Chaltenia patagonica, new genus and species belonging to Chalteniina, a new subtribe of Zolini (Coleoptera: Carabidae)

Sergio Roig-Juñent[1]

IADIZA, CC 507, 5500 Mendoza, Argentina

Armando C Cicchino

Departamento Científico de Entomología, Museo de La Plata, Paseo del Bosque
s/n 1900, La Plata, Argentina

The Canadian Entomologist **133**: 651 – 670 (2001)

Abstract—Based on external structural features and on those of male and female genitalia, the monobasic carabid genus *Chaltenia* **gen.nov.** is described and illustrated, along with *Chaltenia patagonica* **sp.nov.** A parsimony analysis of tribe-level taxa supports a position of this new genus within the supertribe Trechitae. Based on the analysis of fittest trees, the genus *Chaltenia* is most closely related to the tribe Zolini. Several characters, such as head with three supraorbital setae, two rows of squamosetae on ventral surface of male protarsomeres 1–2, elytral interval 8 not carinate, and glossal sclerite quadrisetose, differentiate the genus *Chaltenia* from the three subtribes of Zolini. Because of the large degree of difference from the previously known genera of Zolini, a new monogeneric subtribe, Chalteniina, is described in order to hold the new genus *Chaltenia*. The biogeographical pattern exhibited by the tribe Zolini is congruent with the biogeographical patterns of other carabids, such as the tribe Broscini, that show an amphitropical distribution.

Roig-Juñent S, Cicchino AC. 2001. *Chaltenia patagonica*, nouveau genre et nouvelle espèce de Chalteniina, une nouvelle sous-tribu des Zolini (Coleoptera : Carabidae). *The Canadian Entomologist* **133** : 651–670.

Résumé—Le nouveau genre monospécifique *Chaltenia* **gen.nov.** et l'espèce *C. patagonica* **sp.nov.** sont ici proposés et diagnostiqués sur la base des structures externes ainsi que sur les appareils genitaux des mâles et femelles. Une analyse de parsimonie au niveau tribal indique que ce nouveau genre appartient au Trechitae et, selon les caractères synapomorphiques du genre *Chaltenia*, il est plus proche de la tribu Zolini. Le genre *Chaltenia* diffère grandement des genres des trois sous-tribus connues de Zolini par quelques caractères notanment comme trois soies frontales supraoculaires, le revêtement ventral du protarsites 1–2 du mâle du type sérié avec deux rangées des phanères, avec strie récurrente, et languette avec quatre soies, en conséquence, une nouvelle tribu, Chalteniina, est crée pour ce genre. Le patron biogéographique montré par la tribu Zolini est congruent avec celui d'autres groupes de Carabidae comme Broscini qui ont une distribution amphitropicale.

Introduction

Temperate areas in both hemispheres are relatively rich in carabid beetles of the subfamilies Psydrinae and Broscinae (Stylifera Jeannel, 1941). Within these subfamilies, there are several tribes, such as Bembidiini and Trechini, that have numerous species which are widely distributed in temperate areas. Other tribes, such as Broscini

---

[1] Author to whom all correspondence should be addressed (E-mail: saroig@lab.cricyt.edu.ar).

(Davidson and Ball 1998; Roig-Juñent 2000), Psydrini (Baehr 1998), and Zolini (Jeannel 1962; Deuve 1997), are confined to temperate or mountain areas and are absent from tropical areas. South America is one area where these groups of Carabidae are abundant. While studying specimens from the collection of Carlos Bruch at the Museo de La Plata and Museo Bernardino Rivadavia, an unknown species belonging to Stylifera was discovered. These specimens, stored in the Bruch collection with the platynine genera of South America, represent a new genus and a new species, which we characterize and distinguish from related taxa. To properly place this species within the context of an existing classification, we performed a cladistic analysis because its particular combination of character states did not permit tribal assignment (Sloane 1923; Jeannel 1962; Johns 1974; Deuve 1997).

Material and methods

Our description of the species is based on an examination of five specimens, two males and three females. Specimens were borrowed from or deposited in the following entomological collections:

IADIZA	Instituto Argentino de Investigaciones de Zonas Aridas Mendoza, Argentina (Sergio Roig-Juñent).
MLPA	Museo de La Plata, La PLata, Argentina (Juan Schnack).
MACN	Museo Argentino de Ciencias Naturales Bernardino Rivadavia (Axel O Bachmann).

Dissections and illustrations were made following the techniques used in previous revisions of the South American Broscini (Roig-Juñent 2000). The only measurement reported is the overall length, which was taken from the clypeus to the apex of the elytra.

Cladistic analysis

Characters

The plesiomorphic (0) and apomorphic (1 and 2) states of the adult characters used in this analysis (Appendix 1) are those proposed for higher classification in Carabidae (Sloane 1923; Jeannel 1941, 1955; Bell 1967; Stork 1980; Erwin 1985; Nichols 1985; Deuve 1993; Baehr 1998; Liebherr and Will 1998; Roig-Juñent 1998). Characters are whole numbers (*i.e.*, 10) and states are indictated by superscripts (*i.e.*, 10^1). The distribution of states among the taxa is indicated in the data matrix (Table 1). Character states were coded as discrete states and arranged by setting the most similar states adjacent to each other, so that the most divergent states were at opposite extremes (*e.g.*, character 2). Features for which the pattern of divergence was too complex to arrange as a graded series (*e.g.*, characters 1, 4, 5, 10, 17, 23, 29, and 31) were treated in a nonadditive manner (unordered). Polymorphic characters within a taxon are represented as both states within brackets (Table 1).

Taxa

We chose 29 taxa belonging to 18 of the tribes of Carabidae proposed by Erwin and Sims (1984) (Appendix 2). The family Trachypachidae was chosen as an outgroup of Carabidae because it is considered by several authors (*e.g.*, Erwin 1985; Roig-Juñent 1998) as one of the constituent families of the adelphotaxon of Carabidae (Beutel 1998).

Table 1. Taxon character matrix of Carabidae tribes, subtribes, and genera.

Trachypachidae	0002000000000000000000001000000000000000
Migadopini	1002000010001010200000010000100000000000
Apotomini	1000000010001011110010200011000000111000
Melaenini	2002000013001011110010110011000100110?11
Cymbionotini	000?10?0100011111100?01??0??000100110?11
Axonyina	1001001010000011110010100111100 10??1???1
Broscina	1001001020000011110000100110100101111001
Nothobroscina	1102001023000011310000110110000101111001
Psydrini	0002000010000111310010210001000001110000
Mecyclothoracini	0[01]010010?2000011?0001?1101102?0000110100
Meonidini	00010010?2000011??001?2???100?000??1???0
Melisoderini	0?010010?2000011??001?1?01102?10001101[01]0
Tropidopterini	0101001022001011300110100100201 00??1???0
Amblytelini	0?01??10??000011??001????1101?1001110100
Trechina	0201201021100011300001101110101010110000
Homaloderina	0201201021100011300001101110101010110000
Aepina	0201201021100011300011101110101000110000
Ochtozetus	0001011011100011301100111?0101000?10100
Diplochaetus	0002001011100011301100111?0101000?10?00
Pogonus	0002001011100011?01100111?0101000?10?00
Merizodina	0002111011111111301011101111101001110100
Zolina	0001011011111111?00011101110101001111000
Sinozolina	02020110?211??11?00011201??110100??????
Bembidiina	0102011112100011300011101111101000110100
Tachyna	0101011112100011300011201111101000110000
Xystosomina	010101111210001130001110 1?1110100001 0000
Patrobini	00020000?2000011?00010111111?1011110100
Sphodrina	0112000022000011300100100110212000111100
Platyinina	0111000022000011300100100110212000111100
Harpalini	1110000022000011300100100110212000110000
Chaltenia	310211101211001130001110 10?110100001?000

Note: Character names and states are given in Appendix 1.

Data analysis

The most parsimonious tree was obtained by analysing the data matrix (Table 1), using Goloboff's phylogenetic program Nona 2.0 (Goloboff 1993). This analysis was conducted under 300 wagner with random addition sequence plus tree-bissection reconnection (mult* 30), followed by a branch swapping technique (max*). For each step, 100 trees were held (hold/100). The fittest tree was obtained with the program PeeWee 2.6 (Goloboff 1993), using 30 wagner with random addition sequence plus tree-bissection reconnection (mult* 30), followed by branch swapping (max*). For each step, 50 trees were held (hold/50) and the concavity constant was 3.

Terminology

Most of the terms used to designate details of structures are those recorded in textbooks on general entomology. Other words required to designate particular structures or parts thereof are defined below to avoid confusion.

"Segment" is restricted to those body parts that reflect embryonic somites; thus, somite-like portions of the abdomen are referred to as segments. Abdominal segments and their appendages are designated by Roman numerals that correspond to the respective somites. The first complete sternum is III, and the last one (pregenital) that is normally exposed is VII. For numbering the genital somites, we followed Bils (1976). Portions of appendages are designated by the suffix mere, with the prefix depending upon the appendage in question: antenno, palpo, tarso, *etc.* Terms for the sclerites of the genital segments (VIII–X, in Coleoptera) and their appendages have a complex history that reflect differences among authors regarding sclerite homology. In this paper, we used those described by Deuve (1993) and Liebherr and Will (1998).

Results

Cladistic analysis

The analysis under strict parsimony yielded 70 trees from 124 steps [consistency index (CI) = 0.42, retention index (RI) = 0.71]. The strict consensus tree shows that the genus *Chaltenia* **gen.nov.** belongs to the supertribe Trechitae (Fig. 1). Only character state 11^1 supports this group (Fig. 1). Within the supertribe Trechitae, the genus *Chaltenia* forms a monophyletic unit together with the subtribes Sinozolina, Merizodina, and Zolina, the tribe Trechini, and the three subtribes of Bembidiini. The second analysis yielded two cladograms (fit = 276.2, length = 124 steps). Both cladograms are 2 of the 70 obtained under strict parsimony, and these trees differ only in the position of the subtribe Axonyina as the sister group of the subtribes Nothobroscina plus Broscina or as the sister group of the subtribe Broscina. Because this difference is irrelevant for the relationships with the genus *Chaltenia*, we based our analysis on the tree that shows the relationships for these three Broscini subtribes, as proposed by Roig-Juñent (2000). The selected tree (Fig. 2) is highly congruent with the general classification of Carabidae (Appendix 2), where Carabidae Conjunctae (portion of cladogram up to the tribe Migadopini), the subfamily Harpalinae (tribe Harpalini plus the two subtribes of the tribe Platyinini), and the subfamily Broscinae are monophyletic groups (portion of cladogram up to the tribe Apotomini).

The group defined as Stylifera by Jeannel (1941) contains two subfamilies: Broscinae and Psydrinae. In this analysis Stylifera is a paraphyletic group because it is not included in the subfamily Harpalinae and because it is defined as a combination of simplesiomorphic characters states, such as 3^0 (present from the family Trachypachidae), 15^1 (present from the tribe Migadopini), 16^1 (present up to the tribe Migadopini), 17^3 (present in almost all "higher" Carabidae), and 29–31 (present from the family Trachypachidae) (Table 1).

Within Stylifera, the subfamily Broscinae appears as a monophyletic group. On the other hand, the subfamily Psydrinae, which includes the two supertribes Trechitae and Psydritae (Appendix 2), is a non-monophyletic group (Fig. 2). The tribe Psydrini constitutes the adelphotaxon of the subfamily Broscinae (Fig. 2), whereas the remaining tribes of the subfamily Psydrinae are related to the subfamily Harpalinae.

Of the two groups of the subfamily Psydrinae, only the supertribe Psydritae (as defined by Erwin and Sims 1984; Appendix 2) is non-monophyletic because its tribes (marked with asterisks in Fig. 2) are related to different clades (such as the subfamilies Harpalinae and Broscinae, and the supertribe Trechitae) (Baehr 1998; Liebherr and Will 1998). The basal clades of Carabidae Conjuntae are a problematic group of carabid beetles, and a separate analysis including all genera of the subfamilies Psydrinae and Broscinae will be necessary to test the monophyly of these two subfamilies.

Although the subfamily Psydrinae (*sensu* Erwin and Sims 1984) is not monophyletic, monophyly of the supertribe Trechitae is supported (Fig. 2) by character state 11^1. Character state 10^1 could also support this node. This character state could have been acquired once and reverted immediately to the node of the tribes Bembidiini

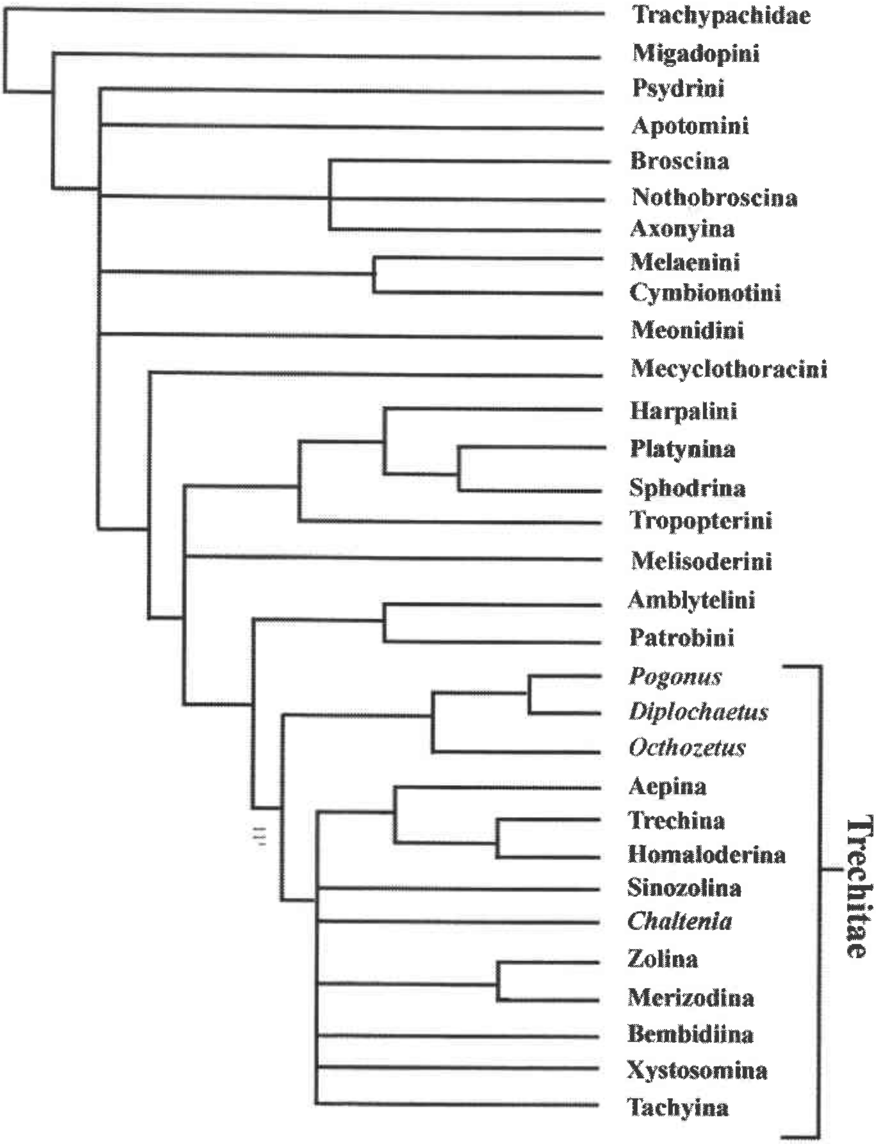


FIGURE 1. Strict consensus tree from the 70 cladograms obtained under strict parsimony. Character state 11^1 is the unique synapomorphy of the supertribe Trechitae.

plus Zolini, or it may have been acquired independently in the tribes Pogonini and Trechini, and in the subtribes Merizodina plus Zolina. GE Ball (personal communication) postulates that the single row of squamosetae was derived by reduction only from a two-row condition. This is based on the generality of two rows throughout the higher Carabidae, with a single row occurring only sporadically. Given this assumption, the character state (one row of squamosetae) is regarded as acquired independently by different groups. The tribes Trechini, Bembidiini, Pogonini, and Zolini (Appendix 2) have traditionally been considered to be closely related, based upon elytral setal patterns (Jeannel 1941) and the lack of conflicting patterns (Maddison *et al.* 1998). Other

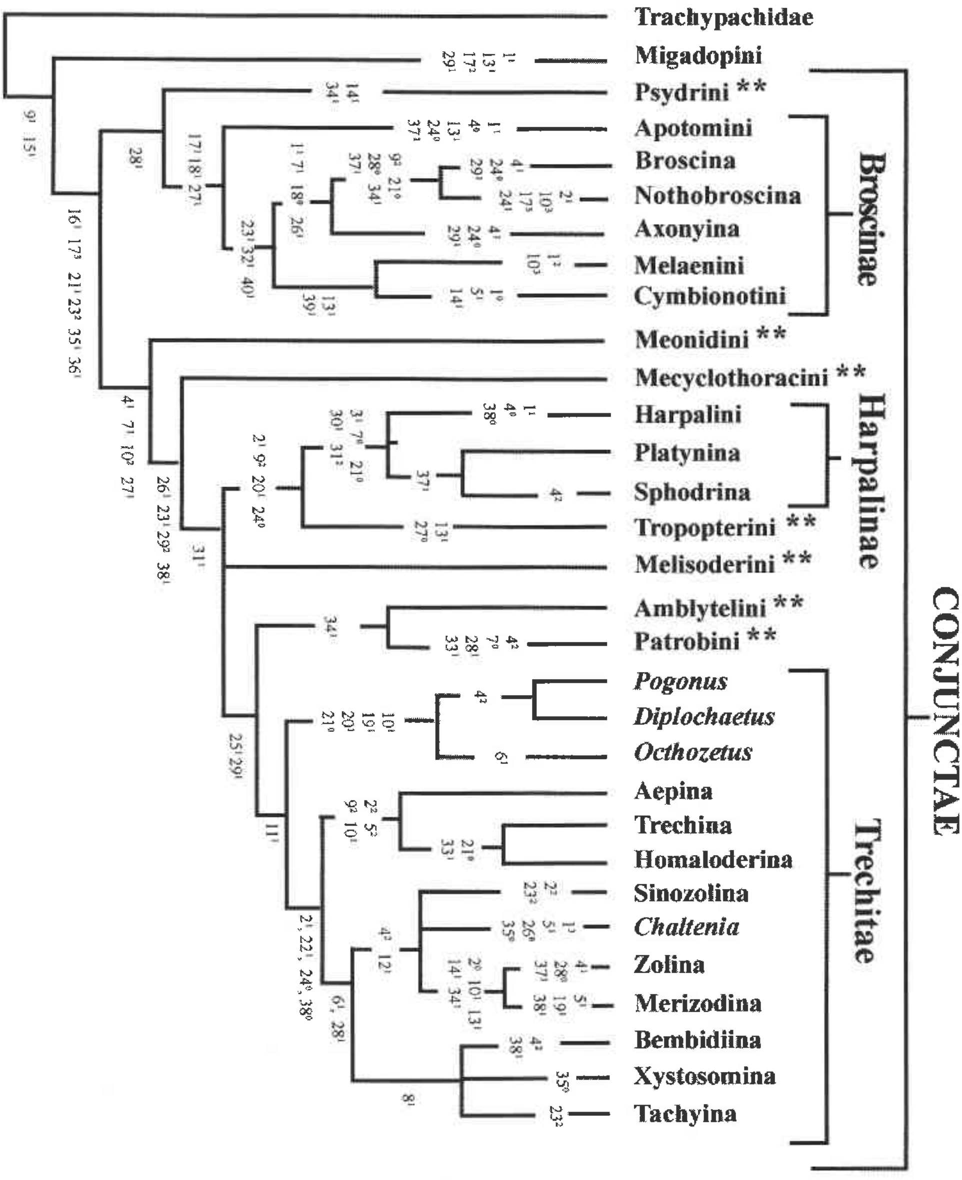


FIGURE 2. Strict consensus tree from the two fittest cladograms obtained using the program Peewee. Synapomorphies and autapomorphies are listed with the character numbers and their states as superscripts. **, tribes of Psydritae.

nonmorphological characters support the monophyly of this group of tribes, such as ribosomal DNA constitution (Maddison *et al.* 1998) and the presence of an aschiasmatic meiosis in males, a synapomorphic feature within carabids (Serrano 1981).

Within the supertribe Trechitae, the three genera of the tribe Bembidiini form a monophyletic unit, as well as the three genera of the tribe Trechini, the three genera of the tribe Pogonini, and the subtribes of the tribe Zolini (Merizodina, Zolina, and Sinozolina). In this analysis, the genus *Chaltenia* appears related to the supertribe

Trechitae (Fig. 2). Within this supertribe, the genus *Chaltenia* appears most closely related to the tribes Bembidiini and Zolini because of the synapomorphies of character states 6^1 and 28^1 (Table 1).

The present analysis shows that the genus *Chaltenia* must be regarded as a member of the tribe Zolini. The synapomorphic character states that unite the genus *Chaltenia* with the subtribes of Zolini are 4^2 and 12^1 (Table 1). The last character state appears in this analysis as a unique feature within the taxa examined, but it is not a synapomorphy exclusive to the tribe Zolini. Reichardt (1977) noted that some Bembidiini exhibit this character state.

Autapomorphic character states for the genus *Chaltenia*, within the supertribe Trechitae, are 11^3 and 26^0 (Table 1). Character state 35^0, within the supertribe Trechitae, is parallel with the character state 35^0 in the subtribe Xystosomina. The other character not used in the analysis that constitutes exclusive states within the tribe Zolini is the well-developed metathoracic wings, but this character could be plesiomorphic because it is present in related tribes. None of these features are exclusive to the genus *Chaltenia*, but their combination is unique for trechite beetles.

Taxonomic treatment of the tribe Zolini Sharp, 1886

Merizodini Sloane, 1920; Jeannel 1941; Jeannel 1962
Zolini van Emdem, 1936; Johns 1974; Reichardt 1977; Deuve 1997

Diagnosis

Adults are small and apterous or winged. The tribe Zolini is a member of the supertribe Trechitae (subfamily Psydrinae) and is distiguished from other tribes by the following characters (Jeannel 1962): maxillary palpomere 3 plurisetose, elytron with apical plica, recurrent stria joined with the apical portion of stria 5, and tarsomeres sulcate dorsally. None of these characters are unique synapomorphies of Zolini, but in combination within the supertribe Trechitae, are exclusive.

Remarks

Sloane (1920) created the name Merizodini for the tribe Zolini because the type species of *Zolus* Sharp, 1886 is included in the genus *Oopterus* Guérin-Ménéville, 1841, and thus the name *Zolus* is a junior synonym of the genus *Oopterus*, by virtue of priority of publication date. Deuve (1997) and GE Ball (personal communication) pointed out that the date of publication of the tribal name Zolini is 1886, and this must be the date of usage at other suprageneric ranks. On the other hand, the name *Oopterus* was not used as the basis for the name of the same suprageneric taxon until 1938 (by Jeannel). Article 40.2 of the International Code of Zoological Nomenclature of 2000 states that “if a family-group name has been replaced before 1961 because of such synonymy, and the replacement has won general acceptance, it is to be maintained.” The tribal name Oopterini has not gained general acceptance, thus, although correct usage requires that the name *Oopterus* be used at the generic level, the suprageneric group containing that genus must be named Zolini.

Included subtribes

Jeannel (1962) recognized two subtribes of the tribe Zolini: Merizodina and Zolina (Jeannel used Oopterina). The subtribes were differentiated by the structure of the basal part of the median lobe (Jeannel 1962). Deuve (1997) described a carabid beetle from China belonging to the tribe Zolini and proposed a new subtribe, Sinozolina, for that new taxon. The genus *Chaltenia* constitutes the fourth subtribe of the tribe Zolini.

Key to tribes of South American Psydrinae and Broscinae (Stylifera of Jeannel 1941) (modified from Reichardt 1977: 360) and to the worldwide subtribes of Zolini

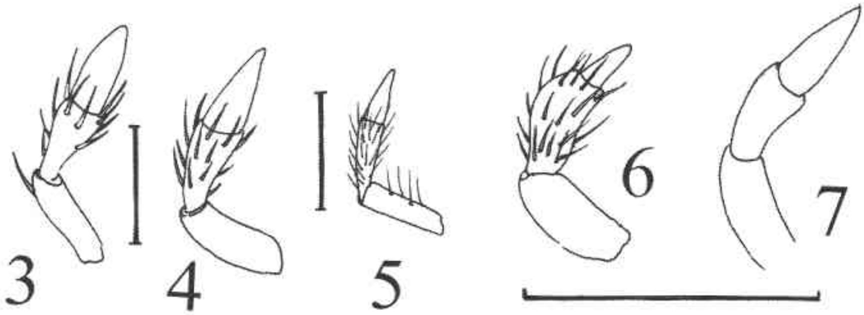
1. Head with one supraorbital setigerous puncture on each side 2
1′ Head with two or more supraorbital punctures on each side 3
2. Body pubescent; mentum without tooth . . . . **Apotomini**
2′. Body glabrous, except for usual fixed setae; mentum with tooth . . . . **Broscini** (in part)
3. Terminal maxillary and labial palpomeres not subulate, not much smaller than penultimate palpomeres (Figs. 3–5, and 7) 4
3′. Maxillary and labial palpus each with terminal article subulate (Fig. 6), much shorter and more slender than penultimate palpomeres . . . . **Bembidiini**
4. Maxillary palpomere 3 pubescent (Figs. 3–5) 5
4′. Maxillary palpomere 3 glabrous or with few setae (from one to four) (Fig. 7) 9
5. Elytron posteriolaterally with internal plica (Fig. 17); article 2 of antenna pubescent; glossal sclerite bi- or quadri-setose; mentum and submentum articulated . . . . **Zolini** 6
5′. Elytron posteriolaterally without internal plica (or not interrupting the lateral margin), antennomere 2 with tuft of setae, only; glossal sclerite bisetose; mentum and submentum fused . . . . **Pogonini** (in part)
6. Male protarsomeres 1–2 apically distinctly expanded on inner side, protarsomere 1 with two rows of squamosetae ventrally, protarsomere 2 with one or two rows of squamosetae; apical portion of the elytral interval 8 not carinate 7
6′. Male protarsomeres 1–2 slightly expanded on inner side (Fig. 12), each with one row of squamosetae ventrally; apical portion of the elytral interval 8 carinate 8
7. Head dorsally with frontal grooves well developed, reaching behind the eyes; head with two supraorbital setae on each side; glossal sclerite bisetose; submentum with two setae; prothorax with one lateral seta on each side; elytra without scutellar stria . . . . subtribe **Sinozolina** (China)
7′. Head dorsally with short frontal grooves, reaching the middle of the eyes; head with three supraorbital setae on each side; glossal sclerite quadrisetose; submentum with four setae; prothorax with two lateral setae on each side; elytra with scutellar stria . . . . **Chalteniina new subtribe**
8. Glossal sclerite quadrisetose; base of median lobe open dorsally . . . . subtribe **Merizodina**
8′. Glossal sclerite bisetose, base of median lobe closed dorsally . . . . subtribe **Zolina** (Australia, New Zealand, and sub-Antarctic islands)
9. Head with two supraorbital setae on each side 10
9′. Head with three or more supraorbital setae on each side . . . . **Broscini** (in part)
10. Head dorsally with frontal grooves curved expanded to genae and ventral surface; at middle, distance between eye and adjacent groove subequal to distance between grooves; glossal sclerite with six or more setae . . . . **Trechini**
10′. Head dorsally without frontal grooves, or grooves in various forms, but never extended posteriad eyes 11
11. Elytron posteriolaterally without internal plica . . . . **Pogonini** (in part)
11′. Elytron posteriolaterally with internal plica 12
12. Elytron without parascutellar striole; base of elytron not margined . . . . **Meonidini**
12′. Elytron with parascutellar striole; base of elytron margined . . . . **Tropidopterini**

Chalteniina new subtribe

Figs. 3, 8–26

Type genus

Chaltenia **gen.nov.**



FIGURES 3–7. Maxillary palpomeres of different species of the supertribe Trechitae: (3) *Chaltenia patagonica* (tribe Zolini), (4) *Merizodus soledadinus* (tribe Zolini), (5) *Octhozetus bicolor* (tribe Pogonini), (6) *Gouleta cayenensis* (tribe Bembidiini), and (7) *Kenodactylus audouni* (tribe Trechini). Scale bar = 0.5 mm.

Diagnosis

The subtribe Chalteniina differs from the subtribes Zolina and Merizodina in having two rows of squamosetae on the ventral surface of the male protarsomeres 1–2 and elytral interval 8 not carinate, and differs from the subtribe Sinozolina in the shape of the dorsal sulcus of frons and the number of glossal setae.

Description

Adult. Head caspsule with three supraorbital setae on each side, two on supraorbital sulcus, and third on inner side at level of second (Fig. 8); frons with sulcus extended to posterior margin of eyes. **Mouthparts.** Mandibular scrobe unisetose; mentum with one pair of setae, and with bifid tooth (Fig. 9); glossal sclerite quadrisetose; maxillary palpomere 3 plurisetose (Fig. 3). **Thorax.** Connection of prothorax and mesothorax broad; front coxal cavities closed posteriorly; middle coxal cavities conjunct (Fig. 15). **Elytra:** base not margined; with eight complete striae and parascutellar stria joined to apical portion of stria 1; parascutellar seta present; umbilicate series with 11 setae, arranged in three groups—four basal, three medial, and four apical; interval 3 with four setae; interval 5 with four setae, three setae on the basal third, and one seta at the junction of interval 5 and the recurrent stria; recurrent stria joined with apical portion of stria 5 (Fig. 16); posteriolaterally with internal plica (Fig. 17). **Metathoracic wings fully developed** (Fig. 18)**:** M4 with origin in middle of oblongum cell. Metepimeron in form of a shelf overlapping abdominal sternum II (the first visible abdominal sternite). **Legs:** front tibia with one spur apical and one as part of cleaning organ, this last distinctly developed (Figs. 10–11), setal band with confluent zone short, anterior row of setae in form of part of cleaning organ; median expansion not shifted anteriorly, antennal channel shallow, tibia not compressed anterioposteriorly; male with protarsomeres 1–2 expanded apically on inner side (Fig. 12), each with two rows of squamosetae ventrally (Fig. 13); mesotibial oblique comb absent, without mesotibial brush on lateral surface; basal tarsomeres of middle tarsus without adhesive setae, sulcate dorsally (Fig. 14). **Male genitalia.** Median lobe open basally (Figs. 23–24); parameres styliform with few apical setae (two left, three right) (Figs. 20–21). **Female genitalia.** Ovipositor without gonopod VIII, gonopod IX dimerous, gonostylus 2 without subapical setose organ; bursa copulatrix without accessory gland (Fig. 26).

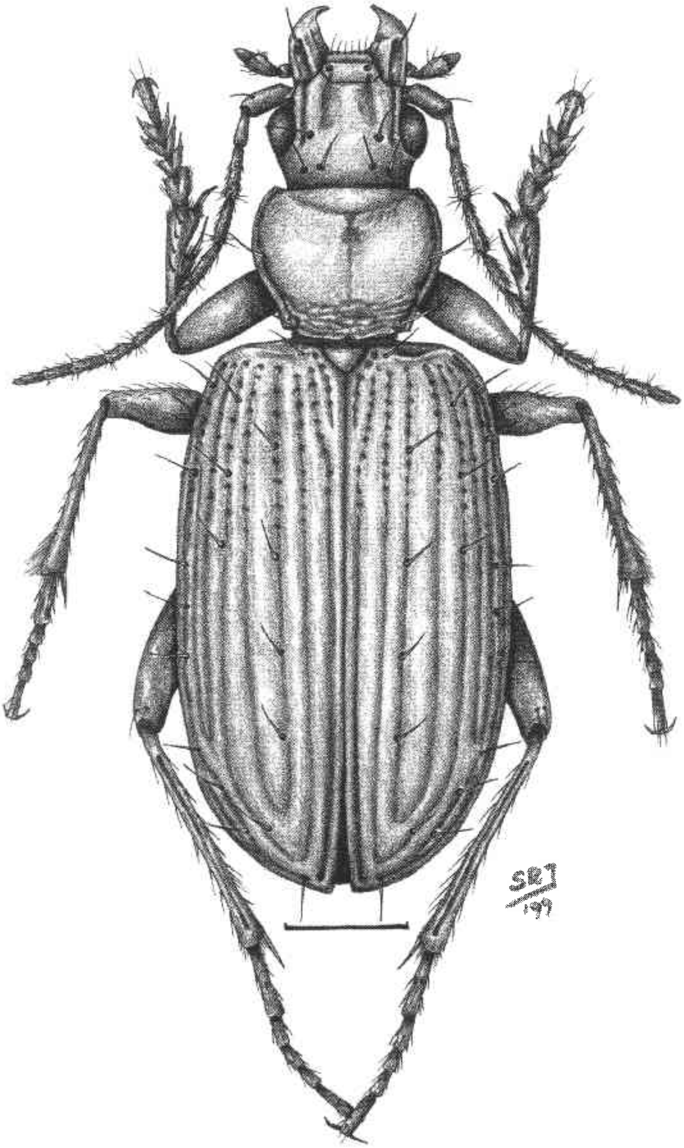


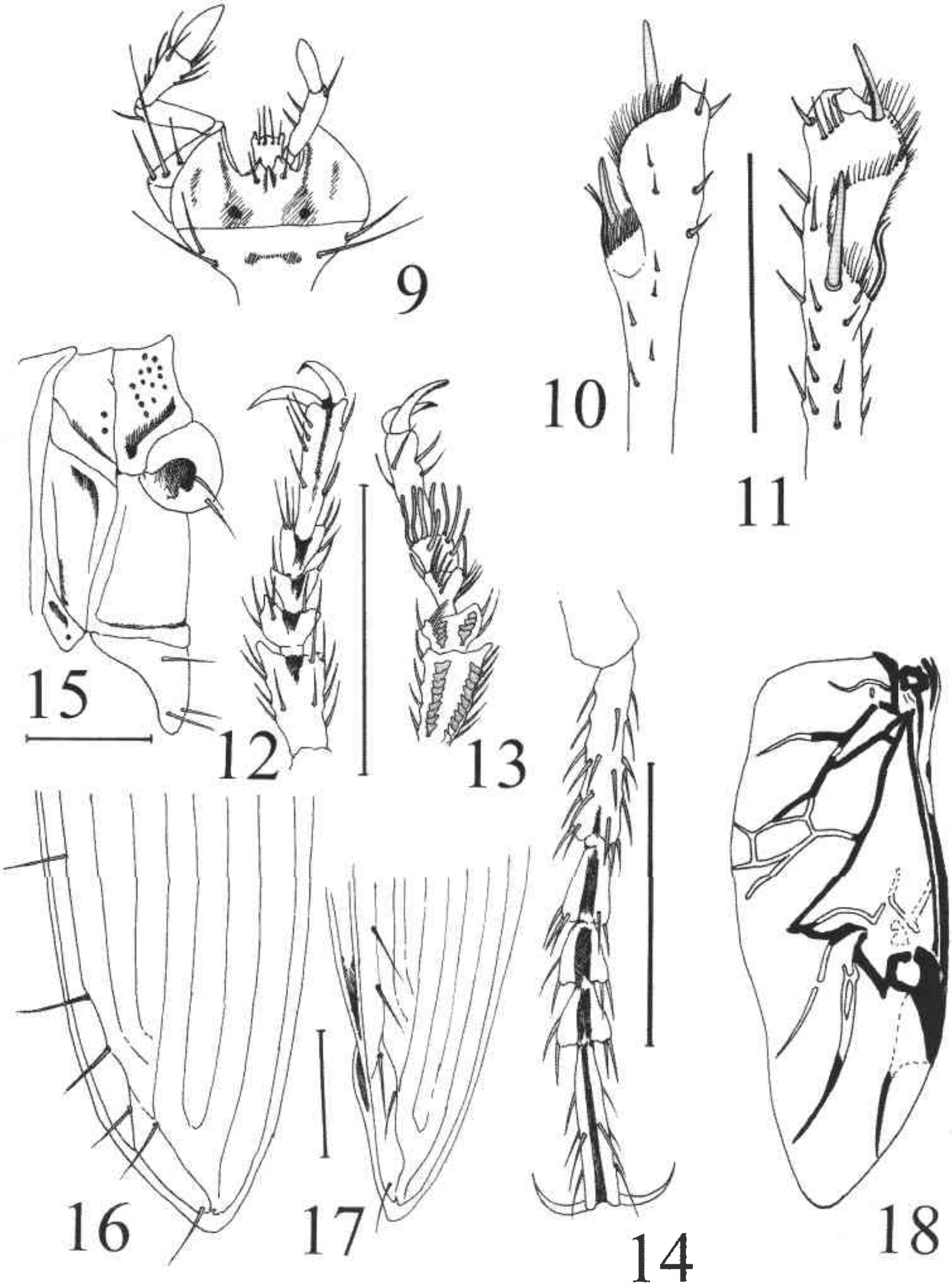
FIGURE 8. Habitus on dorsal view of male *Chaltenia patagonica*. Scale bar 1 mm.

Relationships

The genus *Chaltenia* is included in the supertribe Trechitae (*sensu* Erwin and Sims 1984) because it has the male protarsomeres 1 and 2 dentate and dilated on the inner side (Figs. 12–13). The genus *Chaltenia* appears most closely related to the tribe Zolini because of the presence of a dorsal sulcus on the meso- and meta-tarsomeres.

Geographical distribution

This subtribe is only known from southern Argentina, in the temperate south of South America (Fig. 27) (see below for details).



Figures 9–18. ***Chaltenia patagonica*: (9) mouthparts, ventral view; (10) apex of protibia, dorsal view; (11) apex of protibia, ventrolateral view; (12) male protarsomeres, dorsal view; (13) male protarsomeres, ventral view; (14) male metatarsomeres, dorsal view; (15) meso-metathorax, lateral view; (16) elytral apex, dorsal view; (17) elytral apex, lateral view; and (18) metathoracic wings. Scale bar = 1 mm.**

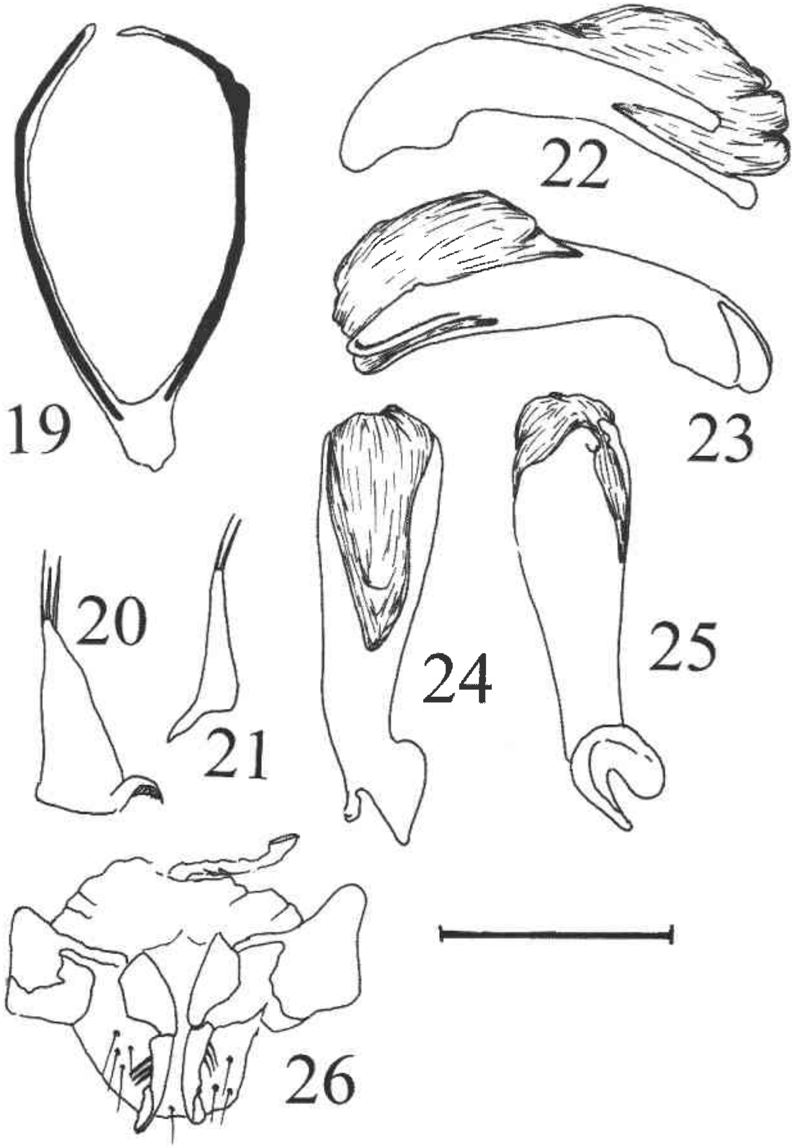


FIGURE 19. Male abdominal segment IX (ventral aspect) of *Chaltenia patagonica*. FIGURES 20–25. Aedeagus of *Chaltenia patagonica*: (20) left paramere; (21) right paramere; (22) median lobe, right view; (23) median lobe, left view; (24) median lobe, dorsal view; and (25) median lobe, ventral view. FIGURE 26. Female track (ventral view) of *Chaltenia patagonica*. Scale bar = 1 mm.

Geographic relations with allied tribes

The related subtribes of the subtribe Chalteniina mostly inhabit the southern hemisphere (Fig. 28). The groups occur in Australia, New Zealand, South America, and sub-Antarctic islands, such as Keguerlen, South Georgia, Campbell, Snares, Antipodes, and Auckland (Johns 1974). Only the subtribe Sinozolina is found north of the equator, restricted to temperate high mountain areas of China. The related tribe Bembidiini is widely distributed in both hemispheres.

Erwin (1985) considered the tribe Zolini to have an amphiantarctic distributional pattern, but the discovery of the subtribe Sinozolina by Deuve (1997) shows that the distributional pattern must be considered amphitropical. This type of distribution has been reported in a large number of taxa that bridges the temperate areas by the total absence of equatorial and tropical taxa, called amphitropical pattern I by Erwin (1985) and Newton (1985). Among Carabidae, this pattern of distribution is known for the tribes Notiokasini–Nebriini (Erwin 1979) and Cnemalobini–Zabrini (Roig-Juñent 1993). This pattern is also observed in the tribe Broscini (Roig-Juñent 2000), where basal genera, such as the genus *Rawlinsius* Davidson and Ball (1998) in Mexico, the genus *Axonya* Andrewes in India, and the genus *Broscodes* Bolivar y Pieltain in Turkey, occur in enviroments similar to those occupied by the subtribe Sinozolina in the northen hemisphere. Areas currently occupied by these taxa are allochtonous tectonics plates that belonged to Gondwana (Parrish 1990). The apical taxa of the tribe Broscini are restricted to austral areas of the southern hemisphere. The tribe Zolini has a distributional pattern similar to that of the tribe Broscini.

Chaltenia gen.nov.

Figs. 3, 8–26

Type species

Chaltenia patagonia **sp.nov.**

Etymology

Derived from the Araucanian name Chaltén for the Fitz Roy Mountain from Patagonia, Argentina, where some specimens were collected.

Description

The genus *Chaltenia* has identical tribal and subtribal features as that of the tribe Zolini and the subtribe Chalteniina, as well as the following external features. Antennae with antennomeres 1–2 glabrous, 3 pubescent on the apical half, 4–11 entirely pubescent; antennomeres 3–10 each with apical ring of fixed setae. **Labium:** submentum with two pairs of setae mentum bisetose and a pair of paramedian foveae, tooth bifid with a central carina (Fig. 9). Pronotum as long as wide, with two lateral setae, one medial and one posterior. **Elytron:** striae distinct and punctate on basal third; apical portion of stria 8 curved and separated from elytral margin (Fig. 16). **Legs:** slender, protrochanter with one seta; protarsomeres 1–2 of males expanded medioapically, with ventral adhesive vestiture; dorsal surface of male protarsomeres carinate at apex. Meso- and meta-tarsomeres 2–5 sulcate dorsally (Fig. 14). **Aedeagus.** Sternum IX thin, incomplete ring (Fig. 19). Median lobe thin, with basal orifice open dorsally. Left and right parameres (Figs. 20–21) setose apically. **Females.** Bursa copulatrix short; gonopod IX with gonostylus 2 with three ensiform setae externally.

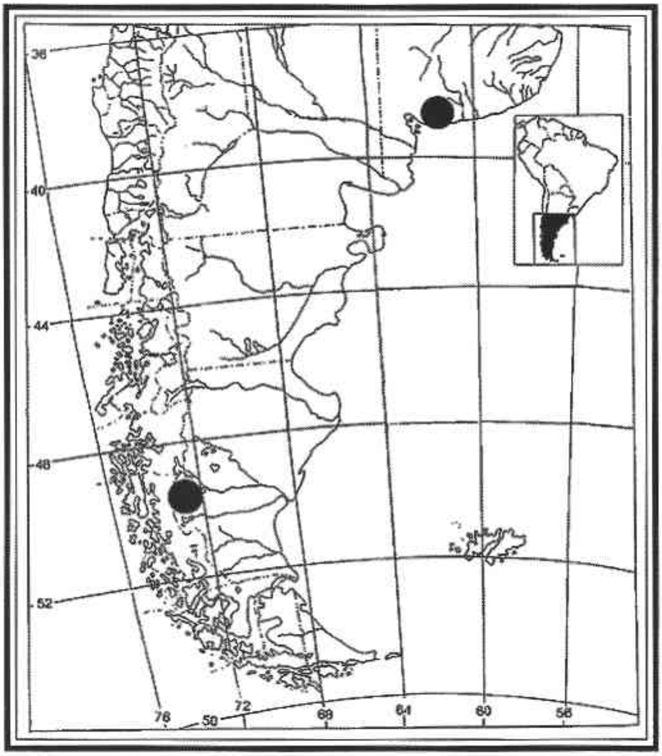


FIGURE 27. Distribution of *Chaltenia patagonica*.

Chaltenia patagonica sp.nov.

Type material

Holotype male: ARGENTINA. Santa Cruz, Valle Tunel, Dr. Witte collection (MLP). **Allotype female:** same data as holotype (MLP). **Paratype 1 female:** same data as holotype (MACN). **Paratypes 1 male, 1 female: ARGENTINA.** Buenos Aires, Bajo Hondo (IADIZA, MACN).

Etymology

The Latin adjectival form of Patagonia is the name of the southernmost region of South America, where this species occurs.

Diagnosis

Adults of this species are readily distinguished from other South American Trechitae by a combination of three supraorbital setae on each side of frons body flat, glossal sclerite quadrisetose, maxillary palpomere 3 plurisetose, and males with two rows of squamosetae on protarsomeres 1–2.

Description

The genus *Chaltenia* has identical tribal, subtribal, and generic features noted above, as well as the following features. Size large (for supertribe Trechitae), length

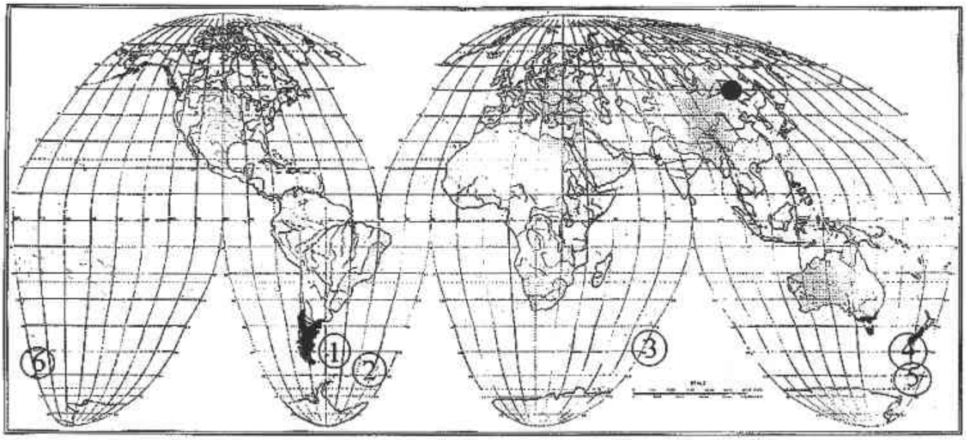


Figure 28. Distribution of the tribe Zolini is represented by dark areas and dots, and islands by numbers: 1, Malvinas (Falkland); 2, South Georgia; 3, Keguerlen; 4, Auckland and Snares; 5, Campbell; and 6, Antipodes.

7.5–9.0 mm. Color of body black; antennae, mouthparts, and legs black. **Head.** Frons with frontal impressions linear (Fig. 8), not curved, and not divergent posteriorly. Eyes rounded, prominent. **Mouthparts** (Fig. 9)**:** maxillary and labial palpomeres elongated, labial palpomere 2 trisetose; maxilla with eustipes trisetose laterally; labium with paraglossae glabrous, long. **Thorax.** Pronotum (Fig. 8) slightly convex, almost as long as broad, apical margin truncate, basal margin slightly sinuate; apex and base of same width; anterior angles rounded; sides convergent posteriorly; lateral margin with narrow bead, sinuate a short distance anteriad base; base with several transverse sulci, and a basolateral area depressed on each side; two marginal setigerous puncture on each side, one near the middle and one at base. Prosternum with anterior margin smooth and glabrous. **Elytra:** flat, oval, striate, with flat intervals; eight striae; interval 9 with 11 setae. **Legs:** slender, meso- and meta-tibiae long. Protarsomeres 3–4 with long setae ventrally (Fig. 13). **Abdomen.** Sterna IV–VI smooth, each with a pair of paramedian ambulatory setae apically; sternum VII with one pair of ambulatory setae in males and two pairs in females. **Male genitalia.** Median lobe with basal orifice open dorsally. Internal sac without sclerites, apex of median lobe bifid (Figs. 22–25); both parameres styliform and setigerous (Figs. 20–21). **Female genitalia** (Figs. 26). Ovipositor with gonopod IX short, goncoxite 2 without subapical setose organ. Bursa copulatrix without accessory gland.

Habitat

Chaltenia patagonica lives in the *Nothofagus* (Nothofagaceae) forest of Patagonia and Monte Desert in Buenos Aires Province.

Distribution (Fig. 27)

Currently, the records are from Argentina only. The only two localities where it was found are about 2000 km apart, from the south of the Buenos Aires Province to the Santa Cruz Province. This widely scattered distribution is not unusual in this tribe, as *Merizodus soledadinus* is distributed over areas that are much farther apart, namely South America, South Georgia Island, and Keguerlen Island (Fig. 28). What is unusual about this new species is that some of the collection sites are in environments where no other zolines occur. Species of the genus *Merizodus* are associated with sub-Antarctic forest or humid austral Patagonian habitats, whereas species of the genus *Chaltenia* are associated with dry environments in the septentrional part of its distribution.

Acknowledgments

We gratefully acknowledge George Ball and Esperanza Cerdeño for comments on a previous draft of this manuscript, two anonymous reviewers whose suggestions have improved the manuscript, and Nelly Horak for assistance with the English version. We also thank the curators named in the Materials and methods section for loan of the specimens required to develop a context adequate for the characterization of this new taxon. We also acknowledge the National Geographic Society (NSG-5776/96) and the Consejo Nacional de Investigaciones Científicas y Técnicas (PIP 4678) for financial assistance.

References

Baehr M. 1998. A preliminary survey of the classification of Psydrinae (Coleoptera: Carabidae). pp 359–68 *in* GE Ball, A Casale, A Vigna Taglianti (Eds), *Phylogeny and classification of Caraboidea (Coleoptera: Adephaga)*. Torino: Atti delle Museo Regionale di Scienze Naturali

Bell RT. 1967. Coxal cavities and the classification of the Adephaga (Coleoptera). *Annals of the Entomological Society of America* **60**: 101–7

Beutel RG. 1998. Trachypachidae and the phylogeny of Adephaga (Coleoptera). pp 81–106 *in* GE Ball, A Casale, A Vigna Taglianti (Eds), *Phylogeny and classification of Caraboidea (Coleoptera: Adephaga)*. Torino: Atti delle Museo Regionale di Scienze Naturali

Bils W. 1976. Das abdomenende weiblcher, terrestrich lebender Adephaga (Coleoptera) und seine Bedeutung für die Phylogenie. *Zoomorphologie* **84**: 113–93

Davidson RL, Ball GE. 1998. The tribe Broscini in Mexico: *Rawlinsius papillatus*, new genus and new species (Insecta: Coleoptera: Carabidae) with notes on natural history and evolution. *Annals of Carnegie Museum* **67**(4): 349–78

Deuve T. 1993. L'abdomen et les genitalia des femelles de coléoptères Adephaga. *Memoires du Museum National d'Histoire Naturelle* **155**: 1–184

Deuve T. 1997. *Sinozolus yuae* n.gen., n.sp., premier represéntant des Zolinae dans l'hemisphère Nord (Coleoptera, Trechidae). *Bulletin de la Societe Entomologique de France* **102**(1): 31–7

Erwin TL. 1978. The larva of neotropical *Enceladus gigas* Bonelli (Coleoptera: Carabidae: Siagoninae, Enceladini) with notes on the phylogeny and classification of some of the more primitive tribes of ground beetles. *Coleopterists Bulletin* **32**(2): 99–106

Erwin TL. 1979. Thoughts on the evolutionary history of ground beetles: hypotheses generated from comparative faunal analyses of lowland forest sites in temperate and tropical regions. pp 539–92 *in* TL Erwin, GE Ball, DR Whitehead, AL Halpern (Eds), *Carabid beetles, their evolution, natural history and classification*. The Hague: Dr. W. Junk Publishers

Erwin TL. 1985. The taxon pulse: a general pattern of lineage radiation and extinction among carabid beetles. pp 437–72 *in* GE Ball (Ed), *Taxonomy, phylogeny and zoogeography of beetles and ants*. Dordrecht, the Netherlands: Dr. W. Junk

Erwin TL, Sims LL. 1984. Carabid beetles of the West Indies (Insects: Coleoptera): a synopsis of the genera and checklist of Caraboidea, and of the West Indian species. *Quaestiones Entomologicae* **20**: 351–466

Goloboff PA. 1993. PIWE: parsimony and implied weights. [MS-DOS program and documentation available from the author at instlillo@infovia.com.ar or www.cladistics.com]

Gourlay ES. 1950. Auckland Island Coleoptera. *Transactions of the Royal Society of New Zealand* **78**: 171–202

Guérin-Méneville MFE. 1841. Descriptions de quelques Coléoptères nouveaux, provenant de la Tasmanie, des iles Vavao et Ternate, de Triton Bay, à la Nouvelle-Guinnée, et du port Famine, dans le détroit de Magellan. *Revue du Zoologie* **8**: 186–92

Hlavac TF. 1971. Differentiation of the carabid antenna cleaner. *Psyche* **78**: 51–66

Jeannel R. 1938. Les migadopides (Coleoptera, Adephaga), une lignee subantarctique. *Revue Francaise d'Entomologie* **5**(1): 1–55

Jeannel R. 1941. Coléoptères carabiques, première partie. *Faune de France* **39**: 1–571

Jeannel R. 1955. L'édèage. Initiation aux recherches sur la systematique des Coléoptères. *Publications du Museum National d'Histoire Naturelle, Paris* **16**: 1–155

Jeannel R. 1962. Les trechides de la Paleantarctide occidentale. pp 527–655 *in* CD Delamare-Deboutteville, E Rapoport (Eds), *Biologie de l'Amérique Australe*. Paris, France: Centre National de la Recherche Scièntifique, and Buenos Aires, Argentina: Consejo Nacional de Investigaciones Científicas y Técnicas

Johns PM. 1974. Arthropoda of the subantarctic islands of New Zealand (1). Coleoptera: Carabidae. Southern New Zealand, Patagonian, and Falkland Islands Insular Carabidae. *Journal of the Royal Society of New Zealand* **4**: 283–302

Kavanaugh DH. 1986. A systematic review of amphizoid beetles (Amphizoidae: Coleoptera) and their phylogenetic relationships to other Adephaga. *Proceedings of the California Academy of Science* **44**: 67–109

Liebherr JK, Will KW. 1998. Inferring phylogenetic relationships within Carabidae (Insecta, Coleoptera) from characters of the female reproductive tract. pp 107–70 *in* GE Ball, A Casale, A Vigna Taglianti (Eds), *Phylogeny and classification of Caraboidea (Coleoptera: Adephaga)*. Torino: Atti delle Museo Regionale di Scienze Naturali

Maddison DR, Baker MD, Ober KA 1998. A preliminary phylogenetic analysis of 18s ribosomal DNA of carabid beetles (Coleoptera). pp 229–50 *in* GE Ball, A Casale, A Vigna Taglianti (Eds), *Phylogeny and classification of Caraboidea (Coleoptera: Adephaga)*. Torino, Atti delle Museo Regionale di Scienze Naturali

Moore BP. 1963. Studies on Australian Carabidae (Coleoptera). 3. The Psydrinae. *Transactions of the Royal Entomological Society of London* **115**: 277–90

Newton AF. 1985. South temperate Staphylinoidea (Coleoptera): their potential for biogeographic analysis of austral disjunctions. pp 180–217 *in* GE Ball (Ed), *Taxonomy, phylogeny and zoogeography of beetles and ants*. Dordrecht, the Netherlands. Dr. W. Junk

Nichols SW. 1985. *Omophron* and the origin of Hydradephaga (Insecta: Coleoptera: Adephaga). *Proceedings of the Academy of Natural Sciences of Philadelphia* **137**: 182–201

Parrish JT. 1990. Gondwanan Paleogeography and Paleoclimatology. pp 15–26 *in* TN Taylos, EL Taylor (Eds), *Antarctic paleobiology. Its role in the reconstruction of Gondwana*. New York: Springer-Verlag Inc

Reichardt H. 1974. The South American Pogonini (Coleoptera, Carabidae). *Papeis Avulsos do Departamento de Zoologia (Sao Paulo)* **27**(21): 279–86

Reichardt H. 1977. A synopsis of the genera of neotropical Carabidae. *Quaestiones Entomologicae* **13**: 346–493

Roig-Juñent S. 1993. Cnemalobini, una tribu de Carabidae (Coleoptera) endémica de América del Sur. *Acta Entomologica Chilena* **18**: 7–18

Roig-Juñent S. 1998. Cladistic relationships of the tribe Broscini (Coleoptera: Carabidae). pp 343–58 *in* GE Ball, A Casale, A Vigna Taglianti (Eds), *Phylogeny and classification of Caraboidea (Coleoptera: Adephaga)*. Torino: Atti delle Museo Regionale di Scienze Naturali

Roig-Juñent S. 2000. The subtribes and genera of the tribe Broscini (Coleoptera: Carabidae): cladistic analysis, taxonomic treatment, and biogeographical considerations. *Bulletin of the American Museum of Natural History* **255**: 1–90

Serrano J. 1981. Male aschiasmatic meiosis in caraboidea (Col. Adephaga). *Genetica (Dordrecht)* **57**: 131–7

Sharp MB. 1886. On New Zealand Coleoptera, with descriptions of new genera and species. *Transactions of the Royal Society of Dublin (NS)* **3**: 351–453

Sloane TG. 1920. The Carabidae of Tasmania. *Proceedings of the Linnean Society of New South Wales* **45**(1): 113–78

Sloane TG. 1923. IX. The classification of the family Carabidae. *Transactions of the Entomological Society of London* 1923: 234–50

Stork NE. 1980. A scanning electron microscope study of tarsal adhesive setae in the Coleoptera. *Zoological Journal of the Linnean Society* **68**: 173–306

van Emdem FI. 1936. Bemerkungen zur klassification der Carabidae: Carabinae und Harpalinae Piliferae. *Entomologische Blaetter fuer Biologie und Systematik der Kaefer* **32**: 12–7, 41–52

(Received: 19 April 2000; accepted: 16 August 2001)

Appendices

(See pp 668–670)

Appendix 1.
Characters used in the tribal analysis

Character	State
(1) Supraorbital setae, **unordered** (fixed setae of Sloane 1923; Jeannel 1941)	**0**, two setae, one adjacent to the anterior margin of the eye and another adjacent to the posterior margin; **1**, one posterior seta; **2**, one anterior seta; **3**, three or more setae
(2) Frontal sulcus	**0**, absent; **1**, straight, at middle more distant from each other than from eyes, grooves not extended behind eyes; **2**, curved, at middle distance between eyes and adjacent groove subequal to distance between grooves, then expanded to genae and ventral side
(3) Mandibular scrobal seta (fixed setae of Sloane 1923; Jeannel 1941)	**0**, present; **1**, absent
(4) Mentum tooth, **unordered**	**0**, absent; **1**, distinct and simple; **2**, bifid apex
(5) No. of glossal sclerite setae, **unordered**	**0**, bisetose; **1**, tetrasetose; **2**, six or more setae
(6) Maxillary palpomere 3	**0**, asetose or with few setae (Fig. 7); **1**, polysetose (Figs. 3–6)
(7) Maxillary palpomere 4, **unordered**	**0**, fusiform; **1**, conical
(8) Maxillary palpomere 4	**0**, size normal, as long as the penultimate; **1**, much shorter and more slender than penultimate palpomere
(9) Antenna cleaner (Jeannel 1938, 1941; Hlavac 1971)	**0**, isochaetus and grade B of Hlavac (1971) (setal band with confluent zone short, anterior row of setae generally present and forming part of cleaning organ; median expansion present but usually not shifted anteriorly, antennal channel shallow, tibia not compressed anterioposteriorly); **1**, anisochaetus and grade B of Hlavac (1971); **2**, anisochaetus and grade C of Hlavac (1971) (setal band divided into a large distal region and a proximal cleaning arc, anterior row of setae absent; channel deep, short, median expansion well-developed anteriorly, tibia compressed anterioposteriorly).
(10) Adhesive setae of anterior tarsi (Stork 1980), **unordered**	**0**, (spongiose of Sloane 1923) articulosetae arranged in a more or less hexagonal pattern, with straight cylindrical shafts bearing regular round or oval plates; **1** and **2**, squamosetae in rows on long axis of tarsus, with shafts distinct dorsoventrally, flattened distally, and laterally extended into almost rectangular parallel plates; **1**, one row; **2**, two rows; **3**, absent
(11) Male protarsomeres 1 and 2	**0**, not dentate and dilated on inner side; **1**, dentate and dilated on inner side (Figs. 12–13)
(12) Meso- and meta-tarsomeres	**0**, not sulcate dorsally; **1**, sulcate dorsally (Fig. 14)
(13) Mesotibial oblique comb (Erwin 1978)	**0**, absent; **1**, present
(14) Mesotibial brush on the lateral surface (Erwin 1978)	**0**, absent; **1**, present
(15) Posterior procoxal closure (Nichols 1985; Bell 1967)	**0**, open; **1**, proepimeron is fitted into the lateral arm of the prosternal process

(16) Pleural contact with mesocoxa (Nichols 1985)	**0**, mesepimeron forming part of the mesocoxal cavity (disjunct condition of Sloane 1923; Jeannel 1941; Bell 1967); **1**, mesepimeron excluded from the mesocoxal cavity (conjunct condition of Sloane 1923; Jeannel 1941; Bell 1967)
(17) Pleural contact with metacoxa (Nichols 1985), **unordered**	**0**, metacoxa expanded laterally to the elytral epipleuron (incomplete of Bell 1967); **1**, metepimeron absent (conjunct condition of Bell 1967); **2**, metepimeron in contact with the metacoxa (disjunct of Bell 1967); **3**, metepimeron forms a shelf that overlaps abdominal sternum II (the first visible abdominal sternite) disjunct lobate, characteristic of Lobopleuri (Bell 1967). Kavanaugh (1986) suggested that the incomplete condition is plesiomorphic for Adephaga and that the other states evolved from it
(18) Connection between prothorax and mesothorax (Erwin 1985)	**0**, broad; **1**, pedunculate
(19) Base of pronotum	**0**, without carina; **1**, with one longitudinal carina on each side
(20) Elytral base	**0**, not or incompletely bordered; **1**, completely bordered
(21) Elytral plica	**0**, absent; **1**, present
(22) Recurrent striae	**0**, absent; **1**, present
(23) Parascutellar striole, **unordered**	**0**, complete and isolated from stria 1; **1**, short and joined to the apical portion of stria 1; **2**, absent
(24) Parascutellar seta (basal seta of the second stria)	**0**, present; **1**, absent
(25) Fixed setae as a series on elytral striae 3	**0**, absent; **1**, present
(26) Type of abdomen (Deuve 1993)	**0**, nebridian, the last apparent tergum is the unmodified VIII; **1**, harpalidian, the last apparent tergum is VIII, anterolateral apodemes present
(27) Attachement of pygidial glands (Deuve 1993)	**0**, anterolateral margin of abdominal tergum IX; **1**, near the abdominal tergum VIII
(28) Base of median lobe (Jeannel 1955; Erwin 1985)	**0**, base closed dorsally; **1**, base open dorsally
(29) Left paramere (Jeannel 1941, 1955; Erwin 1985), **unordered**	**0**, densely setose; **1**, with few setae; **2**, glabrous
(30) Shape of left paramere (Jeannel 1941, 1955; Erwin 1985)	**0**, styliform (similar in shape with the right); **1**, conchiferous (dissimilar in shape)
(31) Right paramere (Jeannel 1941, 1955; Erwin 1985), **unordered**	**0**, densely setose; **1**, with few setae; **2**, glabrous
(32) Internal sac, sclerite X (Roig-Juñent 1998, 2000)	**0**, absent; **1**, present
(33) Copulatory piece (Jeannel 1941, 1955)	**0**, absent; **1**, present
(34) Gonopod VIII (Deuve 1993) or ramus gonocoxae (Liebherr and Will 1998)	**0**, absent; **1**, present
(35) Subapical setose organ (Deuve 1993)	**0**, absent; **1**, present
(36) Stylomere 1 or gonopod IX (Deuve 1993)	**0**, monomerous; **1**, dimerous
(37) Accessory gland (Liebherr and Will 1998)	**0**, absent; **1**, present entering the bursa copulatrix separately from the spermatheca
(38) Appended spermathecal gland (Liebherr and Will 1998)	**0**, absent; **1**, present, entering onto spermathecal duct of spermatheca
(39) Spermathecal diverticulum (Liebherr and Will 1998)	**0**, absent; **1**, as a diverticulum arising from reservoir of spermatheca
(40) Helminthoid sclerite (Deuve 1993)	**0**, absent; **1**, present

Appendix 2.

List of tribes and subtribes in boldface type were included in the cladistic analysis

Family **Trachypachidae**: *Systolosoma brevis* Solier (**outgroup**)
Carabidae
  Subfamily Scaritinae
      Tribe **Migadopini:** *Migadops latus* Guérin-Méneville
  Subfamily Psydrinae
    Supertribe Psydritae
      Tribe **Psydrini:** *Nomius pygmaeus* Dejean
      Tropopterini: *Tropopterus montagnii* Solier and *Tropopterus giuraudyi* Solier
      Mecyclothoracini*
      Meonidini*
      Melisoderini*
      Ambytelini*
      Patrobini: from Jeannel (1941)
    Supertribe Trechitae
      Tribe **Trechini:**
        Subtribe **Homaloderina:** *Aemalodera centromaculata* Solier
        Trechina: *Trechisibus antarcticus* Dejean
        Aepina: *Kenodactylus audouini* (Guérin-Méneville)
      Tribe **Zolini:**
        Subtribe **Merizodina:** *Merizodus angustiocollis* Solier
        Zolina: from Gourlay (1950) and Jeannel (1962)
        Sinozolina: from Deuve (1997)
        Chalteniina: *Chaltenia patagonica*
      Tribe **Bembidiini**
        Subtribe **Bembidiina:** ***Notaphus* (*Austronotaphus*) *convergens* (Berg) and *Peryphus* (*Chilioperyphus*) *chilensis***
        Tachyina: *Pericompsus* sp.
        Xystosomina: *Gouleta cayennensis* (Dejean)
      Tribe **Pogonini:** *Ochtozetus bicolor* (Brullé), *Diplochaetus rutilus* (Chevrolat) from Reichardt (1974), *Pogonus* spp. from Jeannel (1941)
  Subfamily Broscinae
    Supertribe Melaenitae
      Tribe **Melaenini:** *Melaenus piger* Fabricius
      Cymbionotini: from Deuve (1993)
    Supertribe Apotomitae
      Tribe **Apotomini:** *Apotomus hirsutulus* Bates
    Supertribe Broscitae
      Tribe **Broscini:**
        Subtribe Axoniina: *Axonya championi* Andrewes
        Broscina: *Broscus cephalotes* (Latreille)
        Nothobroscina: *Nothobroscus chilensis* Roig-Juñent and Ball
  Subfamily Harpalinae
      Tribe **Harpalini:** *Neoaulaucoryssus speciosus* (Dejean)
      Platynini
        Subtribe **Platynina:** *Incagonum lineatupunctatum* (Dejean)
        Sphodrina: *Pristonychus complanatus* Dejean

NOTE: Species cited were directly analysed, and data from the remaining tribes were take from the references. Tribes are arranged in subfamilies and supertribes, according to Erwin and Sims (1984).

* From Moore (1963); Deuve (1993); Baehr (1998); Liebherr and Wils (1998).