

Description of *Zabius gaucho* (Scorpiones, Buthidae), a new species from southern Brazil, with an update about the generic diagnosis

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Abstract. This paper provides the description of a new species in the genus *Zabius* Thorell (Scorpiones, Buthidae), *Z. gaucho* n. sp., from four localities in the State of Rio Grande do Sul, Brazil. It differs from *Zabius fuscus* (Thorell 1877) and *Z. birabeni* Mello-Leitão 1938 in details of the telson shape, the longitudinal carinae on mesosomal tergites II–VI, and the number of pectinal teeth. The genus was hitherto known only from Argentina, *Z. fuscus* being a frequent inhabitant of the central Sierras; *Z. birabeni*, in turn, is probably a rare and non-orophilous scorpion, collected in scattered localities on the monte/chaco ecotone and in northern Patagonia. The presence of a species of *Zabius* in southern Brazil lends additional support to the generalized distributional track known as “peripampasic track,” which zoogeographically links the central Sierras Pampeanas with ancient mountains in the southern province of Buenos Aires, southeastern Uruguay and southern Brazil.

Keywords: Scorpions, Neotropics, Argentina, taxonomy, new records

Resumo. Neste trabalho descrevemos uma espécie nova do gênero *Zabius* Thorell (Scorpiones, Buthidae), *Z. gaucho* n. sp., procedente de quatro localidades do Rio Grande do Sul, Brasil. Distingue-se de *Zabius fuscus* (Thorell 1877) e *Z. birabeni* Mello-Leitão 1938 por detalhes da morfologia do telson, das cristas longitudinais dos tergitos do mesossoma, e pelo número de dentes pectíneos. O gênero era conhecido até o momento só para a Argentina, sendo *Z. fuscus* um escorpião muito freqüente na região serrana central; *Z. birabeni*, no entanto, é aparentemente uma espécie não orófila e rara, coletada em localidades dispersas no ecótono monte/chaco (oeste do país) e no norte da Patagonia. A presença de uma espécie de *Zabius* no sul do Brasil representa um apoio adicional ao padrão generalizado de distribuição denominado de “track peripampásico”, que vincula zoogeograficamente as Sierras Pampeanas com sistemas orográficos antigos do sul da Província de Buenos Aires, do sudeste do Uruguai e do sul do Brasil.

The small buthid genus *Zabius* Thorell 1894 is restricted to Argentina and previously included only two nominal species: *Z. fuscus* (Thorell 1877) and *Z. birabeni* Mello-Leitão 1938. The former species is a very common scorpion occurring in orographic systems in central Argentina, while the latter seems to be a rare species, reported from scattered rockless localities in western and northern Patagonia (Abalos 1953; Maury 1979; Acosta 1989, 1993, 1996; Acosta & Rosso de Ferradás 1996; Mattoni & Acosta 1997; Acosta & Maury 1998; Ojanguren Affilastro 2005). Therefore, the discovery of several specimens of a hitherto undescribed species of *Zabius* in the State of Rio Grande do Sul, Brazil, represents a remarkable novelty. This new species is described below as *Zabius gaucho* n. sp. In this paper we also provide new records for *Z. fuscus* and *Z. birabeni* and discuss some doubtful reports of the former. Abbreviated synonymies are given to include a few references overlooked by or published after Fet & Lowe (2000). Since the generic diagnosis of *Zabius* available in the literature is brief (e.g., Mello-Leitão 1945; Abalos 1953), we provide a more complete version, both so as to cover the character states peculiar to *Z. gaucho* n. sp. and to include several characters introduced by recent taxonomists. *Zabius* is the southernmost

buthid genus occurring in South America and also worldwide. The Neotropical region contains relatively few genera of that family, although one of them, *Tityus* C.L. Koch 1836, is the most speciose in the order (Fet & Lowe 2000). The presence of a member of *Zabius* in the state of Rio Grande do Sul has interesting biogeographic implications since it adds further evidence supporting the extension of the generalized distributional track known as the “peripampasic track” (Acosta 1989, 1993) into southern Brazil as briefly discussed below.

METHODS

Descriptions and line drawings were made using a Leica MS5 stereomicroscope equipped with drawing tube. Measurements were taken with a graduated ocular and followed guidelines of Stahnke (1970). Photographs were made using a Canon 400D XTi with a 100 mm Macro-Canon lens. Descriptive terms and abbreviations are as follows: carapacial carinae (Stahnke 1970): AM, anterior median; CM, central median; PM, posterior median; CL, central lateral. Carapacial furrows: based on Stahnke (1970), not abbreviated. Mesosomal carinae (adapted from Vachon 1952): Md, median; SM, submedian; SL, sublateral. Carinae of metasomal segments (Francke 1977). Segments I–

IV: DL, dorsal lateral; LSM, lateral supramedian; LIM, lateral inframedian; VL, ventral lateral; VSM, ventral submedian. Segment V: DL, dorsal lateral; LM, lateral median; VL, ventral lateral; VSM, ventral submedian; VM, ventral median. Chelal carinae (Soleglad & Sissom 2001; partially also Vachon 1952): D1, digital; D3, dorsal secondary; D4, dorsal marginal; D5, dorsal internal; I, internomedian; V3, ventrointernal; V1, ventroexternal; E, external secondary; VA, ventral accessory. Carinae on pedipalp femur and patella are given topological terms, to replace the use of "internal" and "external" (actually, structures inside or outside the tegument); correspondences with Stahnke's (1970) nomenclature in brackets: prodorsal (instead of dorso-interior), retrodorsal (dorso-exterior), pro-ventral (ventro-interior), retroventral (ventro-exterior), dorsal median (dorso-median), ventral median (ventro-median), retro-lateral median (exterior-median), prolateral median (not mentioned in Stahnke 1970).

Acronyms of repositories.—CDA: Cátedra de Diversidad Animal I, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Córdoba, Argentina; IBSP: Instituto Butantan, São Paulo, Brazil; LEA: Collection of Luis E. Acosta, Córdoba, Argentina; MACN: Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina; MCN: Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil; MNRJ: Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; ZMH: Zoologisches Museum, Hamburg, Germany.

Additional material examined.—*Tityus argentinus*: ARGENTINA: *Jujuy*: Parque Nacional Calilegua, Toma de Agua (1340 m), 23°41'S, 64°52'W, 25 February 1997 (L. Acosta), 1 ♂ (LEA). *Tityus bahiensis*: BRAZIL: *Mato Grosso do Sul*: Brasilândia, Fazenda Barma, 21°15'S, 52°03'W, 20 February 1993 (A.F. Beck, J.O. Silva), 1 ♂, 1 ♀ (LEA). *Tityus confluens*: ARGENTINA: *Córdoba*: Chancaní, 31°22'S, 65°29'W, 19 December 1987 (L. Acosta, F. Pereyra), 4 ♀ (CDA 000.506). *Tityus fasciolatus*: BRAZIL: *Distrito Federal*: Brasília, 15°48'S, 47°55'W, April 1992 (M. Knox Brito), 1 ♂, 1 ♀ (LEA). *Tityus serrulatus*: BRAZIL: *Distrito Federal*: Brasília, 15°48'S, 47°55'W, April 1992 (M. Knox Brito), 1 ♀ (LEA). *Tityus trivittatus*: ARGENTINA: *Santa Fe*: Santa Fe, 31°38'S, 60°42'W, January 1985 (C. Espíndola), 1 ♀ (CDA 000.533). *Tityus uruguayensis*: URUGUAY: *Canelones*: 1 ♂, Solymar Norte, 34°49'S, 55°56'W, 18 February 1999, C.A. Toscano-Gadea (LEA). *Centruroides sculpturatus*: USA: *Arizona*: 5 specimens, Alamo Dam State Park, Yuma Co., 34°14'N 113°35'W, 1 May 1970, M.A. Cazier (LEA). *Rhopalurus agamemnon*: BRAZIL: *Goiás*: 3 specimens, Campinaçu, Serra da Mesa, ca. 13°51'S, 48°33'W, 18 February–2 March 1996, Silvestre, Brandão, Yamamoto (LEA). *Rhopalurus rochae*: BRAZIL: *Bahia*: 2 specimens, Caatinga do Moura, 10°59'S, 40°45'W, 24–29 January 1980, P.E. Vanzolini (LEA).

SYSTEMATICS

Family Buthidae C.L. Koch 1837

Genus *Zabius* Thorell 1894

Zabius Thorell 1894:279.

Type species.—*Isometrus fuscus* Thorell 1877 by original designation.

Diagnosis.—Small to medium-sized scorpions (up to 65 mm). General color yellowish to dark ferruginous, tegumentary carinae usually darker. Anterior margin of carapace with a notch; ocular mound slightly displaced anteromedially. Most carapacial carinae not easily recognizable, normally obscured by the irregular granulation: AM and CM feeble or absent, PM fairly or well developed between the slight transverse posterior furrow and the posterior border. Sternum narrowed elongated pentagonal, Type 1 (nomenclature after Soleglad & Fet 2003): apex reduced and slightly depressed, bordered posteriorly by well defined lobes (resembling the anterior part of the lateral lobes of Type 2 and giving the sternum the appearance of being anteriorly bifid); posterior depression very deep, not surrounded by lobes. Mesosomal tergites I–VI with three distinct longitudinal carinae (one MD, two SM), tergite VII with five carinae. Sternite V with two SM and two SL carinae. Metasoma slender. Metasomal segments I–III bearing ten longitudinal carinae (LIM complete in segment I, but much weaker or almost vanishing in segments II and III); segment IV with eight carinae (LIM lacking); segment V with five carinae (complete), plus VSM carinae limited to the proximal half. Telson without subaculear apophysis; a blunt small protuberance is present instead; vesicle globose (*Z. fuscus*, *Z. birabeni*) or more elongated (*Z. gaucho* n. sp.), aculeus relatively short. Pedipalp chela dilated, with a lobe at the base of the movable finger, corresponding to a notch in the fixed finger (both dilatation and lobation more accentuated in males). Nine chelal carinae (Figs. 10–12, 14), eight being complete, plus a short basal VA between E and V1, separating trichobothria *Eb*₁ and *Eb*₂ (Abalos 1953: 350 named this shortened VA the "dorsal accessory"); angle D3:D4:D5 $\cong$ 90°. Chelal carinae are conspicuous and well defined, except for V3, the granulation (or crenulation) of which is present only in the basal third, the rest being a smooth tegumentary border. Denticular margin of the movable finger with 9–12 oblique rows, with outer and inner accessory denticles, but without supernumerary denticles. Trichobothriotaxy: subtractive neo-bothriotaxy, type A, group α (Vachon 1974, 1975); femur with 10 trichobothria (*d*₂ missing), patella with 13 (*d*₂ very small and difficult to see), chela with 15. Pectines with fulcra. Legs without tibial spur; prolateral basitarsal spur on legs III and IV bifid.

Comments on chelal carination.—The number and nomenclature of carinae on the chela received some attention in the literature. Vachon (1952) recognized a maximum of seven chelal carinae, while Stockwell (1989) proposed a pattern of eight basic carinae. More recently Prendini (2000), followed by Soleglad & Sissom (2001), identified a derived pattern of 10 carinae in most non-buthids, whereas buthids (represented as out-group in their analyses only by the genus *Centruroides* Marx 1890) were characterized as having an eight-carinate condition, presumably basal for the order. There are many genera of Buthidae without or with very obsolete chelal carinae, so that a homology assessment is difficult. Others (e.g., *Zabius* and examples mentioned below) have, in contrast, well developed carinae suggesting that a 9-carinae pattern might be the basic condition for this family. In their character state statement Prendini (2000) and Soleglad & Sissom (2001) overlooked an "accessory" carina (VA), feeble in some *Centruroides* but well developed in several other buthids. In *Zabius*, carination is strong, and nine carinae can clearly be identified (Figs. 10–12, 14) as described by Abalos (1953) and

Ojanguren Affilastro (2005). Assuming that D2 (subdigital) and V2 (ventral median) are lacking, and using D1 (digital) and V1 (ventral external) as "landmarks" an additional short though well defined carina (VA, ventral accessory: Vachon 1952) is observed between V1 and E. Trichobothrium Eb_3 is placed in the intercarinal sector D1–E, Eb_2 between E and VA, and Eb_1 between VA and V1. The same condition (short, well defined VA, and the described arrangement of *Eb* trichobothria) was verified in *Tityus argentinus* Borelli 1899, *T. bahiensis* (Perty 1833), *T. confluentis* Borelli 1899, *T. fasciolatus* Pessôa 1935, *T. serrulatus* Lutz & Mello 1922, *T. trivittatus* Kraepelin 1898 and *T. uruguayensis* Borelli 1901 (L. Acosta pers. obs.). A rapid survey of the literature revealed a similar arrangement in at least 20 additional species of *Tityus* as well as in members of *Alayotityus* Armas 1973, *Tityopsis* Armas 1974, and *Microtityus* Kjellesvig-Waering 1966 (Armas 1984; Lourenço & Vachon 1996). The development of VA appears to be somewhat variable in *Centruroides*: in *C. margaritatus* (Gervais 1841), *C. exsul* (Meise 1934), and *C. testaceus* (DeGeer 1778) it is short and granular, while in *C. gracilis* (Latreille 1804) it is obsolete (Sissom & Francke 1983; Sissom & Lourenço 1987, designated as "external secondary" therein). In *Centruroides exilicauda* (Wood 1863), the position of VA is occupied by a V-shaped rugulose sculpturation, not well defined, which leaves Eb_1 and Eb_2 to each side. VA is rudimentary (as an irregular row of small granules) in *Rhopalurus rochae* Borelli 1910 and *R. agamemnon* C.L. Koch 1839 (L. Acosta pers. obs.).

In Old World buthids, when present, VA appears to have a full extension. In two *Hottentotta* species illustrated in Lamoral (1979, figs. 45 and 66, *sub Buthotus*), a diagonal VA carina runs between Eb_2 and Eb_3 , extending along the entire palm to the articular condyle. In a generalized drawing, Vachon (1952:62, fig. 69) shows a complete VA, too. In ventral view (figs. 46 and 67 of Lamoral 1979), a longitudinal carina is observed from the same condyle up to the palm base in the position typical to V1. Further Old World buthids with a complete VA include, e.g., *Butheolus thalassinus* Simon 1882 (smooth to finely granular), *Compsobuthus acutecarinatus* (Simon 1882) (faint, smooth ridge), *C. brevipalpus* (Werner 1936) (faint, granular ridge), and *Androctonus bicolor* Ehrenberg 1828 (strong, smooth) (Sissom 1994; M. Soleglad, *in litt.*), whilst the illustration of *Compsobuthus vachoni* Sissom 1994 suggests a short VA (Sissom 1994:19). Although examples are not intended to give an exhaustive revision, it seems clear that the full VA carina of Old World representatives and the shortened version in *Zabius*, *Tityus*, *Centruroides*, *Tityopsis*, and *Alayotityus* likely represent two states of the same feature. If homologies, as currently assessed, are correct (especially concerning the identification of V1), VA might prove to be unique for buthids, not found elsewhere in the order.

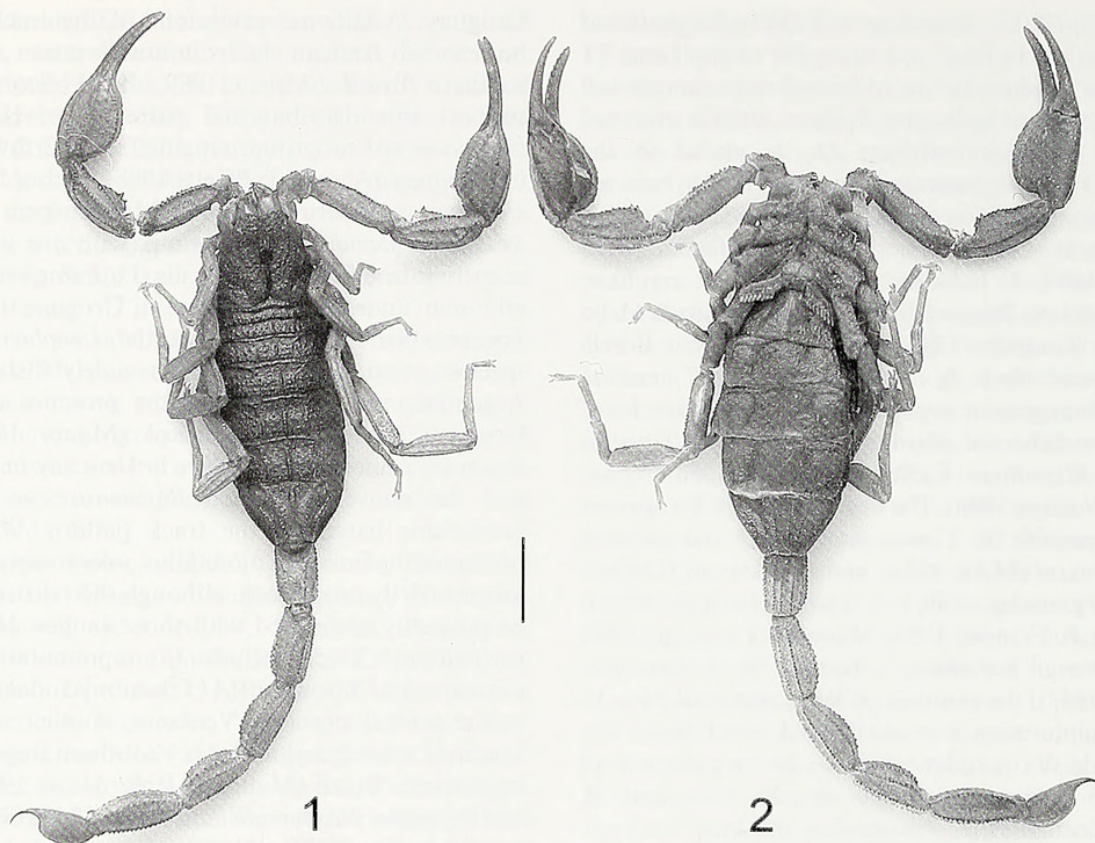
Included species.—*Zabius fuscus*, *Zabius birabeni*, and *Zabius gauchus* new species.

Distribution.—South America: Central Argentina to northern Patagonia; southern Brazil (Fig. 15); Paraguay? The presence of a *Zabius* species in southern Brazil adds evidence to the so called "peripampasic track" (Acosta 1989, 1993). This generalized track was identified through the approximate congruence of the distributions of several scorpion and opilionid taxa, primarily connecting the Pampean Sierras in central Argentina (provinces of Córdoba and San Luis), with low systems in the province of Buenos Aires (Tandilia and Ventania), and in southeastern

Uruguay. Additional extensions of the track were suggested both to sub Andean chains in northwestern Argentina, and to southern Brazil (Acosta 1989, 1993). Scorpion taxa which support this distributional pattern are: (1) the *Bothriurus prospicuus* species group, ranging from northwestern Argentina to Uruguay (Acosta & Peretti 1998), with a hitherto unnamed species in southern Brazil (C. Mattoni pers. comm.), (2) the *Bothriurus flavidus* species group, with one widespread species occurring in Córdoba, San Luis, La Pampa and Buenos Aires, and one undescribed species in Uruguay (L. Acosta & C. Toscano-Gadea unpubl.), (3) the *Urophonius brachycentrus* species group, with one species widely distributed in central Argentina, and a second in the province of Buenos Aires, Uruguay, and southern Brazil (Maury 1977). The recent discovery of new species either in Uruguay or Brazil (*Z. gauchus* and the above mentioned *Bothriurus*) was indeed at least predictable based on the track pattern. While the track is presumed to link old mountains, most scorpions in it are no longer strictly orophilous, although their distributions appear to be primarily associated with those ranges. Harvestmen of the peripampasic track include: (a) representatives of the genus *Ceratomontia* Roewer 1914 (Triaenonychidae), with one species in the central sierras + Ventania, another one in Tandilia + Ventania + Uruguayan ranges + southern Brazil, and a third one in southern Brazil (Maury & Roig Alsina 1985; Maury 2000), and (b) genus *Neopucroliella* Roewer 1931 (Gonyleptidae), with several species in the central sierras and one in Ventania (this is the only taxon not yet recorded in Uruguay or Brazil; Acosta 1990).

KEY TO THE SPECIES OF *ZABIUS*

1. Mesosomal tergites II–VI: SM carinae extended posteriorly in a noticeable projection (at least with the length equivalent to three granules; Fig. 13); anterior margin of carapace with a moderate notch (Figs. 3, 4); pectines with 7–10 teeth (female, male unknown); pectinal basal plate subrectangular (Fig. 7); telson only slightly globose, somewhat elongated; subaculear tuberosity weakly developed (Fig. 5). *Z. gauchus*
Mesosomal tergites II–VI: SM carinae not extended posteriorly in a projection, but end at the tergite margin or with at most a single granule prominent; front border of carapace with an accentuated notch (Fig. 8); pectines with 11–15 teeth (male and female); pectinal basal plate divided in two lobes by a noticeable notch on the anterior border (Fig. 9); telson markedly globose, subaculear tuberosity small but evident 2
2. Total length up to 65 mm. General color dark ferruginous to light hazel. Stigmata elliptical; metasomal segment V: VL carinae uniformly granular, ranging from a row of small granules to small blunt tubercles, none of which is noticeably larger than the rest; denticular margin of the movable finger of the pedipalp chela with 12 oblique granular rows *Z. fuscus*
Total length up to 45 mm; general color straw yellow; stigmata rounded; metasomal segment V: VL carinae with 2 or 3 large, tall tubercles or small apophyses in the middle, which are clearly distinct from the remaining granules in the row; denticular margin of the movable finger of the pedipalp chela with 9 or 10 oblique granular rows *Z. birabeni*



Figures 1, 2.—*Zabius gaucho* new species, female paratype (Riozinho, IBSP). 1, Dorsal aspect. 2, Ventral aspect. Scale line: 5 mm.

Zabius gaucho new species

Figs. 1–7, 10–13

Type material.—BRAZIL: *Rio Grande do Sul*: holotype female, Taquara, Morro do Itacolomi (29°38'S, 50°46'W), 16 July 1992, L. Frug (MCN 553). Paratypes: BRAZIL: *Rio Grande do Sul*: 1 female, Nova Petrópolis (29°21'S, 51°08'W), 4 August 1993, E.E. Ely (MCN 580); 1 female, Riozinho (29°38'S, 50°27'W), 21 January 2002, A.D. Brescovit (CDA 000.254); 1 female, same locality, 17 December 2001, I. Bernard (IBSP 3464); 1 female, "Taguara del Mondo nuovo" [actually Taquara], Mus. Straßburg, c. 1893 (c. = exchanged), det. "*Tityus* (*Phaëus*) [*Zabius*] *fuscus*" [stricken out and corrected on the label] (ZMH).

Other material examined.—BRAZIL: *Rio Grande do Sul*: 1 ♀, Tenente Portela (27°22'S, 53°46'W), 17 December 2002, M. Dorneles (MCN 720, damaged).

Etymology.—The species name is derived from the Portuguese adjective "gaúcho," treated here as indeclinable; it is popularly applied to the inhabitants of the Brazilian state of Rio Grande do Sul, where the new species was collected.

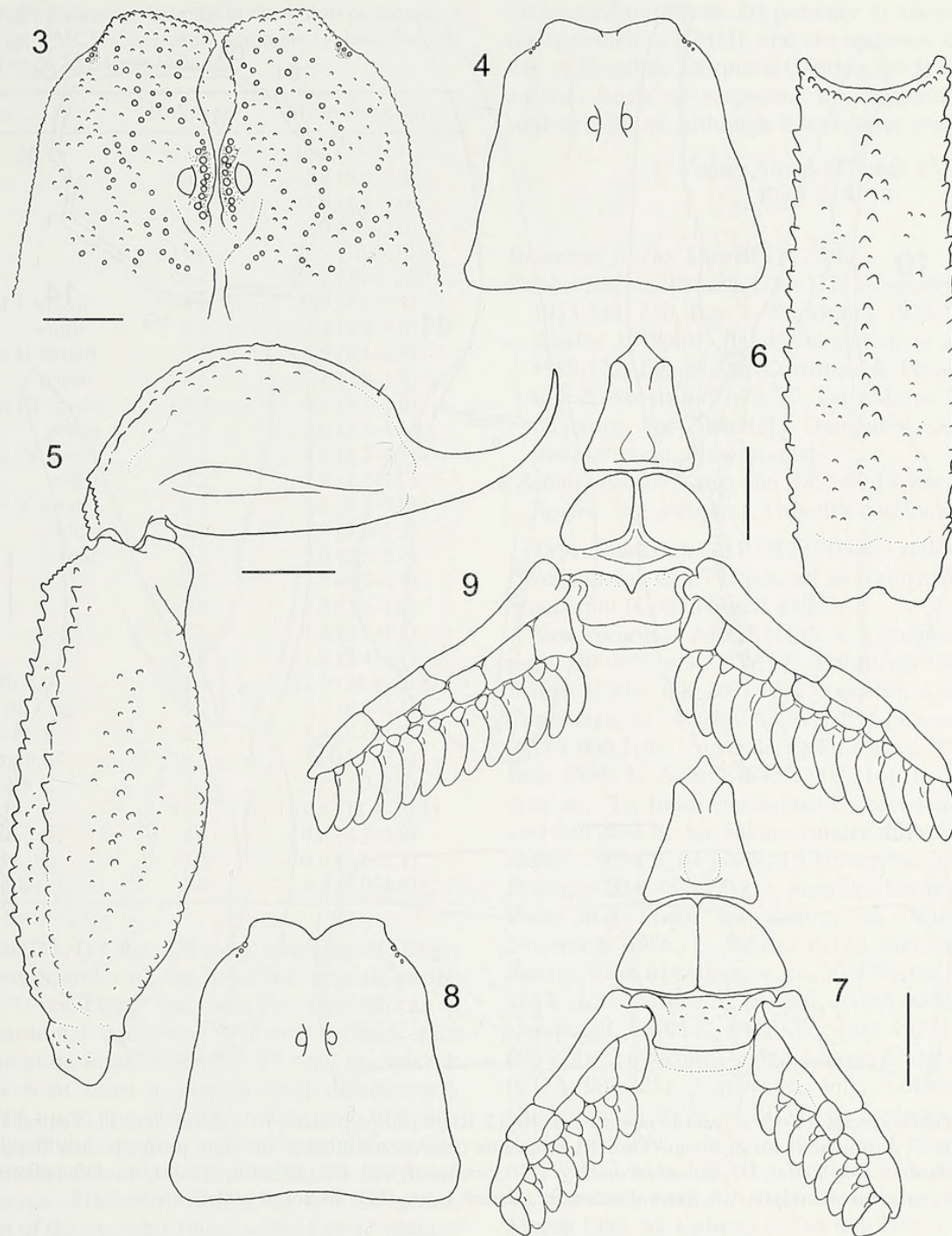
Diagnosis.—Mesosomal tergites II–VI with SM carinae extended in a short but conspicuous posterior projection. Anterior margin of carapace with a moderate notch. Pectines with 7–10 teeth; basal plate subrectangular. Telson only slightly globose, somewhat elongated; subaculear tuberosity little developed. Because of their similar size and coloration (hazel to dark ferruginous), the overall appearance of *Z. gaucho* n. sp. resembles that of *Z. fuscus* (*Z. birabeni* is readily separated because of its small size, its lighter coloration, and the distinctive small apophyses on VL carinae of metasomal segment V). A careful examination reveals, however, that *Z.*

fuscus shares more diagnostic characters with *Z. birabeni* than with *Z. gaucho* n. sp. In both *Z. fuscus* and *Z. birabeni* the carinae of mesosomal tergites do not show marked projections and the telson is more markedly globular (cf. Ojanguren Affilastro 2005). They also have higher pectinal teeth counts, and the pectinal basal plate has a distinctive anterior notch as if composed of two halves fused medially (Fig. 9). Specimens of *Z. gaucho* n. sp. show a faint and irregular reticulate pigment, especially on the mesosomal tergites, which is not present in the congeners. Granules of some carinae or granular areas (e.g., medial border of pedipalp femur; DL carinae all along the metasoma) are taller and more acute in *Z. gaucho* n. sp. Carapace carinae are poorly defined in all three species, even least defined in the new species.

Description.—Male unknown. Females: total body length 41.7–55.3 mm. Detailed measurements of holotype, together with summary values of the available sample (mean, maximum, minimum): Table 1.

Color: General color reddish hazel, with granules and pedipalp fingers darker; legs and ventral side (coxae, sternal region, pectines, sternites I–III) lighter, sternites IV and V gradually darkening to the general coloration; chelicerae yellowish, with reticulate pigment dorsally on the cheliceral hand behind the fingers. Carapace and especially mesosomal tergites with very faint reticulate pigmentation.

Morphology: Carapace anterior margin with a V-shaped but not accentuated median notch, bordered by a granular row. Surface of carapace covered by coarse granulation. Median anterior and median central furrows shallow, the former wider; median posterior and postmarginal furrows forming a deep triangular depression. Lateral posterior furrow deep, the

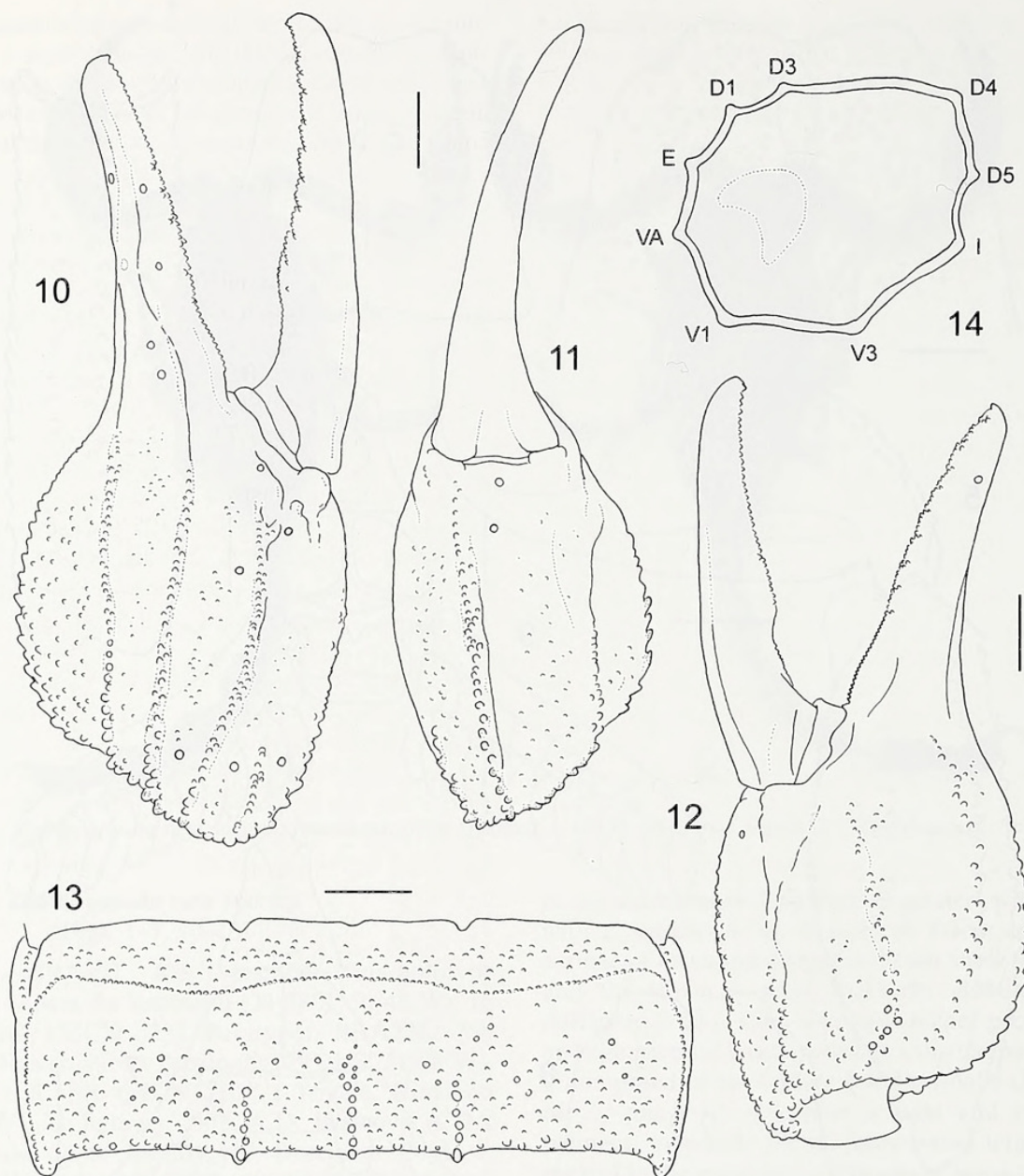


Figures 3–9.—*ZabiUS* species. 3–7. *Z. gauchus* new species. 3. Carapace, front half. 4. Outline of carapace. 5. Telson and metasomal segment V, lateral view. 6. Metasomal segment V, ventral view. 7. Sternum, genital operculi, pectinal plate and pectines. 8, 9. *Z. fuscus* (Thorell). 8. Outline of carapace. 9. Sternum, genital operculi, pectinal plate and pectines. Scales: 1 mm (Figs. 4 and 8 not at scale).

remaining ones just insinuated by a slight depression and/or lack of granulation. Most carapacial carinae unrecognizable, much less defined than in congeners, AM and CM almost absent; short superciliary crest as a row of pearl-like, dark conspicuous granules, leaving a well defined interocular groove in between; CL represented by an oblique row of small granules (most granulation on the area is oriented a similar way); PM fairly defined along the longitudinal tegumentary ridge each side of the posterior marginal furrow, up to the posterior transverse furrow. Posterior margin with a row of granules; posterior end of PM terminates with a pointed

granule on the carapace margin, aligned with the SM carinae of tergites (see below).

Mesosomal tergites: finely granular on the pretergites and the anterior half of tergites, the posterior half with coarse granulation, as on carapace. Tergites I–VI with three aligned longitudinal carinae (one MD, two SM). MD very short on tergite I, becoming more developed posteriorly (on tergite II it is extended up to one third of the tergal plate, III and IV up to the half, and almost complete on V and VI); in all cases ending in a blunt granule. SM carinae shorter than MD; they are feeble on tergite I, but on tergites II–VI ending in an acute granule of



Figures 10–14.—*Zabius* species. 10–13. *Z. gaucho* new species. 10–12. Right pedipalp chela: 10. Lateral view, 11. Ventral view, 12. Mesal view. 13. Mesosomal tergite V, dorsal view. 14. *Z. fuscus* (Thorell), schematic transverse section of the right pedipalp chela (basal third), showing all nine carinae. Abbreviations: D1, digital, D3, dorsal secondary, D4, dorsal marginal, D5, dorsal internal, I, internomedian, V3, ventrointernal, V1, ventroexternal, E, external secondary, VA, ventral accessory. Scales: 1 mm (Fig. 14 not at scale).

increasing size, almost resembling a tiny apophysis over the tergite's edge. Tergite VII with SL and SM carinae complete, Md restricted to a very short, basal portion. Sternites I and II almost smooth, from sternite III onwards, coarsely granular on the lateral border, and SL carinae insinuated; these are more defined on sternite IV; sternite V granular, SM and SL carinae almost complete (they do not reach the anterior border). Stigmata oval. Number of pectinal teeth ($n = 11$): 7 teeth (2 pectines), 8 (8), 10 (1); holotype with 10-[damaged].

Metasoma. Segments I–IV: VSM, VL, LSM, and DL carinae complete, the latter with large and acute granules (especially posteriorly); LIM complete on segment I, it is very weak on segments II and III, and is absent on segment IV. Segment V: VM and VL complete, VSM less conspicuous and restricted to the basal half; LM is represented by few unordered granules, while DL are complete but little evident, formed by blunt

granules. Telson slightly globose, with almost no trace of subaculear tubercle; ventral surface rugulose. Pedipalps. Medial surface of trochanters coarsely granular, granules are especially tall and acute proventrally. Pro- and retrodorsal and proventral carinae of femur complete, regularly granular; prolateral median carina of tall conical, unequal granules or small apophyses; retrolateral median carina homogeneously crenulate, ending in an acute conical apophysis near the base; retroventral carina not defined, replaced by a flattened area with subtle granulation. Patella with pro- and retrodorsal, and retroventral carinae regularly granular; proventral carina crenulate, ending in a large conic protuberance (absent on the basal third of the segment, where a smooth concavity exists); dorsal median and retrolateral median carinae feeble, ventral median very weak; prolateral surface smooth, except for a large conical protuberance, aligned with the proventral

Table 1.—Detailed measurements (mm) of the holotype female of *Zabius gauchus* n. sp. (MCN 553), and summary values for the available sample ($n = 5$; ZMH not included).

Character	Holotype	Mean (max–min)
Body length	55.3	46.5 (55.3–41.7)
Carapace length	6.6	5.7 (6.6–5.3)
anterior width	3.1	3.6 (4.1–3.0)
posterior width	6.3	6.0 (6.5–5.6)
Mesosoma length	16.6	12.5 (16.6–10.4)
Metasoma length	26.4	23.2 (26.4–20.2)
Metasomal segment I length	4.5	3.7 (4.5–3.1)
width	2.8	2.4 (2.8–2.0)
Metasomal segment II length	5.1	4.5 (5.1–3.8)
width	2.5	2.1 (2.5–1.8)
Metasomal segment III length	5.3	4.6 (5.3–4.0)
width	2.3	2.0 (2.3–1.6)
Metasomal segment IV length	5.2	4.8 (5.2–4.3)
width	2.2	1.9 (2.2–1.7)
Metasomal segment V length	6.3	5.5 (6.3–5.0)
width	2.0	1.8 (2.0–1.7)
height	2.3	2.0 (2.3–1.8)
Telson length	5.7	5.1 (5.7–4.7)
width	2.1	1.8 (2.1–1.6)
height	2.1	1.9 (2.1–1.8)
Aculeus length	2.4	1.9 (2.4–1.7)
Pedipalp total length	24.4	22.1 (24.4–20.8)
Pedipalp femur length	6.3	5.7 (6.3–5.1)
width	2.1	1.8 (2.1–1.5)
Pedipalp patella length	6.7	5.9 (6.7–5.5)
width	2.3	2.2 (2.3–2.1)
Pedipalp chela length	11.4	10.6 (11.4–10.1)
width	4.3	4.0 (4.3–3.0)
height	3.5	3.0 (3.6–2.1)
Movable finger length	7.0	6.5 (7.0–6.2)

one. Chelal carinae D1, D3, and D4 long, attaining the finger dorsum, with blunt granules on the hand but smooth on the finger; D5 and I crenulate, the area in between as a conspicuous longitudinal concavity; V1 well defined, with conspicuous granulation in all its length; V3 only granular at its base, the rest is at most a smooth weak tegumentary border; E extended up to the vicinity of the small *Esb*, it is crenulated basally, the rest with normal granulation; VA carina between E and V1 crenulated, limited to the basal fourth of the manus. Trichobothriotaxy as for the genus. Denticular margin of the movable finger with 11 or 12 oblique slightly imbricate rows of granules, the most basal continued longitudinally along the edge, 11 or 12 inner and outer accessory denticles, without supernumerary granules.

Distribution.—This species has only been recorded from the state of Rio Grande do Sul, Brazil. Nothing is known about the natural history of this species. The two specimens from Riozinho were collected in urban areas, despite the fact that this city is the third best protected Atlantic Forest area, with 90% of the native forest preserved (SOS Mata Atlântica, 2004). Both specimens were collected in the same place, a peripheral district divided into several plots that has been inhabited for more than 10 years. The first specimen (CDA 000.254) was found inside a house, the second one (MCN 705) in the backyard between the house and the margin of a narrow stream in a grassy area with brick piles, stones, and wood. It is surprising that such a large and conspicuous species remained

undetected until now. Its presence in ancient collections (e.g., the specimen of ZMH), and the inclusion of *Zabius* in an old key of Brazilian scorpions (Ihering 1915) suggests that earlier authors knew or suspected the existence of this genus in southern Brazil, although it was never explicitly stated.

Zabius fuscus (Thorell 1877)

Figs. 8, 9, 14

Isometrus fuscus Thorell 1877:140.

Zabius fuscus: Thorell 1893:372; Ringuelet 1953:280; Abalos 1953:349, 350, figs. 1–22; Maury 1973:353, 363; Bucher & Abalos 1979:401, fig. 45; Gualdoni *et al.* 1986:87; Acosta 1989:122, figs 88–90; Corronca & Peralta 1995:121; Mattoni & Acosta 1997:72, 77; Fet & Lowe 2000:279 [complete reference list therein]; Ojanguren Affilastro 2005:103 [redescription, illustrations].

[*Zabius*] *fuscus*: Kraepelin 1895:8, 18 [mentioned as "*Tityus fuscus*" but accepting Thorell's combination].

Type material.—ARGENTINA: holotype, "Cordova", "Weijenbergh ded." deposited in Naturhistoriska Riksmuseet Stockholm (Coll. Thorell 43/22).

New records.—ARGENTINA: *Córdoba*: 1 ♀, Cerro Colorado, 30°06'S, 63°56'W, 21 February 1987, L. Acosta, A. Peretti (CDA 000.208); 2 ♂, between Cerro Colorado and Caminiaga, ca. 30°04'S, 63°59'W, 21 February 1987, L. Acosta (CDA 000.216); 1 juvenile, Deán Funes, 30°29'S, 64°16'W, 24 June 1986, L. Acosta (CDA 000.214); 1 ♀ with young on the dorsum, "La Industrial Salinera", between Lucio V. Mansilla and San José de las Salinas (under railway sleeper, border of saline), 29°54'S, 64°40'W, 19 November 1998, C. Mattoni, A. Peretti (CDA 000.221); 1 juvenile, between Cañada de Río Pinto and Todos los Santos, ca. 30°47'S, 64°17'W, 22 November 1986, L. Acosta (CDA 000.206); 2 ♂, Todos los Santos, 6 km to Ongamira, ca. 30°47'S, 64°23'W, 26 December 1987, L. Acosta, A. Peretti (CDA 000.209); 3 juveniles, Candonga, 31°05'S, 64°20'W, July 1957, E. Gibson (CDA 000.224); 2 juveniles, same collection data except July 1958 (CDA 000.225); 1 juvenile, Villa Colanchanga, Dique La Quebrada, 31°09'S, 64°21'W, 15 September 1985, L. Acosta (CDA 000.204); 1 ♂, 1 ♀, 2 juveniles, Cerro Uritorco, 30°51'S, 64°29'W, 2 May 1987, L. Acosta (CDA 000.218); 3 juveniles, La Cumbre, road to Cuchi-Corral, ca. 30°59'S, 64°34'W, March 1986, M. Cabrera (CDA 000.210); 1 ♂, Tiu Mayo, 2 km to La Cumbre, 30°58'S, 64°26'W, 3 May 1987, L. Acosta (CDA 000.220); 1 ♂, 1 juvenile, Vaquerías, 31°07'S, 64°27'W, 29 December 1985, L. Acosta (CDA 000.211); 1 juvenile, Cerro Pan de Azúcar, 31°14'S, 64°25'W, 15 April 1990, L. Acosta, A. Peretti (CDA 000.212); 1 juvenile, Villa San José, Mallín, 31°18'S, 64°34'W, 23 August 1986, L. Acosta, R. Pizzi (CDA 000.219); 1 ♂, 2 juveniles, Tanti, Cerro Blanco, 31°21'S, 64°36'W, July 1968, R. Martori (CDA 000.230); 2 juveniles, Villa del Lago, 31°24'S, 64°30'W, 10 May 1981, L. Acosta (CDA 000.229); 1 juvenile, San Antonio de Arredondo (in a house, upstairs), 31°29'S, 64°32'W, 27 January 1988, H. Getar (CDA 000.228); 1 ♀, Cuesta Blanca, 31°29'S, 64°35'W, January 1989, C. Boné (CDA 000.233); 1 ♀, El Diquecito, 31°22'S, 64°23'W, October 1970, Brigado, Puentes (CDA 000.226); 1 ♂, Villa Diquecito ("Las Bateas"), 31°21'S, 64°21'W, 24 October 1980, L. Acosta (CDA 000.202); 1 ♀, Córdoba (center of the

city), 31°24'S, 64°11'W, 28 November 2000, N. Fernandez (CDA 000.244); 1 juvenile, San Clemente, 31°43'S, 64°38'W, 23 September 1986, L. Acosta (CDA 000.222); 2 ♀, Atos Pampa, 31°59'S, 64°42'W, 16 December 1967, no collector (CDA 000.223); 1 ♀, between Atos Pampa and Yacanto de Calamuchita, ca. 32°01'S, 64°42'W, 26–27 December 1987, P. Boero de Cabrera (CDA 000.203); 1 juvenile, Las Albahacas, 32°54'S, 64°50'W, 15 November 1981, M. Gualdoni (CDA 000.231); 1 ♂, 1 ♀, 3 km N of Achiras, 33°10'S, 65°00'W, 1 March 2000, L. Acosta, A. Peretti (CDA 000.026); 1 ♂, 1 juvenile, Quebrada de la Mermela, Chancaní, 31°24'S, 65°25'W, 20 December 1987, L. Acosta, F. Pereyra (CDA 000.236); 2 juveniles, Niña Paula (near Mina Clavero), 31°45'S, 64°56'W, 11 March 1981, M. Gualdoni (CDA 000.207). *San Luis*: 1 ♀, 2 juveniles, Sauce de los Chorrillos (5 km E San Luis), 33°17'S, 66°15'W, 15 July 1970, R.D. Sage (CDA 000.197); 1 ♂, 1 juvenile, 5 km road from San Francisco del Monte de Oro to Carolina, 32°40'S, 66°08'W, 12 March 1994, L. Acosta, C. Mattoni (CDA 000.199); 3 juveniles, Suyuque Nuevo, 33°08'S, 66°15'W, 14 March 1994, L. Acosta (CDA 000.200). *La Rioja*: 1 ♂, 1 juvenile, Santa Lucía, near Chamental (620–660 m), 30°29'S, 66°20'W, 6 December 1994, L. Acosta, C. Mattoni (CDA 000.085).

Distribution.—*Zabius fuscus* appears to be an almost strictly orophilous scorpion (Acosta 1989; Acosta & Rosso de Ferradás 1996) the range of which coincides with the Pampean Sierras of San Luis, Córdoba, La Rioja, Catamarca and Santiago del Estero in central Argentina (Fig. 15; Maury 1979; Acosta & Maury 1998; Ojanguren Affilastro 2005). The type locality is “Córdoba” and most likely refers to the city. Despite the statement of Teruel (2003: 147) about the “sporadic presence” of *Z. fuscus* in collections, this species is very common, and good series are available in Argentinean institutions. Many localities from Córdoba and San Luis were cited by Mello-Leitão (1934), Abalos (1953), and Ojanguren Affilastro (2005). Mattoni & Acosta (1997) added some localities in the insular sierras of the province of La Rioja (Loma Larga, between Malanzán and Loma Larga, La Calera, Olta, Dique de Olta, Quebrada del Padre), which might represent a disjunct area for the species. Specimens of *Z. fuscus* are readily caught under mid-sized or large stones. In summer, collecting with UV light suggests that many individuals hide in deep crevices of the rock walls and in “pircas” (a kind of fence made with piled stones), though not in high densities. Females are normally seen at the opening of their retreats, with only the pedipalp fingers outside, presumably to detect the presence of prey; males are more active, and more frequently are found clinging or walking on the wall. *Zabius fuscus* is commonly collected together with *Bothriurus cordubensis* Acosta 1995 and, like this species, its range excludes the higher montane belt of the Sierras Grandes (above 1800–1900 m). Aside from several findings of *Z. fuscus* in houses in small villages in the sierras, where they are thought to enter accidentally, some specimens were sporadically collected in the highly urbanized city of Córdoba (see record above), most probably because of being transported together with wood or rocks. One female with young on the dorsum was caught in an unexpected site, on the very border of the extensive saline area called “Salinas Grandes” (A. Peretti & C. Mattoni, pers. comm.). The specimen was close to an almost abandoned old salt factory under a railway sleeper

lying on a salty surface. This finding is remarkable since the site consists of a plain with only small halophilous shrubs, is surrounded by Chaco vegetation, and lies around 40 km from the nearest rocky area. Without providing details, Kraepelin (1899) recorded *Z. fuscus* from Paraguay, which was considered rather unlikely by Maury (1984) and Lourenço (1994). Kraepelin's (1899) material is stored in ZMH (“*Fityus* (~~*Phafus*~~) [*Zabius*] *fuscus* (Thor.), Burmeister d. 1890, Paraguay” [genus name stricken out and corrected on the label], examined). Since the specimen consists of a badly preserved juvenile and comes from a very old collection, doubts remain about the accuracy of the identification and the locality, so we agree that a further confirmation is needed. The species was also cited from the province of Jujuy (northern Argentina) by Mello-Leitão (1934) — a specimen collected by Salvador Mazza but no longer kept in any repository; Maury (1979) did not include this doubtful locality in his map. References of *Z. fuscus* from the province of Tucumán (Abalos 1953) were accepted by Maury (1979) and Corronca & Peralta (1995) but deemed to need confirmation by Mattoni & Acosta (1997) and Ojanguren Affilastro (2005). According to Teruel (2003), a specimen of *Zabius* was collected in Tucumán though the species identity remains an open question. Be this record assigned to *Z. fuscus* or not, the genus seems not as frequent in Tucumán as in other parts of its range.

Zabius birabeni Mello-Leitão 1938

Zabius birabeni Mello-Leitão 1938:84, fig. 1; Abalos 1953:353, figs. 23–27 (in part?); Fet & Lowe 2000:279 [complete reference list therein]; Ojanguren Affilastro 2005:105 [redescription, illustrations].

Type material.—ARGENTINA: *Rio Negro*: holotype male, Valcheta (40°41'S, 66°09'W), M. Birabén (Museo de La Plata 18060). According to Mello-Leitão (1938) a paratype from “Gaviotas, province of La Pampa” should exist at MNRJ, but it is not included on the type list provided by Kury & Nogueira (1999) and is probably lost.

New record.—ARGENTINA: *La Rioja*: 1 juvenile, Bajo Hondo (31°41'S, 66°00'W), 13 November 1982, E. Maury (MACN).

Distribution.—Recorded from the Argentinean provinces of Río Negro, La Pampa, Buenos Aires, Entre Ríos, La Rioja, San Juan, San Luis and Córdoba (Abalos 1953; Maury 1973; Acosta 1996; Ojanguren Affilastro 2005). With the exception of a few references from the sierras in southern province of Buenos Aires (Abalos 1953; Maury 1973; Ojanguren Affilastro 2005), whose accuracy may in some cases need revision (Acosta 1996), *Z. birabeni* is characteristic of rockless areas (Fig. 15). Although the records are somewhat scattered, most localities embrace an ample arc that roughly corresponds to an ecotonal area between Monte and Chaco+Espinal (Acosta 1996). In contrast to this wide range, the species appears to be quite rare (Acosta 1996; Ojanguren Affilastro 2005). The locality “50 km Sierra Grande”, province of Río Negro (Ojanguren Affilastro 2005), represents the southernmost record for the entire family Buthidae.

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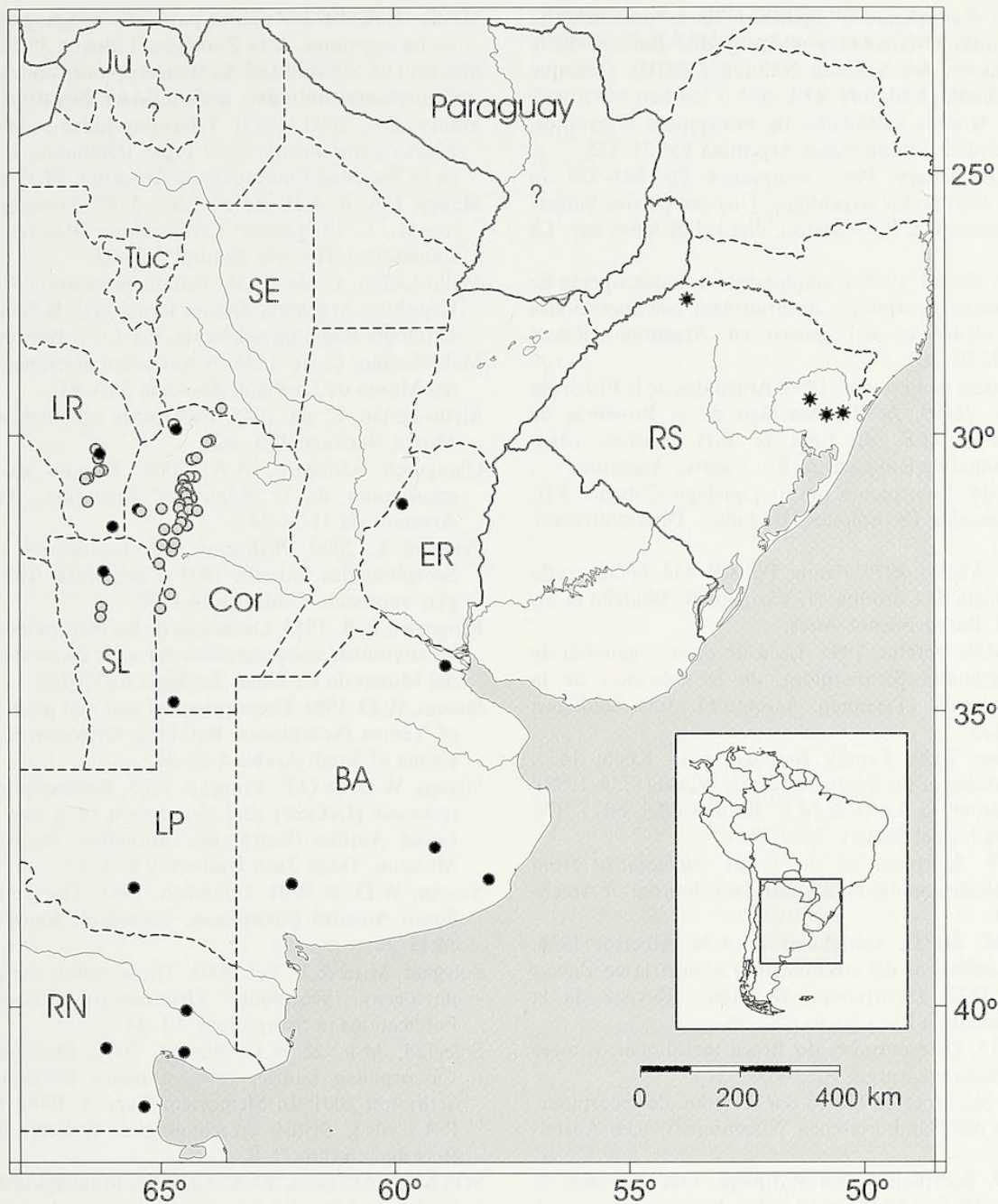


Figure 15.—Studied localities of *Zabius gauchus* new species (black stars), *Z. fuscus* (light circles), and *Z. birabeni* (black circles). Solid thick lines: country boundaries; thin lines: rivers; dashed lines: province or state boundaries. Abbreviations: Ju: province of Jujuy, Tuc: province of Tucumán, SE: province of Santiago del Estero, LR: province of La Rioja, ER: province of Entre Ríos, Cor: province of Córdoba, SL: province of San Luis, LP: province of La Pampa, BA: province of Buenos Aires, RN: province of Río Negro, RS: state of Rio Grande do Sul. Inset: location of the represented area.

examine several specimens from their collections. The senior author also thanks Camilo Mattoni and Alfredo Peretti for providing information on the capture site of *Zabius fuscus* in the Salinas Grandes area, and Michael Soleglad for fruitful discussion on the nomenclature of chelal carinae. The latter, Victor Fet, and two referees (Lorenzo Prendini, Erich Volschenk) made many useful suggestions to improve the manuscript. The collaborative work was facilitated through a travel grant to LEA (*Programa de Centros Asociados de Pós-graduação Brasil / Argentina, CAPES / SPU - Universidade Estadual de Campinas / Universidad Nacional de Córdoba*). Additional support was provided by Projeto Biota/Fapesp (# 99/05446-8 to ADB and DMC) and CNPq to ADB (grant #

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