



Fourth International Tenebrionoidea Symposium

November 25-26th, 2015
(Wednesday and Thursday)
Mendoza, Argentina

Sponsored by



Time	Wednesday 25th November
9:00	Registration
9:30 – 10:00	Welcome addresses, institutional greetings and announcement
10:00 – 11:00	Talks
11:00 – 11:20	Coffee Break Scientific illustration exhibition 
11:20 – 12:20	Talks
12:20 – 14:00	Lunch
14:00 – 15:00	Talks
15:00 – 15:20	Coffee Break 
15:20 – 16:00	Talks
16:00 – 17:00	Discussion: • Projects of interest to all • Field trip (Steering committee)
17:00	Visit to the Entomology Collection of Iadiza
20:00	Dinner. Place to be decided

Time	Thursday 26th November
9:40 – 10:40	Talks
10:40 – 11:00	Coffee Break 
11:00 – 11:40	Talks
11:40 – 12:40	Poster Session
12:40 – 14:00	Lunch
14:00 – 14:40	Talks
14:40 – 15:00	Coffee Break 
15:00 – 15:30	Discussion: Potential localities and dates for the Fifth International Tenebrionoidea Symposium.
15:30 – 16:00	Decide a journal, dates, etc. for publishing the Symposium Proceedings
16:00	Symposium closing session Visit to the Entomology Collection of Iadiza



Steering Committee
Fourth Internal Tenebrionoidea Symposium

Fernando H. Aballay

Rodolfo Carrara

Florencia Fernández Campón

Gustavo E. Flores

Susana J. Lagos Silnik

Ana María Scollo

*Laboratorio de Entomología, IADIZA
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Germán H. Cheli

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Teodoro Stadler

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Symposium Program

Wednesday 25th November

09.00 / Registration opens, Sala Latinoamericana

09.30 / Welcome addresses, Institutional Greetings and Announcements

Talks

Moderators: **Rodolfo Carrara** and **Teodoro Stadler**

10:00 – 10:20 / **Rolf L. Aalbu**

Studies in the Cnemeplatini: new species and revision of the genus *Alaudes* Horn and a new species of *Lepidocnemeplatia* Löbl & Merkl from Southwestern U.S. and Mexico including notes on distribution, biology, and phylogenetic placement of the tribe (Coleoptera: Tenebrionidae).
Rolf L. Aalbu, Michael S. Caterino and Aaron D. Smith

10:20 – 10:40 / **Gustavo E. Flores**

Two Evaniosomini species (Coleoptera: Tenebrionidae) associated with decaying carcasses in Argentina, with remarks on tribal assignment of *Achanius* Erichson. Gustavo E. Flores and Fernando H. Aballay

10:40 – 11:00 / **Fernando H. Aballay**

An illustrated key to and diagnoses of the species of Tenebrionidae (Coleoptera) associated with decaying carcasses in Argentina. Fernando H. Aballay, Gustavo E. Flores, Violeta A. Silvestro, Noelia I. Zanetti and Néstor D. Centeno

11:00 – 11:20 / Coffee Break

11:20 – 11:40 / **M. Cecilia Domínguez**

Vicariance events shaping Southern South American insect distributions: a search using Hovenkamp's (1997, 2001) protocols and VIP. M. Cecilia Domínguez, Federico A. Agrain, Gustavo E. Flores and Sergio Roig-Juñent

11:40 – 12:00 / **Guillermo P. López García**

Potential adverse effects of volcanic ash from Puyehue-Cordón Caulle Range on tenebrionid larvae. Guillermo P. López García, Micaela Buteler and Teodoro Stadler

12:00 – 12:20 / **Warren E. Steiner, Jr.**

New assignments among the genera *Haplandrus* LeConte, *Metaclisa* Jacquelin du Val and *Tharsus* LeConte, with a new genus for North America (Coleoptera: Tenebrionidae). Warren E. Steiner, Jr.

12:20 – 14:00 / Lunch

Moderators: **Florencia Fernández Campón** and **Gustavo E. Flores**

14:00 – 14:20 / **Marcin Jan Kamiński**

The origin of amphitropic disjunctions in animals: a case study of distributional patterns of wingless darkling beetles (Pedinini: Melambiina). Marcin Jan Kamiński

14:20 – 14:40 / **Mike A. Ivie**

The genera of New World Colydiinae (Coleoptera: Zopheridae). Mike A. Ivie

14:40 – 15:00 / **Rodolfo Carrara**

A test of multiple climate-based hypotheses for distribution limits of the Andean darkling beetles (Coleoptera: Tenebrionidae). Rodolfo Carrara, Pablo Peri and Gustavo E. Flores

15:00 – 15:20 / Coffee Break

15:20 – 15:40 / **Charles J. Hart**

Unravelling the Taxonomic Mess that is *Diastolinus* Mulsant and Rey. Charles J. Hart

15:40 – 16:00 / **Wolfgang Schawaller**

Tenebrionidae of the Nepal Himalayas: diversity, origin, and ecology. Wolfgang Schawaller

Discussion

16:00 / Potential or current projects of interest to all: large scale surveys, global biogeography, checklist for diversity hotspots (Aaron D. Smith and Gustavo E. Flores).

16:30 / Plan instruction and travel-related activities to prepare for the field trip (Steering committee).

17:00 / Visit the Entomology collection of IADIZA

20:00 / Dinner. Place to be decided

Thursday 26th November

Talks

Moderators: Marcin Jan Kamiński and Aaron D. Smith

9:40 – 10:00 / **Gustavo E. Flores**

Revision of some types of Billberg and Germar of the South American genera *Scotobius* and *Nyctelia* (Coleoptera: Tenebrionidae), with new synonymies and taxonomic implications. Violeta A. Silvestro and Gustavo E. Flores

10:00 – 10:20 / **Leonardo C. Ramírez**

First fossil darkling beetles assemblage (Coleoptera: Tenebrionidae) from the late Pleistocene of Buenos Aires, Argentina. Leonardo C. Ramírez, Rodolfo Carrara, Violeta Silvestro and Gustavo E. Flores

10:20 – 10:40 / **Rodolfo Carrara**

Disentangle the effect of climate and human influence on distribution patterns of *Scotobius pilularius* Germar (Coleoptera: Tenebrionidae). Rodolfo Carrara, Violeta A. Silvestro, Germán H. Cheli, M. Florencia Fernández Campón and Gustavo E. Flores

10:40 – 11:00 / Coffee Break

11:00 – 11:20 -Kojun Kanda

The role of high-throughput sequencing in the study of tenebrionid taxonomy and phylogeny. Kojun Kanda

11:20 – 11:40 -Germán H. Cheli

Epigeal Tenebrionids (Coleoptera: Tenebrionidae) from Northern arid Patagonia: ecological remarks and their relationship with anthropic desertification. Germán H. Cheli, Gustavo E. Flores, Fernando Martínez, Nicolás Martínez Román, Gustavo Pazos, Lina Videla, Patricia Olivera, Mariana Alfaro and Sebastian Giacomino

Poster Session

11:40 – 12:40 / Sala Latinoamericana

12:40 – 14:00 / Lunch

Talks

14:00 – 14:20 / **Erich Lara Spiessberger**

Comparative morphology of *Taphrosoma* Kirsch and *Mylaris* Pallas (Coleoptera: Tenebrionidae, Stenochiinae). Erich Lara Spiessberger and José Ricardo M. Mermudes

14:20 – 14:40 / **Aaron D. Smith**

A generic review of Amphidorini: where does *Nycterinus* belong? Aaron D. Smith

14:40 – 15:00 / Coffee Break

Discussion

15:00 – 15:30 / Potential localities and dates for the Fifth International Tenebrionoidea Symposium. (Presenters can give talks about the most suitable options for the host country).

15:30 – 16:00 / Decide a journal, dates, etc. for publishing the symposium Proceedings (Aaron D. Smith, Marcin Jan Kamiński and Gustavo E. Flores)

Symposium closing session

Visit the Entomology collection of IADIZA

Attendees

Fernando H. Aballay	Argentina
Juan Héctor Aragón	Argentina
Paula Campos-Soldini	Argentina
Rodolfo Carrara	Argentina
Germán H. Cheli	Argentina
M. Cecilia Domínguez	Argentina
Gustavo E. Flores	Argentina
Guillermo López-García	Argentina
Leonardo Ramírez	Argentina
Violeta Silvestro	Argentina
Teodoro Stadler	Argentina
Erich L. Spiessberger	Brazil
Milton Campbell	Canada
Gerardo Arriagada	Chile
Luboš Purchart	Czech Republic
Roland Grimm	Germany
Wolfgang Schawaller	Germany
Alfredo Giraldo-Mendoza	Peru
Marcim J. Kamiński	Poland
Rolf L. Aalbu	USA
Charles J. Hart	USA
Mike A. Ivie	USA
Donna Ivie	USA
Kojun Kanda	USA
Aaron D. Smith	USA
Jil Steiner	USA
Warren E. Steiner	USA

Talks' Abstracts

Studies in the Cnemeplatiini: new species and revision of the genus *Alaudes* Horn and a new species of *Lepidocnemeplatia* Löbl & Merkl from Southwestern U.S. and Mexico including notes on distribution, biology, and phylogenetic placement of the tribe (Coleoptera: Tenebrionidae)

Rolf L. Aalbu¹, Michael S. Caterino² and Aaron D. Smith³

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The genus *Alaudes* Horn is revised. The genus includes *A. singularis* Horn, *A. setigera* Blaisdesll, *A. alternata* Fall and the following new species: *A. mojaviensis* new species (Mojave desert, California & Arizona), *A. coloradoensis* new species (Colorado desert, California), *A. moenkopii* new species (Colorado Plateau, Northern Arizona and Southern Utah), *A. californicus* new species (Central Valley, California), and *A. viscaianensis* new species (Baja California Sur, Mexico). *A. fallax* Fall, *A. testacea* Blaisdell and *A. squamosa* Blaisdell are placed as synonyms of *A. singularis* Horn. A key is provided to the species. A new species of *Lepidocnemeplatia* is described from California and Mexico: *L. imperialis* new species (Algodones dunes, California & Mexico). Distribution, biology as well as phylogenetic placement of the tribe is discussed.

Key words: Systematics, phylogeny, distribution, Cnemeplatiini.

Two Evaniosomini species (Coleoptera: Tenebrionidae) associated with decaying carcasses in Argentina, with remarks on tribal assignment of *Achanius* Erichson

Gustavo E. Flores* and Fernando H. Aballay

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Eating habits of two Evaniosomini species from Argentina are given for the first time, consisting of feeding on decomposing pig and llama carcasses. *Thinobatis profana* Kulzer is transferred from *Thinobatis* (Pimeliinae: Thinobathini) to *Vaniosus* Kulzer (Pimeliinae: Evaniosomini) on the basis of constant tribal level characters. The genus *Thinobatis* Eschscholtz is removed from Argentina and confined only to coastal areas of Chile. The genus *Achanius* Erichson (including subgenus *Ambigatus* Fairmaire) is transferred from Edrotini (Eurymetopini of Doyen) to Evaniosomini based on the structure of the internal female reproductive tract and mandible configuration. *Achanius* (*Ambigatus*) *antofagastensis* Flores and Aballay, new species, is described. These two species showed preferences for microhabitat conditions and association with stages of decomposition, and should be considered of potential forensic importance for bodies found in arid environments.

Key words: Pimeliinae, Evaniosomini, *Achanius*, *Thinobatis*, *Vaniosus*.

An illustrated key to and diagnoses of the species of Tenebrionidae (Coleoptera) associated with decaying carcasses in Argentina

Fernando H. Aballay^{1*}, Gustavo E. Flores¹, Violeta A. Silvestro², Noelia I. Zanetti^{3, 4} and Néstor D. Centeno⁴

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Besides the dominant coleopteran families Dermestidae and Cleridae usually employed to perform post-mortem interval (PMI) estimations, species of other families such as Tenebrionidae have frequently been reported in forensic studies. Though less abundant, these species are prevalent in decomposing carcasses. In this study we identified adults of the Tenebrionidae associated mainly to pig and human carcasses located in different areas of Argentina. The greatest number of species is reported to occur in both late decay and dry stages. The objective of this work is to provide an illustrated key of 26 Tenebrionidae species associated with decaying carcasses in Argentina, including diagnoses, habitus photographs and a table of these species detailing the substrate from where they were collected. These 26 Tenebrionidae species registered are grouped into four subfamilies: Alleculinae (one species of Alleculini), Diaperinae (two species of Cripticini), Tenebrioninae (13 species, eight belonging to the tribe Scotobiini, three of Opatrini, one species from each tribe: Alphitobiini and Tenebrionini), Pimeliinae (10 species, three belonging to the tribe Epitragini, two of Evaniosomini, two of Praociini, one species from each tribe: Trilobocarini, Edrotini and Elenophorini). A discussion is presented on the potential forensic importance of some species collected on human and pig carcasses.

Key words: Key, Tenebrionidae, Alleculinae, Diaperinae, Tenebrioninae, Pimeliinae, forensic, carcasses, Argentina.

Vicariance events shaping Southern South American insect distributions: a search using Hovenkamp's (1997, 2001) protocols and VIP

M. Cecilia Domínguez, Federico A. Agrain, Gustavo E. Flores and Sergio Roig-Juñent

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The main goal of this study is to use multiple insect phylogenies along with geographical information to test known vicariance hypotheses for Southern South America (SSA). We analyzed the phylogenies and geographical distributions of seven insect genera endemic to SSA (including four Tenebrionidae) using Hovenkamp's protocol, which have been in part implemented software (VIP). Using this software we were able to hypothesize 55 traceable vicariance events (TVE), among these we recognized four supported vicariance events (SVEs) (i.e. confirmed by more than a single sister group). The first SVE consisted of an East/West separation of the faunas in all analyzed trees; the second SVE is a North/South separation of the fauna located East of the Andes; the third SVE was found in the southernmost fauna located East of the Andes, which separates allopatric Patagonian species in a North/South direction; and finally the fourth SVE separates in a North/South direction clades of the Central Chilean fauna located West of the Andes. Our results, suggest that these four SVEs could be correlated with the uplifting of the Andes marine ingressions that occurred during the Cenozoic that is the estimated age at which these events occurred. Finally, we discuss that current software implementation of Hovenkamp's ideas need to be expanded; particularly regarding the automated selection of TVEs.

Key words: Vicariance, Southern South America, VIP, Hovenkamp.

Potential adverse effects of volcanic ash from Puyehue-Cordón Caulle Range on tenebrionid larvae

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The Puyehue Cordon Caulle (PCC) volcanic outbreak from 2011 affected most of the surface of the Monte Austral region in the Argentine Patagonia. This area is rich in endemic species and Tenebrionidae is well represented, playing a key role by interlocking in the ecosystem food web. The insecticidal effect of volcanic ash (VA) has been proven to occur by contact exposure, disturbing the water balance in insects. Tenebrionid larvae are somewhat protected from massive exposure to VA fall due to their cryptic habits. However, particles from VA deposits move progressively into the underlying soil and tenebrionid larvae may become exposed to VA contaminated food. The aim of the study was gain further understanding of the impact of volcanism on food chain processes and nutrient cycling in the Monte Austral. For this purpose, we studied the intake toxicity of VA on tenebrionid larvae in laboratory bioassays, fed on flour discs prepared with VA at 500, 1,000; 5,000; 30,000 and 50,000 ppm. *Tenebrio molitor* Linnaeus was used as an experimental model organism, given that it develops in conditions analogous to those of many other tenebrionid euryphagous species from xerophilic habitats, mostly associated with the soil. It was found that intake toxicity of VA in *T. molitor* larvae was dose-dependent with effects visible after long term exposure. Mortality was observed at the two highest concentrations tested and at the lower concentrations, sub-lethal effects as larval size lessening, weight loss and reduction in the number of molts were registered. It can therefore be concluded that intake toxicity is a major adverse effect of VA on tenebrionid

larvae that would lead to massive mortality at high concentrations and dwarfing effects at sub-lethal concentrations. Thus, the intake of VA by larvae may have harmful effects on tenebrionid natural populations and consequently on the Monte Austral ecosystem.

Key words: Puyehue-Caulle Range, volcanic ash, insecticide, *Tenebrio molitor*, larvae.

New assignments among the genera *Haplandrus* LeConte, *Metaclisa* Jacquelin du Val and *Tharsus* LeConte, with a new genus for North America (Coleoptera: Tenebrionidae)

Warren E. Steiner, Jr.

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The five species currently placed in the North American genus *Haplandrus* LeConte 1862 are examined, with new information on immature stages, distribution, and life history. The type-species, *H. fulvipes* (Herbst 1797) is a member of Stenochiinae. Reassignments and new synonymies are proposed for the other species which belong in other genera and tribes of Tenebrioninae. *Haplandrus ater* (LeConte 1866) is transferred back to *Metaclisa* Jacquelin du Val 1861; *H. collaris* Casey 1924 and *H. subangusta* Casey 1924 are junior synonyms of that species. North American members of *Metaclisa* are reviewed, with a discussion of tribal placement of the genus. *Tharsus* LeConte 1862 is recognized as a new synonym of *Metaclisa*. A new genus is proposed for the boreal *H. concolor* LeConte 1866 which has characters that place it among genera of Tenebrionini.

Key words: *Haplandrus*, Taxonomy, Systematics, new genus.

The origin of amphitropic disjunctions in animals: a case study of distributional patterns of wingless darkling beetles (Pedinini: Melambiina)

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Despite the significant geographical distances the Mediterranean-type regions share many taxa. This phenomenon was most frequently reported for various groups of plants. However, data concerning animals is also available. The main aim of this study is to investigate the origin and evolution of the amphitropic African disjunction between the Mediterranean Basin and the Cape Floristic Region based on the wingless darkling beetles of the subtribe Melambiina Mulsant & Rey, 1854. In this talk, I will present assumptions and preliminary results of my project.

Key words: amphitropic disjunctions, Mediterranean Basin, Cape Floristic Region, Tenebrioninae.

The genera of New World Colydiinae (Coleoptera: Zopheridae)

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The 46 genera of the New World colydiines are treated as a group for the first time. This poorly known group has been nearly impossible to work with in the Neotropics due to a lack of synthetic work and consistent generic concepts. We have reviewed all described and many undescribed species of the group, including the type species of all but one genus, and made extensive modifications in the classification of the group. All genera are illustrated, a key is provided, and a list of all described species and their proper placement is included.

Key words: Zopheridae, Colydiinae, taxonomy, systematics.

A test of multiple climate-based hypotheses for distribution limits of the Andean darkling beetles (Coleoptera: Tenebrionidae)

Rodolfo Carrara^{1*}, Pablo Peri² and Gustavo E. Flores¹

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Several hypotheses related climatic variables as limiting factors of insect distribution ranges: the “energy–availability hypothesis” posits that are high and low temperatures, the “water–availability hypothesis”, posits that is low precipitation and both “energy–variability hypothesis” and “water–variability hypothesis” posits that is high seasonal variation in temperature and precipitation, respectively. In this work we use occurrence data of 23 endemic tenebrionids from the Andean region to assess to what extent the different climatic variables limit their distribution ranges. First, we utilize maximum entropy modeling to evaluate the fit to data of 14 candidate models, which resulting from the combination of different hypotheses, by applying Akaike Information Criterion (AIC). Then, from best fitting model to each species we conduct analyses between species probabilities of occurrence and climatic variables to recognize its role as limiting factors of species distributions. Results demonstrated that species distributions, as a whole, are better explained by the action of more than one climatic variable, with the exception of one species. From 23 species only 10 showed that climate act as limiting factor of their distribution ranges. Among climatic variables those representing water variability were identified as the most influential for species distribution ranges, followed by water availability, energy availability and energy variability. Considering hypotheses formulations, only relationships between water availability and distribution ranges responded according to expectations by limiting species distribution toward low precipitations; instead, the remaining relationships responded contrary to expectations limiting species distributions toward low energy availability, and water and energy variability. This result suggests that, far of generalities, different climatic variables can act as limiting factor of species distribution ranges probably due to the evolutionary history of each species.

Key words: distribution modeling, climatic variables, limiting factors, species distribution ranges.

Unravelling the taxonomic mess that is *Diastolinus* Mulsant and Rey

Charles J. Hart

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The West Indian genus *Diastolinus* Mulsant and Rey (Coleoptera: Tenebrionidae: Opatrini) is a diverse group of 55 nominal species, all of which are flightless and common in xerophytic habitats. In spite of a long taxonomic history, the group has been the victim of many isolated descriptions by Marcuzzi (31 species) and Garrido (9 species), as well as old Fairmaire descriptions from South America (2 species). It has never been given a proper revisionary treatment. As a result, the species definitions are difficult to interpret and the relationships between species are not well understood. The last time the group was explicitly defined was in 1859 by Mulsant and Rey and now the genus is not at all reflective of actual species relationships, instead representing a hodgepodge of flightless Opatrini related to or actually belonging to *Blapstinus* Waterhouse. After assembling a large collection of *Diastolinus* and reviewing the complicated history, 7 current *Diastolinus* species are moved into *Blapstinus*, 7 current South American *Diastolinus* species are placed in the currently invalid subgenus *Goajiria* Marcuzzi and *Goajiria* is validated as a full genus, 23 current *Diastolinus* species are moved into a new currently unnamed genus, the genus *Sellio* Mulsant and Rey is synonymized with *Diastolinus*, and *Diastolinus* is redefined to include 16 West Indian species, 9 of which are new. Additionally there are at least 7 synonymies to be addressed. This is a preliminary work to finally clarify some of the taxonomic confusion and begin to reflect species relationships on the basis of morphological characters. Additionally, relatives of *Diastolinus* such as *Platylus* Mulsant and Rey and general biogeography of the group will be discussed.

Key words: *Diastolinus*, *Blapstinus*, *Sellio*, *Platylus*, Island Biogeography, Caribbean.

Tenebrionidae of the Nepal Himalayas: diversity, origin, and ecology

Wolfgang Schawaller

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Nepal is a small country (long-time closed for foreigners) in the centre of the highest mountain of the world, the Himalayas. Nevertheless, this small area (147.181 km²) is a hotspot of evolution. The relative high number of 375 species (113 genera) of Tenebrionidae is known from this country at present. The talk treats a short history of entomological research, the composition of the fauna, some habitats, and the vertical and horizontal zonation of Nepalese Tenebrionidae. The origin of the fauna, and reasons for the high diversity are discussed. A few ecological adaptations are also presented.

Key words: diversity, vertical zonation, horizontal zonation, biogeography.

Revision of some types of Billberg and Germar of the South American genera *Scotobius* and *Nyctelia* (Coleoptera: Tenebrionidae), with new synonymies and taxonomic implications

Violeta A. Silvestro¹ and Gustavo E. Flores²

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The genera *Scotobius* (Tenebrioninae) and *Nyctelia* (Pimeliinae) are widely distributed in southern South America, are the most specious in Argentina and constitute the type genera of the tribes Scotobiini and Nycteliini. The study of the types species described by Billberg (1815) and Germar (1824) and bibliographical research led us to perform taxonomic changes in both genera. A new synonymy within the genus *Scotobius* Germar, 1824 is proposed: *Scotobius crispatus* Germar, 1824 with *S. miliaris* (Billberg 1815). *Scotobius pilularius* Germar, 1824 is restored from an erroneous synonymy with *S. miliaris* and becomes

again the type species of the genus, subsequently designated by Lacordaire (1830). The author of the genus *Nyctelia* is Berthold, 1827; attributed for 190 years to Latreille, 1825. *Zophosis picipes* Billberg, 1815 is transferred to the genus *Nyctelia* and two new synonymies are proposed: *N. nodosa* (Germar, 1824) with *Nyctelia picipes* (Billberg, 1815) and *N. brunnipes* Guérin-Méneville, 1834 with *Nyctelia picipes* (Billberg, 1815). From *Zophosis nodosa* fixing the type species of *Nyctelia*, its senior synonymous *Zophosis picipes* becomes the type species of *Nyctelia*.

Key words: Tenebrioninae, Pimeliinae, Nycteliini, Scotobiini, new synonymies.

First fossil darkling beetles assemblage (Coleoptera: Tenebrionidae) from the late Pleistocene of Buenos Aires, Argentina

Leonardo C. Ramírez¹, Rodolfo Carrara², Violeta A. Silvestro³ and Gustavo E. Flores²

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Late Pleistocene outcrops exposed in Buenos Aires province, Argentina, represent one of the most informative sources for paleoecological studies on South American fauna and flora. Several proxies were utilized for the study of pleistocene environmental conditions in the Pampas, but only a few were based on paleoentomological data. The aim of this study is to present the first record of three species of darkling beetles from the Late Pleistocene of Buenos Aires province, and to provide new paleoenvironmental. The sediments containing fossil insects correspond to the Guerrero Member of the Luján Formation and where dated between $12,100 \pm 100$ 14C BP and $13,400 \pm 200$ 14C BP. During the extraction and concentration of fossil insects we avoid the kerosene flotation and the sieving in order to maintain the material

suitable for radiocarbon dating and prevent breakage. We identified specimens of *Nyctelia picipes* (Billberg), *Epipedonota cristallisata* (Lacordaire) (Pimeliinae: Nycteliini) and *Scotobius pilularius* Germar (Tenebrioninae: Scotobiini). By analyzing the particular environmental requirements of these species and the use of the MCR method, we could infer values of temperature and other relevant climatic aspects. This association could show us the first pulses of post-glacial climate recovery and the replacement by the insect fauna that currently inhabit the area. This study is one of the first approaches to the quaternary paleoentomology of Argentina, and highlights the potential of paleoentomological information, when evaluated in combination with previous knowledge on global climate conditions after the last glacial maximum.

Key words: Fossil Tenebrionidae, Late Pleistocene, Lujan Formation, Buenos Aires, Argentina.

Disentangle the effect of climate and human influence on distribution patterns of *Scotobius pilularius* Germar (Coleoptera: Tenebrionidae)

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Scotobius pilularius Germar occurs in both natural and human modified areas within humid coastal and grassland environments of Argentina, Brazil and Uruguay (i.e., natural distribution area). However, in Argentina it is also found in very different environments, some of these climatically extreme, such as arid steppes. In these habitats, *S. pilularius* is found outside natural habitats and in areas associated with different levels of human activity. In this work, we examine factors

that may determine the observed spatial distributions of *S. pilularius* in its natural distribution area and recognize to what extent those factors are responsible of its distribution in distinct habitats of Argentina. We consider that at least three hypotheses can be postulated to explain these distributions: i) climatic conditions determine species occurrences; thus, species is distributed in these habitats because climate allows its subsistence; ii) there is an interplay between climatic conditions and human influence; thus, the species is distributed in areas in which climate allows its subsistence and human activities also promote conditions to its subsistence; and iii) human influence determines its distribution; thus, human activities create conditions to its subsistence which are independent of climatic conditions. Considering spatial information on climate, human influence and distribution localities of *S. pilularius*, we assessed the support of data to these competing hypotheses by using species distribution models. We found that, while within the natural distribution area of *S. pilularius* the climate and human influence hypothesis (ii) significantly explain its distribution; only the human influence hypothesis (iii) significantly explains its distribution in extreme habitats of Argentina. This outcome suggests that *S. pilularius* probably moved from asynanthropy or an independence of human activities before human settlement, to a hemisynanthropy by inhabiting surroundings of human settlements within its natural areas, to conclude in eusynanthropy or a strong dependence of human activity to its subsistence outside of its natural area.

Key words: Distribution models, species occurrence, climatic variables, human activities, asynanthropy, eusynanthropy.

The role of high-throughput sequencing in the study of tenebrionid taxonomy and phylogeny

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In this talk, I discuss two applications of high-throughput sequencing in the study of tenebrionid taxonomy and systematics. First, I report on our recent successes recovering DNA sequences from old museum

specimens. Using low-coverage genome sequencing, we were able to recover nuclear protein coding genes from an enigmatic Neotropical Lagriinae. We incorporated this data with a PCR-derived dataset to infer its phylogenetic position. Second, I discuss our recent efforts to sequence partial transcriptomes across the family and use this data to identify potential phylogenetically informative markers. This data will be used to resolve the deep splits in the family, which could not be resolved with traditional PCR-derived datasets.

Key words: classification, molecular phylogeny, Tenebrionidae

Epigean Tenebrionids (Coleoptera: Tenebrionidae) from Northern arid Patagonia: ecological remarks and their relationship with anthropic desertification

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A mixed temperature-precipitation gradient causes great environmental heterogeneity in arid Patagonia that determines complex biotic communities. Several environmental classifications were made in attempts to understand the effects of this heterogeneity, but those classifications varied according to the author. Furthermore, in the context of global climate change, desertification is the most important consequence of human activities in arid Patagonia, and its main consequence is the loss of biodiversity. Darkling beetles are among the most abundant, diverse and best known insects of this region, and they are particularly suitable for monitoring environmental changes. In this work the structure and composition of tenebrionid beetle associations in the major environmental units of northern arid Patagonia are described. Also, the effects of anthropogenic desertification over

these beetles in each environmental unit are evaluated. Six sites on each environmental unit, three conserved and three desertified, were selected. Then an entomological survey into these selected sites was performed using pitfall traps. The occurrence of thirty eight species, arranged in fifteen genera, six tribes and two subfamilies, have been recorded. The most specious genus was *Nyctelia* Berthold with ten species. The two most abundant species were *Nyctelia rotundipennis* Fairmaire and *Nyctelia unicastata* Fairmaire. Also there were many rare species. The tenebrionid assemblages were different between environmental units. The most characteristic species were *Leptynoderes nordenskioldi* Kulzer, *Hylithus tentyroides* (Lacordaire), *Epitragus* spp Latreille in Monte; *Nyctelia dorsata* Fairmaire, *Nyctelia latiplicata* Kulzer, *Nyctelia blapoides* Fairmaire in Distrito Central; *Nyctelia rotundipennis*, *Nyctelia unicastata*, *Nyctelia fitzroyi* Waterhouse, *Emmallodera rugosa* Silvestro & Flores in Sierras and Mesetas and Pastizales Subandinos. Desertification produced alterations in tenebrionid species assemblages of all environmental units. These results have been integrated and their ecological outstanding are discussed.

Key words: Tenebrionidae; arid Patagonia; environmental units; anthropic desertification.

Comparative morphology of *Taphrosoma* Kirsch and *Mylaris* Pallas (Coleoptera: Tenebrionidae, Stenochiinae)

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Cnodalonini includes more than 300 genera, the highest number of genera in any tenebrionid tribe, this diversity is allied with the few morphological studies, which difficult the understanding of their phylogenetic relationships. *Mylaris* with five species and *Taphrosoma* with two, represent part of this diverse tribe respectively from Central-South America and Amazonia. The present study pointed the external morphology and male and female terminalia of *Mylaris maxima* (Germar, 1824), *Mylaris gigas* (Linnaeus, 1767), and *Taphrosoma*

dohrni Kirsch, 1866 to define and recognize new characters to genera in Cnodalonini (Stenochiinae). The material belongs to the following Entomological Collections: José Alfredo Pinheiro Dutra and Museu Nacional, (Universidade Federal do Rio de Janeiro) Brazil; Embrapa Cerrados' Collection, Planaltina, Distrito Federal, Brazil. The main differences among *Mylaris* species were restrained to pronotum shape, punctures of elytra, and inner vestiture of metafemora. *M. maxima* has elytral striae with row of fine punctures, flattened interestriale, metafemora strongly curved at the apex and inner margin 2/3 proximal covered by short and dense setae. Male and female of *M. gigas* have linear and glabrous metafemora, elytra with swollen interestriale and vestigial punctures. Males of *Mylaris* species have protibiae with medial sinuosity and twisted apically; aedeagus with fused parameres and alae of apical piece with 2/3 basal piece length. *Taphrosoma dohrni* differs from the species of *Mylaris* by lateral margin of pronotum, which bears a medial projection, and elytra with conspicuous coarse punctuation; alae of apical piece as long as the half basal piece. The sexual dimorphism in *T. dohrni* differed from the species of *Mylaris* mainly by protibiae with a medial rounded tooth. Ovipositors of both genera are recognized by Tschinkel & Doyen (1980) as "Cnodalonine type". Eighth tergite on *Mylaris* has rounded apex, while on *Taphrosoma* is emarginated.

Key words: Cnodalonini, Neotropical, Systematics.

A generic review of Amphidorini: where does *Nycterinus* belong?

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A review of the Amphidorini genera and their distributions is presented and compared to a phylogeny of the tribe. The effect of evolutionary ecology on different lineages is also discussed, including the validity of some current amphidorine genera and the inclusion of *Nycterinus* in the tribe. Based on the presented phylogeny, possible alternative placements for *Nycterinus* are proposed.

Key words: Amphidorini, Systematic, Phylogeny, Tenebrioninae.

Posters' Abstracts

1. Annual variation of the thermal parameters of the guitarist beetle *Megelenophorus americanus* (Coleoptera: Tenebrionidae) in the Monte desert

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Investigation of thermal physiology gives us information about how species are influenced by the climate. Our aim was to study the thermal variation of Critical thermal maximum (CTMax), volunteer escape (VE), and fluid release (FR) to determine if *Megelenophorus americanus* shows acclimatization along the year in the Monte desert of San Juan, Argentina. Individuals were collected the last week of every month, during their activity period (at night). The inactivity period of this species is from March to October. We measured the operative temperatures (Te) from null models put in three different microhabitats. The average value was considered as Te. The field body temperature (Tb) was recorder with the infrared digital thermometer. In the laboratory the individuals were incubated 48hs at 20°C with a 12:12 light:night hour photoperiod. Beetles were exposed at an increment of temperature of 1°C/min. Three types of behavior were registered during the heating experiment: the VE, FR and CTMax. Our results show significant correlations between Te and Tb, FR and CTMax (Spearman: $R=0.97$, $p=0.001$; $R=0.40$, $p=0.001$; $R=0.40$, $p=0.002$, respectively). VE showed significant deferens between months (ANCOVA: $F(5, 50)=6.06$, $p=0.0001$), as well as FR (ANCOVA: $F(5, 50)=2.9592$, $p=0.02$) and CTMax (ANCOVA: $F(5, 50)=4.47$, $p=0.001$). The variation of Te shows its highest values in January and its lowest values in March. Also the correlation between CTMax and Te is an indicator

of thermal acclimatization mechanism that may help individuals to survive in environments with extremely high temperatures. On the other hand, the behavior of spitting fluids on its head could be a mechanism to make brain's temperature decrease for keeping neuronal activities working. This should be tested in further studies. We observed in December values atypically low for the thermal parameters and environmental temperatures, regarding November and January. We assume that is a consequence of the unusually rainy and cold summer that was experimented that year.

Key words: Critical thermal maximum; Monte desert, operative temperature; body temperature; Thermal physiology

2. Preliminar phylogenetic analysis of the American species of *Epicauta* Dejean (Meloidae: Meloinae: Epicautini) based on adult morphological characters

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Epicauta is one of the most diverse genera of Meloidae. Within this genus, two subgenera are currently recognized: the nominotypical and *Macrobasis* LeConte. The subgenus *Epicauta* is distributed throughout the Americas, Europe, Asia, and Africa, with about 400 species; and *Macrobasis* is almost entirely confined to North America, including 70 species. The phylogenetic analysis of 76 terminal taxa was performed on the basis of 81 morphological characters, applying parsimony algorithms of the TNT program. The outgroup includes *Pyrota wagneri* (Pyrotini) and *Tetraonyx seminiger* (Tetraonycini), and the ingroup 74 species of *Epicauta*, two belonging to the subgenus *Macrobasis* and 72, to the nominotypic genus. Among the latter, 55 come from South America and 17 from North America, one for each species group described for this region. North American species are included in order to test if they constitute a clade different from that of the South American ones, or if some South American species could be incorporated to some previously defined North American species groups. The data matrix was analyzed with two different procedures, under equal weights

and under implied weights. The support of each clade was evaluated with “symmetric resampling” and “relative Bremer support”. The phylogenetic analysis under equal weights resulted in 3726 most parsimonious cladograms, used to build a strict consensus tree that was compared with the tree obtained through implied weight with K5 concavity constant. Our data base supports the monophyly of *Epicauta*. Although many previously described species groups within *Epicauta* were recovered as monophyletic groups in this analysis, the cladogram showed many unresolved relationships. This indicates the need for obtaining additional data from genetics or immature stages, which should probably allow us to resolve the relationships within this clade more fully.

Key words: phylogenetic analysis, parsimony, *Epicauta*, South American species.

3. Darkling beetles as environmental bioindicators in Northeastern Patagonia

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Darkling beetles are among the most abundant and diverse arthropods in arid Patagonia. In recent years the knowledge of its biodiversity and ecology in northeastern Patagonia has been increased substantially, highlighting their ecological importance and improving the understanding of the functioning of these fragile ecosystems. This report presents a practical application of the study of tenebrionid biodiversity in northeastern Patagonia, highlighting its importance as environmental bioindicators at local and regional level through the development of three practical examples. It is widely known that desertification is a major conservation problem in the arid Patagonia, and that grazing is their main cause. As a first study case it is showed that darkling beetles are good bioindicators for monitoring the

environmental effects of sheep grazing at local scale in northeastern Patagonia. At the same time, it is showed the utility of this community to build environmental classifications, demonstrating that these beetles are sensitive to environmental heterogeneity at the regional level. Finally it is explored the value of these beetles for monitoring the environmental effects of fire, the main natural disturbance factor in these environments, even for long time periods since the event have occurred. We believe that the inclusion of this animal group on management plans and monitoring of this region will strengthen its long-term preservation.

Key words: Tenebrionidae, environmental bioindicators, arid Patagonia

4. Advances in the knowledge of the feeding ecology of *Nyctelia circumundata* Lesne (Coleoptera: Tenebrionidae) in Northeastern Patagonia

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Tenebrionidae is the most abundant coleopteran family inhabiting the northeastern Patagonia and *Nyctelia circumundata* Lesne is one of the most conspicuous darkling beetles in the region. Tenebrionids are typically considered as scavengers, nevertheless there are records of some species feeding on living plants. In this contribution, using laboratory bioassays (two-way choice tests), the feeding ecology of *N. circumundata* is studied asking the following questions: this beetle feeds on living plants? If it is true, it exhibits any feeding preference pattern? It would be able that this beetle consumes any invasive species? Plant water stress could affect the food selectivity of this beetle? How chemical and physical plant attributes influence the food selection process? As a result *N. circumundata* feeds on living plant and exhibited a defined feeding preference pattern. Even consuming the invasive species *Diploptaxis tenuifolia* (L.) DC., which has turned out to be the

most consumed item. *N. circumundata* did not show preference by any water supply regimes. These results suggest that the classical feeding concept about tenebrionids would be modified. The preference pattern observed could be consequence of a complex interaction between plant energetic attributes, palatability and metabolic requirements. Probably the food selection process would be a hierarchical process where chemical attributes are taken into account for species selection and physical attributes for choosing individuals inside species. The fact that *D. tenuifolia* was a preferred item suggests the development of new interactions among native insects and invasive plants, which may bring about new ecological implications.

Key words: Tenebrionidae, *Nyctelia circumundata*, feeding behavior, arid Patagonia.

5. Epigean Tenebrionids (Coleoptera: Tenebrionidae) from Leones, Tova and Tovita Islands, Chubut, Argentina

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The Interjurisdictional Marine Coastal “Patagonia Austral” National Park (PIMCPA) protects over 180 km of Patagonian Atlantic coastline in northern San Jorge gulf including an archipelago that comprises more than 39 islands of which the biggest are Leones, Tova and Tovita. Birds and marine mammals of the area have been the subject of many researches over the last 25 years. However, the entomological fauna that inhabits the islands is unknown. In this work darkling beetles (Tenebrionidae) are reported for the first time in the islands, its species assemblage is described and their relationships with mainland entomofauna are studied. Between March 2013 and December 2014 three entomological surveys were performed to these islands using

pitfall traps and manual collecting. The insular fauna assemblage was studied and compared in relation to those to the mainland using MDS, ANOSIM and PCA. The occurrence of eight species, arranged in eight genera and four tribes, is recorded. Six species were common to the three islands, *Psectrascelis sulcicollis* Waterhouse was recorded as exclusive to Tova and Tovita Islands, while *Platesthes burmeisteri* Haag-Rutenberg was only present on Leones Island. Although there were no endemic species, the islands exhibit a different tenebrionid species assemblage with respect to the continent. It is mainly composed by nocturnal or crepuscular species (including *Praocis* (*Hemipraocis*) *fimbriata* Burmeister, *Patagonogenius quadricollis* Fairmaire, *Emmалlodera crenaticostata* Blanchard and *Scotobius akidioides* Waterhouse), while several diurnal species of *Nyctelia* Berthold are the most common and diverse darkling beetles among mainland fauna.

Key words: Tenebrionidae; Islands; "Patagonia Austral" National Park (PIMCPA); Patagonia.

6. Tenebrionidae of Peru: Analysis of the components of its fauna

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The present knowledge of peruvian Tenebrionidae is summarized. Currently, the Peruvian fauna includes 8 subfamilies, 37 tribes, 104 genera, and 354 species or subspecies. The following topics are included: taxonomic diversity, geographic distribution and historic knowledge. Taxonomic diversity deals with species richness, endemism, biogeographic composition and estimation of species richness. According to geographic distribution, the Peruvian fauna are grouped in Desert, Andean and Amazonic taxa. Historic knowledge deals with description process through decades and contributions of authors.

Key words: Tenebrionidae, Peru, taxonomic diversity, geographic distribution, historic knowledge.

7. Description of first instar larvae of the subgenus *Praocis* Eschscholtz, 1829 (Coleoptera: Tenebrionidae), endemic element from the coastal desert of Chile

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The subgenus *Praocis* Eschscholtz, 1829 (Pimeliinae: Praociini), is an endemic group of north-central Chile encompassing 18 species distributed mostly across the Chilean desert and coastal steppe. In this work we describe the morphology and structure of the first instar larvae of *Praocis* (*Praocis*) *spinolai* Gay & Solier, 1840, *Praocis* (*Praocis*) *subaenea* Erichson, 1834, *Praocis* (*Praocis*) *curta* Solier, 1840, and *Praocis* (*Praocis*) *sulcata* Eschscholtz, 1829 (Coleoptera: Tenebrionidae), all of them endemic elements of the transitional coastal desert of Chile. To obtain larvae, male and female individuals were collected in the fields and maintained in mating boxes until oviposture and hatching. The structure and external morphological features of the larvae were analyzed via scanning electron microscopy (SEM). The results show that first instar larvae have morphological adaptations to edaphic environments, such as prothoracic legs for digging, strongly-sclerotized cephalic capsule with large number of sensilla, and well-developed pygopodium. We analyzed the importance of certain morphological features as specific diagnostic criteria and determined that the differences in the frontal sensilla, clipeum shape, anterior labrum margin, and pygopodium shape between the species is of taxonomic and, probably, phylogenetic value.

Key words: Tenebrionidae, Praocini, *Praocis*, larvae, Chile.

8. Distribution, ecology and conservation status of *Gyriosomus granulipennis* Pizarro-Araya & Flores 2004 (Coleoptera: Tenebrionidae)

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The Pingüino de Humboldt National Reserve is located in the coastal transitional desert of Chile (25-32° S) and is composed of the Choros, Damas and Chañaral islands, which extends across the regions of Atacama and Coquimbo (Chile). Recently, *Gyriosomus granulipennis* Pizarro-Araya & Flores 2004 (Coleoptera: Tenebrionidae) has been described as endemic to Choros island and represents a particular case of a species with a distribution restricted to a semidesertic insular ecosystem. The objectives of this work were 1) to examine the distribution, ecology and conservation status of *G. granulipennis* and 2) to propose long-term work plans for monitoring and preserving the species populations. According to the data analyzed, the distribution of this species is concentrated in the plateaus of the northern and mid-western portion of Choros island. Population dynamics studies of the species suggest that the populations are small and linked to the availability and dynamics of the island's seasonal vegetation. *G. granulipennis* was the first insect species to be classified in a conservation category in Chile (Vulnerable). The major threats currently facing this species are the incipient habitat reduction, the loss of trophic resources caused by introduced (*Oryctolagus cuniculus*) and invasive species (*Mesembryanthemum cristallinum* and *M. nodiflorum*), and predation from occasional species (*Athene cunicularia*). We estimate that it is essential to continuously monitor the population status and dynamics of this tenebrionid species in order to develop effective protection and conservation plans that take into consideration the loss of habitat and the eradication of introduced species.

Key words: Conservation, endemism, islands, Tenebrionidae, Chile.

9. Description of the first-instar larva of *Scotobius pilularius* Germar 1824 (Coleoptera: Tenebrionidae)

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The Neotropical genus *Scotobius* Germar (Tenebrioninae: Scotobiini) comprises 61 species distributed from central Peru and southern Brazil to southern Argentina and Chile. *Scotobius* and five other genera conform the tribe Scotobiini (Solier, 1838), which is abundant in arid and subarid environments endemic to South America. Larval morphology of members of this tribe is very poorly known. Only two species have been described, and both descriptions are superficial and lack comparative precision and detail. In particular, primary chaetotaxy was not emphasized as the first instar is unknown. In this contribution we present the first detailed description of the first-instar larva of a Scotobiini (*Scotobius pilularius* Germar, 1824), with emphasis on primary chaetotaxy of the cephalic capsule, head appendages, legs, and thoracic and abdominal segments. Larvae were cleared in lactic acid, dissected, and observed under a compound microscope. Drawings were made using a drawing tube attached to the microscope, and digitally inked. First-instar larvae of *S. pilularius* are characterized by: body smooth, lightly sclerotized; mandibles asymmetrical, with transverse suboval sclerome; thorax strongly convex, pronotum well developed, subquadrate; abdomen ten-segmented; thoracic and abdominal segments with two longitudinal dorsal rows of setae, those on meso- and metathorax and abdominal segments I-VIII inserted contiguously to short blunt cuticular projections; each thoracic segment with three long lateral setae on each side; abdominal segments I-VIII with two lateral setae on each side; abdominal segment IX with four large setae and a distal arrange of pores and minute setae; cephalic capsule, head appendages, and legs with several setae and pores varying in size and shape.

Key words: Tenebrioninae, Scotobiini, *Scotobius*, larval morphology, chaetotaxy.

10. Catalogue of Brazilian Tenebrionidae

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The most recent catalogue dealing with Brazilian fauna of Tenebrionidae is Blackwelder's from 1945 but is not an exclusive list for the country. It includes the fauna of Brazil and remaining South and Central American countries. In the present work based in an extensive bibliographical research which refers to the late seventy years, an updated catalogue of Brazilian Tenebrionidae is presented. New discovered species and the most taxonomic adjustments, which occurred on this family over these seven decades are added. The catalogue includes 1311 species cited for Brazil arranged in 166 genera, 34 tribes and eight subfamilies, according to the most recent classification of the family. The present study is part of a major project, the CTFB (Catálogo Taxonômico da Fauna do Brasil), which will be distributed as an online taxonomic reference on Brazilian species that is firmly anchored to rules of nomenclature and whose main objective is to serve as a bridge between the taxonomic decisions made by specialists and the actions of the Brazilian government that involve biodiversity management and the environment.

Key words: Brazil, Neotropical, Taxonomy.