0	0	0	0	3	1	0	0	0	0	1	0	0	2	0	0	0	0	0
Alaus nobilis	0	1	1	3	1	1	3	0	0	0	0	0	3	3	0	1	0	0	1	0	1	–	0	0	0	0	0
Alaus oculatus	0	1	0	3	1	0	3	0	0	1	0	3	3	2	0	0	0	0	1	0	0	4	0	0	0	0	0
Alaus patricius	0	1	1	2	1	1	0	0	4	0	0	0	3	3	0	0	0	0	1	0	0	2	0	0	0	0	0
Alaus plebejus	0	1	0	2	1	1	0	0	4	0	0	0	3	0	0	0	0	0	1	0	1	–	0	0	0	0	0
Alaus sericeus	0	1	0	3	1	1	3	0	4	0	0	0	3	1	0	0	0	0	1	0	0	2	0	0	0	0	0
Alaus thoracopunctatus	0	1	1	3	1	2	3	0	0	0	0	0	3	2	0	0	0	0	1	0	0	2	0	0	0	0	0
Alaus tricolor	0	1	1	1	1	2	3	0	0	0	0	2	3	3	0	1	0	0	1	0	0	4	0	0	0	0	0
Alaus unicus	0	1	0	3	1	0	3	0	4	0	0	0	3	2	0	0	0	0	1	0	0	2	0	0	0	0	0
Alaus veracruzanus	0	1	0	0	1	1	1	0	0	0	0	0	3	1	0	0	1	0	1	0	0	–	0	0	0	0	0
Alaus zunianus	0	1	0	2	1	0	3	0	4	1	0	3	3	2	0	1	0/1	0	1	0	0	2	0	0	0	0	0
Chalcolepidius albisetosus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius albiventris	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius angustatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	2	1	0	0	0	0
Chalcolepidius apacheanus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius approximatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius attenuatus	0	1	0	2	1	0	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	2	1	0	0	0	0
Chalcolepidius aurulentus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius bomplandii	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius boucardi	0	1	0	0	1	0	1	0	1	0	0	3	1	3	0	1	1	0	1	0	0	2	1	0	0	0	0
Chalcolepidius chalcantheus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	1	1	0	1	0	0	2	1	0	0	0	0
Chalcolepidius copulatuvittatus	0	1	0	0	1	0	1	0	1	0	0	2	1	0	0	1	0	0	1	0	0	2	1	0	0	0	0
Chalcolepidius corpulentus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius cyaneus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius desmaresti	0	1	0	0	1	0	1	0	3	0	0	3	1	3	0	2	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius dugesi	0	1	0	2	1	0	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius erythroloma	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius eschscholtzi	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius extenuatuvittatus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius exulatus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius fabricii	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius fasciatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius ferratuvittatus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius forreri	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius fryi	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius gossipiatus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius inops	0	1	0	0	1	0	1	0	2	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius jansoni	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius lacordairii	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius lafargi	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius lenzi	0	1	0	2	1	0	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	2	1	0	0	0	0
Chalcolepidius limbatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius mexicanus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius mocquerysii	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius morio	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius obscurus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius oxydatus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius porcatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius proximus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius pruinosus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius rodriguezi	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Chalcolepidius rostainei	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius rubripennis	0	1	0	1	1	0	1	0	1	0	0	2	1	3	0	1	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius rugatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepdius serricornis	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius silbermanni	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius smaragdinus	0	1	0	0	1	0	1	0	1	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius spinipennis	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius sulcatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius supremus	0	1	0	0	1	0	1	0	0	0	0	2	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius tartarus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius truncuwittatus	0	1	0	0	1	0	1	0	0	0	0	1	1	0	0	1	0	0	1	0	0	3	1	0	0	0	0
Chalcolepidius validus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius villei	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius virens	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius virgatipennis	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius virginalis	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius viridipilis	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	1	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius webbi	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepidius zonatus	0	1	0	0	1	0	1	0	0	0	0	3	1	3	0	2	1	0	1	0	0	3	1	0	0	0	0
Chalcolepis austerus	0	1	1	3	0	2	3	0	1	0	0	0	1	3	0	0	0	0	1	0	1	–	0	0	0	0	0
Chalcolepis luczotii	0	1	1	3	0	2	3	0	1	0	0	0	1	3	0	0	0	0	1	0	1	–	0	0	0	0	0
Chalcolepis similis	0	1	1	3	0	2	3	0	3	0	0	0	1	3	0	0	0	0	1	0	1	–	0	0	0	0	0
Chalcolepis splendidus	0	1	1	3	0	2	3	0	1	0	0	0	1	3	0	0	0	0	1	0	1	–	0	0	0	0	0
Fusimorphus submentallicus	0	1	0	0	1	0	0	1	4	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1
Hemirhipus apicalis	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus bimaculatus	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus elegantissimus	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus faimairii	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus guatemalensis	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus hougeti	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus lineatus	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus ochraceipilosus	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Hemirhipus rojasi	0	1	2	3	1	0	0	0	4	0	0	2	3	2	0	3	0	0	1	0	0	5	0	0	0	1	2
Lacais glauca	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	–	0	0	0	0	0
Lacais nietoi	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	–	0	0	0	0	0
Lacais suturalis	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	–	0	0	0	0	0
Pherhimius dejeani	0	1	0	3	1	0	0	0	0	0	0	2	3	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Pherhimius fascicularis	0	1	0	3	1	0	2	0	0	0	0	2	3	0	0	0	0	0	1	0	0	0	0	2/3	0	1	1
Saltamartinus decorus	0	1	0	3	1	0	0	0	0	0	0	2	3	0	0	0	0	0	1	0	0	1	0	0	0	1	1
Saltamartinus perroudi	0	1	0	3	1	0	0	0	0	0	0	2	3	0	0	0	0	0	1	0	0	1	0	0	0	1	1
Saltamartinus scriptus	0	1	0	3	1	0	0	0	0	0	0	2	3	0	0	0	0	0	1	0	0	1	0	0	0	1	1
Eleuphemus fasciatus	0	1	0	3	1	0	3	0	4	1	0	0	3	3	0	2	1	1	1	0	0	2	0	0	0	0	0
Eleuphemus funerarius	0	1	0	3	1	0	3	0	4	1	0	0	3	3	0	2	1	1	1	0	0	2	0	0	0	0	0
Alaomorphus candezei	0	1	0	2	1	1	0	0	4	0	0	2	2	2	2	4	0	0	1	1	0	1	0	0	0	1	2
Coryleus pectinatus	0	1	0	2	1	0	0	0	4	2	0	2	3	3	0	0	1	0	1	0	0	2	0	0	0	0	0
Lycoreus goudoti	0	1	0	2	1	0	0	0	0	2	0	0	0	3	0	0	1	0	1	0	0	2	0	0	0	0	0
Abiphis nobilis	0	1	0	0	1	0	0	0	3	2	0	2	3	0	0	0	1	0	1	0	0	2	0	0	0	0	0
Phibisa pupieri	0	1	0	0	1	1	0	0	3	2	0	2	3	3	0	0	1	2	1	0	0	2	1	0	0	0	0
Neocalais macer	0	1	0	2	1	1	0	0	3	2	1	0	3	2	0	0	1	0	1	0	0	1	0	0	0	0	0
Pseudocalais basilewskyi	0	1	1	3	1	0	1	0	2	0	0	2	3	0	1	2	0	0	1	0	0	3	0	0	0	1	0
Calais excavatus	0	1	1	2	1	0	0	0	0	3	0	2	3	2	0	0	1	0	1	0	1	–	0	1	0	0	0
Conobajulus ugiensis	0	1	0	3	1	0	0	0	0	0	0	3	3	2	0	0	0	0	1	0	2	–	0	0	1	0	2
Cryptalaus prosectus	0	1	1	0	1	0	0	0	4	0	0	0	3	2	0	0	1	0	1	0	1	–	0	2	0	0	2
Austrocalais pogonodes	0	1	0	0	1	1	0	0	1	0	0	2	3	2	0	2	0	0	1	0	0	1	0	2	0	0	0
Alaolacon cyanipennis	0	1	0	0	1	0	0	0	4	1	0	3	3	3	0	1	0	0	1	0	0	2	0	0	0	0	0
Aliteus reichei	0	1	0	0	1	1	0	0	5	0	0	0	3	2	0	0	1	0	1	0	0	1	0	0	0	0	0
Mocquerysia coerulipennis	0	1	0	3	1	2	0	0	5	1	0	3	3	1	0	1	1	0	1	0	0	4	0	0	0	0	0
Eumoeus murray	0	1	0	0	1	0	0	0	4	1	0	0	3	2	0	2	0	0	1	0	0	1	0	0	0	0	2
Anthracalaus westermanni	0	1	0	1	1	1	0	0	0	0	0	0	3	2	0	1	1	0	1	0	0	1	0	0	0	0	0
Aphileus lucanoides	0	1	0	0	1	2	0	0	0	0	0	3	2	0	0	0	0	0	1	0	1	–	0	0	0	0	1
Thoramus wakefieldi	0	1	0	3	1	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	2	0	0	0	0	0

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
Pyrophorus divergens	0	1	0	–	3	1	1	0	3	0	0	1	0	0	0	0	0	0	0	0	3	0	1	6	2	0	1
Tetrigus parallelus	0	1	0	–	2	1	3	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	1	0	1	0	1
Catelanus trilineatus	0	1	0	–	0/3	1	2	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0
Alaus alicii	0	2	0	–	0	1	2	0	3	0	0	0	0	1	0	?	1	0	0	0	0	0	1	0	0	0	0
Alaus calcaripilosus	0	1	0	–	2	1	2	0	3	0	0	1	0	1	0	1	1	1	0	0	0	3	1	5	3	0	0
Alaus cinnamomeus	0	1	0	–	3	1	2	0	1	0	0	0	0	1	0	?	0	0	0	0	?	?	?	?	?	0	0
Alaus haroldi	0	2	0	–	1	1	2	0	1	0	0	0	0	1	0	1	?	?	0	?	?	?	?	?	?	?	?
Alaus latipennis	0	1	0	–	2	1	2	0	3	0	1	1	1	1	0	0	1	0	0	0	?	?	?	?	?	?	?
Alaus lusciosus	0	0	0	–	3	1	2	0	3	0	0	0	0	1	0	0	1	0	0	0	0	3	1	1	1	0	0
Alaus melanops	0	1	0	–	3	1	2	0	3	0	0	0	0	1	0	0	1	0	0	0	0	3	1	3	1	0	0
Alaus myops	0	1	0	–	3	1	2	0	3	0	0	0	0	1	0	0	1	0	0	0	0	3	1	1	1	0	0
Alaus nobilis	0	1	0	–	3	1	2	0	3	0	1	1	0	1	0	?	1	0	0	0	?	?	?	?	1	0	0
Alaus oculatus	0	1	0	–	3	1	2	0	3	0	0	0	0	1	0	0	1	0	0	0	0	3	0	–	1	0	0
Alaus patricius	0	1	0	–	2	1	2	0	3	0	1	1	1	1	0	1	1	0	0	0	2	3	1	0	1	0	0
Alaus plebejus	0	1	0	–	3	1	2	0	3	0	0	0	0	1	0	1	1	0	0	0	0	3	0	–	1	0	0
Alaus sericeus	0	3	0	–	3	1	2	0	3	0	0	0	0	1	0	0	1	0	0	0	0	3	0	–	1	0	0
Alaus thoracopunctatus	0	1	0	–	2	1	2	0	3	0	0	1	0	1	0	0	1	0	0	0	0	3	1	5	1	0	0
Alaus tricolor	0	1	0	–	1	1	2	0	3	0	1	1	0	1	0	1	1	0	0	0	0	3	1	0	1	0	0
Alaus unicus	0	3	0	–	3	1	2	0	1	0	0	0	0	1	0	1	1	0	0	0	0	3	1	0	1	0	0
Alaus veracruzanus	0	1	0	–	2	1	2	0	1	0	0	0	0	1	0	1	1	0	0	0	0	3	1	0	1	0	0
Alaus zunianus	0	3	0	–	3	1	2	0	3	0	0	0	0	1	0	0	1	0	0	0	0	3	1	4	1	0	0
Chalcolepidius albisetosus	0	1	1	–	2	1	2	0	0	0	0	1	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius albiventris	0	4	1	–	1	1	2	0	0	0	0	0	0	1	0	1	?	?	0	?	?	?	?	?	?	?	?
Chalcolepidius angustatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	2	0	0	0	?	?	?	?	?	1	0
Chalcolepidius apacheanus	1	–	–	1	1	1	2	0	3	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius approximatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius attenuatus	0	4	0	–	2	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	1	2	1	0	0
Chalcolepidius aurulentus	1	–	–	1	2	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius bomplandii	1	–	–	1	2	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius boucardi	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0	0	–	1	1	0
Chalcolepidius chalcantheus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	–	1	1	0
Chalcolepidius copulatuvittatus	0	4	0	–	3	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius corpulentus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	1	1	0
Chalcolepidius cyaneus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius desmaresti	0	1	0	–	4	1	2	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	1	2	2	1	0
Chalcolepidius dugesi	0	4	1	–	1	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	1	2	1	0	0
Chalcolepidius erythroloma	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius eschscholtzi	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	3	1	0
Chalcolepidius extenuatuvittatus	0	4	1	–	3	1	2	0	0	0	0	1	0	1	0	1	?	?	0	?	?	?	?	?	?	?	?
Chalcolepidius exulatus	0	4	1	–	2	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	1	2	1	0	0
Chalcolepidius fabricii	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	0	0	–	?	1	0
Chalcolepidius fasciatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	3	?	?	?	?	?	1	0
Chalcolepidius ferratuvittatus	0	4	0	–	2	1	2	0	0	0	0	1	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius forreri	1	–	–	1	1	1	2	0	2	0	0	0	0	1	0	1	?	?	0	?	?	?	?	?	?	?	?
Chalcolepidius fryi	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	?	?	?	?	?	?	?
Chalcolepidius gossipiatus	0	4	1	–	2	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius inops	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	?	?	?	1	0
Chalcolepidius jansoni	0	1	0	–	1	1	2	0	0	0	0	1	0	1	0	1	2	0	0	0	0	2	0	–	2	1	0
Chalcolepidius lacordairii	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	1	1	0
Chalcolepidius lafargi	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepidius lenzi	0	4	1	–	2	1	2	0	3	0	0	0	0	1	0	1	1	1	0	0	1	2	1	2	1	0	0
Chalcolepidius limbatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepidius mexicanus	0	4	1	–	3	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	2	?	1	0	0
Chalcolepidius mocquerysii	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepidius morio	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	?	?	?	1	0
Chalcolepidius obscurus	1	–	–	1	1	1	2	0	1	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepidius oxydatus	0	4	0	–	1	1	2	0	0	0	0	1	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius porcatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	1	1	0
Chalcolepidius proximus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	?	?	0	?	?	?	?	?	?	?	?
Chalcolepidius pruinosus	1	–	–	1	1	1	2	0	1	0	0	0	0	1	0	1	3	2	0	1	?	?	?	?	?	?	?
Chalcolepidius rodriguezi	0	4	1	–	2	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
Chalcolepidius rostainei	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	?	?	?	?	?	?	?
Chalcolepidius rubripennis	0	4	1	–	1	1	2	0	0	0	0	0	0	1	0	1	2	0	0	0	0	2	0	–	1	1	0
Chalcolepidius rugatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepdius serricornis	0	4	1	–	3	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius silbermanni	1	–	–	1	1	1	2	0	1	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepidius smaragdinus	0	0	0	–	1	1	2	0	3	0	0	0	0	1	0	1	0	0	0	0	0	2	0	–	1	1	0
Chalcolepidius spinipennis	0	4	0	–	1	1	2	0	0	0	0	1	0	1	0	1	1	1	0	0	1	2	1	1	1	0	0
Chalcolepidius sulcatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	?	?	?	?	?	?	?
Chalcolepidius supremus	0	4	0	–	2	1	2	0	0	0	0	0	0	1	0	1	1	1	0	0	?	2	?	?	?	?	?
Chalcolepidius tartarus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	2	3	0	2	2	2	0	–	1	1	0
Chalcolepidius truncuvittatus	0	4	0	–	3	1	2	0	0	0	0	0	0	1	0	1	?	?	0	?	?	?	?	?	?	?	?
Chalcolepidius validus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	1	1	0
Chalcolepidius villei	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepidius virens	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	1	1	0
Chalcolepidius virgatipennis	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	?	?	?	?	?	1	0
Chalcolepidius virginalis	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	0	0	1	0	2	0	–	1	1	0
Chalcolepidius viridipilis	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	2	0	0	0	0	2	0	–	1	1	0
Chalcolepidius webbi	1	–	–	1	1	1	2	0	3	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	1	1	0
Chalcolepidius zonatus	1	–	–	1	1	1	2	0	0	0	0	0	0	1	0	1	3	2	0	1	0	2	0	–	3	1	0
Chalcolepis austerus	0	1	0	–	2	1	2	0	1	0	0	1	0	1	0	0	0	0	0	0	?	?	?	?	?	?	?
Chalcolepis luczotii	0	1	0	–	2	1	2	0	1	0	0	1	0	1	0	0	0	0	0	0	1	2	1	0	1	0	0
Chalcolepis similis	0	1	0	–	2	1	2	0	1	0	0	1	0	1	0	0	0	0	0	0	1	2	1	0	1	0	0
Chalcolepis splendidus	0	1	0	–	2	1	2	0	1	0	0	1	0	1	0	0	0	0	0	0	1	2	1	0	1	0	0
Fusimorphus submentallicus	1	–	–	2	3	1	2	0	3	0	0	1	0	0	0	0	0	0	0	0	?	?	?	?	?	0	0
Hemirhipus apicalis	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	1	0	0
Hemirhipus bimaculatus	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	1	0	0
Hemirhipus elegantissimus	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	1	0	0
Hemirhipus faimairii	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?
Hemirhipus guatemalensis	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?
Hemirhipus hougeti	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	1	0	0
Hemirhipus lineatus	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	1	0	0
Hemirhipus ochraceipilosus	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	0	0
Hemirhipus rojasi	1	–	–	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	1	0	0
Lacais glauca	0	0	0	–	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	1	0	1	0	0
Lacais nietoi	0	0	0	–	0	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	1	0	1	0	0
Lacais suturalis	0	0	0	–	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	1	0	1	0	0
Pherhimius dejeani	0	1	0	–	2	1	1	0	3	0	0	0	0	1	0	0	0	0	0	0	3	0	1	1	1	0	0
Pherhimius fascicularis	0	1	0	–	2	1	1	0	3	0	0	0	0	1	0	0	0	0	0	0	3	0	1	0	1	0	0
Saltamartinus decorus	0	1	0	–	2	1	?	0	3	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?
Saltamartinus perroudi	0	1	0	–	2	1	?	0	3	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?
Saltamartinus scriptus	0	1	0	–	2	1	?	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	1	2	1	0	0
Eleuphemus fasciatus	0	2	0	–	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?
Eleuphemus funerarius	0	2	0	–	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	6	2	0	0
Alaomorphus candezei	0	1	0	–	3	1	2	0	3	4	0	0	0	1	0	?	0	0	0	0	0	2	0	–	1	1	0
Coryleus pectinatus	0	1	0	–	0	1	2	0	0	0	0	1	0	1	0	1	0	0	0	0	?	?	?	?	?	?	?
Lycoreus goudoti	0	1	0	–	1	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	2	3	1	2	1	0	0
Abiphis nobilis	0	1	0	–	0	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	0	–	1	0	0
Phibisa pupieri	0	3	0	–	1	1	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	2	?	?	0	0
Neocalais macer	0	1	0	–	2	1	2	0	0	0	0	1	0	1	0	1	0	0	0	0	0	3	0	–	1	0	0
Pseudocalais basilewskyi	0	1	0	–	2	1	2	0	0	0	0	1	0	1	0	1	0	0	0	0	2	3	1	0	0	0	0
Calais excavatus	0	4	0	–	1	1	2	0	0	0	1	0	1	1	0	1	0	0	0	0	0	3	1	0	0	0	0
Conobajulus ugiensis	0	1	0	–	2	1	2	1	3	1	1	0	0	1	0	?	0	0	0	0	?	?	?	?	1	0	0
Cryptalaus prosectus	0	1	0	–	2	1	2	0	0	3	1	1	0	1	0	1	0	0	0	0	0	3	1	0	1	0	0
Austrocalais pogonodes	0	1	0	–	2	1	2	0	3	2	1	1	1	1	0	1	0	0	0	0	?	?	?	?	?	?	?
Alaolacon cyanipennis	0	3	0	–	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?
Aliteus reichei	0	1	0	–	2	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	?	?	?	?	?	?	?
Mocquerysia coerulipennis	0	5	0	–	3	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	0	1
Eumoeus murray	0	0	0	–	3	1	1	0	0	0	0	0	0	0	0	?	0	0	0	0	3	0	1	4	2	0	1
Anthracalaus westermanni	0	2	0	–	5	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	1	4	2	0	1
Aphileus lucanoides	0	3	0	–	2	1	0	1	3	0	0	0	0	0	0	0	1	1	0	0	?	?	?	?	?	0	1
Thoramus wakefieldi	0	1	0	–	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	0	0	1

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107
Pyrophorus divergens	–	0	–	–	–	–	0	0	0	0	–	1	4	0	1	–	3	3	3	0	1	–	–	1	0	4
Tetrigus parallelus	–	1	–	–	–	–	0	0	0	0	–	1	0	0	2	–	0	0	0	0	1	–	–	1	0	5
Catelanus trilineatus	1	1	4	–	–	–	0	0	3	0	–	1	0	0	2	–	1	0	0	0	1	–	–	1	0	4
Alaus alicii	0	1	5	–	–	–	0	0	0	1	1	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Alaus calcaripilosus	0	1	–	–	–	–	0	0	5	0	–	1	1	0	0	0	4	1	1	0	0	0	1	0	0	0
Alaus cinnamomeus	0	1	5	–	–	–	1	–	0	0	–	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Alaus haroldi	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	2	2	1	0	0	0	0	1	1	0	6
Alaus latipennis	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	4	1	1	0	0	0	0	1	0	1	–
Alaus lusciosus	1	1	5	–	–	–	0	0	0	0	–	0	1	0	0	2	1	1	2	0	0	0	1	0	0	0
Alaus melanops	1	1	5	–	–	–	0	0	0	0	–	1	1	1	0	2	0	0	2	0	0	0	1	0	0	0
Alaus myops	1	1	5	–	–	–	0	0	6	0	–	2	1	1	0	2	1	1	2	0	0	0	1	0	0	0
Alaus nobilis	0	1	7	–	–	–	0	0	0	0	–	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Alaus oculatus	1	1	5	–	–	–	0	0	6	0	–	1	1	0	0	2	1	1	2	0	0	0	1	0	1	–
Alaus patricius	0	1	7	–	–	–	0	0	0	0	–	3	1	0	0	1	2	1	0	0	0	0	1	0	0	2
Alaus plebejus	0	1	2	–	–	–	0	0	0	0	–	1	1	0	0	0	2	1	0	0	0	0	1	0	0	0
Alaus sericeus	0	1	5	–	–	–	1	–	0	0	–	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Alaus thoracopunctatus	1	1	5	–	–	–	0	0	0	0	–	2	1	0	0	2	1	1	2	0	0	0	0	0	0	0
Alaus tricolor	0	1	7	–	–	–	1	–	0	0	–	4	1	0	0	2	2	1	0	0	0	2	1	0	0	0
Alaus unicus	1	1	5	–	–	–	1	–	0	0	–	3	1	0	0	0	2	1	0	0	0	0	1	0	0	0
Alaus veracruzanus	0	1	2	–	–	–	0	0	0	0	–	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Alaus zunianus	1	1	5	–	–	–	0	0	0	0	–	1	1	0	0	5	1	1	0	0	0	0	1	0	0	0
Chalcolepidius albisetosus	0	1	0	–	–	–	0	0	1	0	–	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius albiventris	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius angustatus	0	1	1	0	0	5	0	0	1	1	0	3	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius apacheanus	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius approximatus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius attenuatus	0	1	0	–	–	–	0	0	1	0	–	2	1	0	0	3	2	1	0	0	0	0	0	0	0	2
Chalcolepidius aurulentus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius bomplandii	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	2	0	0	0	1	1	2	0	1
Chalcolepidius boucardi	0	1	1	1	0	5	0	0	0	2	0	0	1	0	0	0	4	1	0	0	0	1	3	2	0	3
Chalcolepidius chalcantheus	0	1	1	0	1	3	0	0	0	1	0	0	1	0	0	0	3	2	1	0	0	1	3	2	0	3
Chalcolepidius copulatuvittatus	0	1	0	–	–	–	0	0	0	0	–	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius corpulentus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius cyaneus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	2	2	1	0	0	0	1	1	2	0	1
Chalcolepidius desmaresti	0	1	1	0	1	1	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	5	0	0	1
Chalcolepidius dugesi	0	1	0	–	–	–	0	0	1	0	–	2	1	0	0	4	2	1	0	0	0	0	0	0	0	3
Chalcolepidius erythroloma	0	1	1	0	2	2	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius eschscholtzi	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	2	2	3	0	0	0	1	1	2	0	1
Chalcolepidius extenuatuvittatus	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	3	2	2	0	0	0	0	0	0	0	0
Chalcolepidius exulatus	0	1	0	–	–	–	0	0	0	0	–	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius fabricii	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	3	2	0	0	0	1	1	2	0	1
Chalcolepidius fasciatus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	2	0	0	0	1	1	2	0	1
Chalcolepidius ferratuvittatus	0	1	0	–	–	–	0	0	0	0	–	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius forreri	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	0	3	1	0	0	0	1	1	2	0	1
Chalcolepidius fryi	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	2	2	1	0	0	0	1	1	2	0	1
Chalcolepidius gossipiatus	0	1	0	–	–	–	0	0	1	0	–	2	1	0	0	3	3	1	0	0	0	0	0	0	0	0
Chalcolepidius inops	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	2	3	2	0	0	0	1	4	2	0	0
Chalcolepidius jansoni	0	1	1	0	1	1	0	0	0	1	1	0	1	0	0	1	4	2	0	0	0	0	0	0	0	1
Chalcolepidius lacordairii	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius lafargi	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius lenzi	0	1	0	–	–	–	0	0	1	0	–	2	1	0	0	3	2	2	0	0	0	0	0	0	0	2
Chalcolepidius limbatus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius mexicanus	0	1	0	–	–	–	0	0	1	0	–	2	1	0	0	3	?	?	0	0	0	0	0	0	0	1
Chalcolepidius mocquerysii	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	0	3	2	0	0	0	1	1	2	0	1
Chalcolepidius morio	0	1	1	0	0	5	0	0	?	1	0	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius obscurus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	3	2	0	0	0	1	1	2	0	1
Chalcolepidius oxydatus	0	1	0	–	–	–	0	0	0	0	–	1	1	0	0	1	2	2	0	0	0	0	0	0	0	2
Chalcolepidius porcatus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	2	2	0	1
Chalcolepidius proximus	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius pruinosus	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	1	3	2	0	0	0	1	1	2	0	1
Chalcolepidius rodriguezi	0	1	0	–	–	–	0	0	1	0	–	2	?	?	?	?	?	?	?	?	?	?	?	?	?	?

APPENDIX 2 (Continued): Data matrix for Hemirhipini. (?) missing data; (–) innaplicable characters.

	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107
Chalcolepidius rostainei	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	1	2	2	0	0	0	1	2	2	0	1
Chalcolepidius rubripennis	0	1	1	0	1	1	0	0	0	1	0	0	1	0	0	1	3	1	0	0	0	1	1	2	0	0
Chalcolepidius rugatus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	3	1	0	0	0	1	1	2	0	1
Chalcolepdius serricornis	0	1	0	–	–	–	0	0	1	0	–	1	1	0	0	3	3	1	0	0	0	0	0	0	0	1
Chalcolepidius silbermanni	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	3	1	0	0	0	1	2	2	0	1
Chalcolepidius smaragdinus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	0	4	2	1	0	0	1	4	2	0	3
Chalcolepidius spinipennis	0	1	0	–	–	–	0	0	1	0	–	2	1	0	0	3	3	2	0	0	0	0	0	0	0	2
Chalcolepidius sulcatus	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	1	2	2	0	0	0	1	1	2	0	1
Chalcolepidius supremus	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius tartarus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	0	3	2	0	0	0	1	4	2	0	3
Chalcolepidius truncuwittatus	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Chalcolepidius validus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	3	2	0	0	0	1	1	2	0	1
Chalcolepidius villei	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	2	2	2	0	0	0	1	1	2	0	1
Chalcolepidius virens	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	2	2	0	0	0	1	1	2	0	1
Chalcolepidius virgatipennis	0	1	1	0	2	2	0	0	0	1	0	?	1	0	0	1	2	3	0	0	0	1	1	2	0	1
Chalcolepidius virginalis	0	1	1	0	3	4	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius viridipilis	0	1	1	0	0	5	0	0	0	1	1	0	1	0	0	1	2	1	0	0	0	1	4	2	0	3
Chalcolepidius webbi	0	1	1	0	3	0	0	0	0	1	0	0	1	0	0	1	2	1	0	0	0	1	1	2	0	1
Chalcolepidius zonatus	0	1	1	0	0	5	0	0	0	1	0	0	1	0	0	1	3	2	0	0	0	1	1	2	0	1
Chalcolepis austerus	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	2	2	1	0	0	0	0	1	0	0	0
Chalcolepis luczotii	0	1	3	–	–	–	0	0	2	0	–	2	1	0	0	5	2	1	0	0	0	0	0	0	0	1
Chalcolepis similis	0	1	3	–	–	–	0	0	2	0	–	2	1	0	0	2	2	1	0	0	0	0	0	0	0	0
Chalcolepis splendidus	0	1	3	–	–	–	0	0	2	0	–	2	1	0	0	2	1	1	0	0	0	0	0	0	0	1
Fusimorphus submentallicus	1	1	4	–	–	–	0	0	4	0	–	2	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus apicalis	1	1	6	–	–	–	2	1	6	0	–	2	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus bimaculatus	1	1	6	–	–	–	2	1	6	0	–	1	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus elegantissimus	1	1	6	–	–	–	2	2	6	0	–	2	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus faimairii	?	?	?	?	?	?	?	?	?	?	?	?	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus guatemalensis	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Hemirhipus hougeti	1	1	6	–	–	–	2	1	6	0	–	2	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus lineatus	1	1	6	–	–	–	2	1	6	0	–	2	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Hemirhipus ochraceipilosus	1	1	6	–	–	–	2	1	6	0	–	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Hemirhipus rojasi	1	1	6	–	–	–	2	1	6	0	–	1	0	0	2	–	0	0	0	0	1	–	–	1	0	4
Lacais glauca	0	1	2	–	–	–	0	0	0	0	–	0	1	0	0	1	3	1	0	0	0	0	1	0	0	1
Lacais nietoi	0	1	2	–	–	–	0	0	0	0	–	0	1	0	0	1	2	1	0	0	0	0	0	0	0	3
Lacais suturalis	0	1	2	–	–	–	0	0	0	0	–	0	1	0	0	1	3	1	0	0	0	0	0	0	0	4
Pherhimius dejeani	0	1	4	–	–	–	2	–	0	0	–	1	0	0	2	–	1	1	0	0	0	1	6	1	0	4
Pherhimius fascicularis	0	1	4	–	–	–	2	–	0	0	–	0	0	0	2	–	1	1	1	0	1	–	–	1	0	4
Saltamartinus decorus	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Saltamartinus perroudi	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Saltamartinus scriptus	1	1	4	–	–	–	0	0	0	0	–	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Eleuphemus fasciatus	?	?	?	?	?	?	?	?	?	?	?	?	2	1	2	–	1	3	0	0	0	2	1	1	1	–
Eleuphemus funerarius	1	1	8	–	–	–	0	0	0	0	–	1	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Alaomorphus candezei	0	1	1	2	4	6	0	0	0	0	–	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Coryleus pectinatus	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	5	2	2	0	0	0	0	1	0	0	2
Lycoreus goudoti	0	1	5	–	–	–	0	0	1	0	–	3	1	0	0	3	2	1	0	0	0	0	1	0	0	4
Abiphis nobilis	0	1	8	–	–	–	0	0	0	0	–	3	1	0	0	4	3	1	0	0	0	0	1	2	0	4
Phibisa pupieri	1	1	8	–	–	–	0	0	0	0	–	1	1	0	0	3	2	1	0	0	0	0	1	2	0	4
Neocalais macer	0	1	1	2	4	6	0	0	0	0	–	1	1	0	0	2	3	1	0	0	0	0	1	2	0	6
Pseudocalais basilewskyi	0	1	5	2	5	6	2	–	3	1	1	2	?	?	?	?	?	?	0	0	0	0	1	0	0	2
Calais excavatus	0	1	5	–	–	–	0	0	0	0	–	2	1	0	0	3	1	1	0	0	0	0	1	0	1	–
Conobajulus ugiensis	0	1	1	1	2	7	0	0	2	0	–	3	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Cryptalaus prosectus	1	1	2	–	–	–	0	0	0	0	–	3	1	0	0	2	1	1	0	0	0	0	1	2	1	–
Austrocalais pogonodes	?	?	?	?	?	?	?	?	?	?	?	?	1	0	0	2	2	1	0	0	0	0	1	2	0	4
Alaolacon cyanipennis	?	?	?	?	?	?	?	?	?	?	?	?	3	0	1	–	2	1	0	?	?	?	?	?	?	?
Aliteus reichei	–	?	?	?	?	?	?	?	?	?	?	?	0	0	2	–	1	1	0	0	0	0	1	1	1	–
Mocquerysia coerulipennis	–	1	8	–	–	–	0	0	0	0	–	?	3	1	1	–	1	1	0	0	1	–	–	2	1	–
Eumoeus murray	–	1	4	–	–	–	0	0	0	0	–	3	?	?	?	?	?	?	?	?	?	?	?	?	?	?
Anthracalaus westermanni	–	1	–	–	–	–	0	0	0	0	–	4	?	?	?	?	?	?	0	0	0	3	0	0	0	4
Aphileus lucanoides	–	1	2	–	–	–	0	0	0	0	–	3	2	0	2	–	3	3	4	0	0	4	0	0	1	–
Thoramus wakefieldi	–	1	6	–	–	–	0	0	0	0	–	0	3	1	1	–	1	1	0	0	1	–	–	1	0	4