

Revalidation of *Parasadocus* Mello-Leitão, 1927 (Opiliones: Gonyleptidae), with its transference from Pachylinae to Roeweriinae

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Abstract. A study was conducted to reevaluate the phylogenetic position of *Discocyrtus catharinensis* (Mello-Leitão, 1923) in the family Gonyleptidae Sundevall, 1833. Based on a maximum parsimony cladistic analysis of 22 terminal taxa and 92 morphologic characters (1766 scorings), (1) the genus *Parasadocus* Mello-Leitão, 1927 is restored from the synonym list of *Discocyrtus* Holmberg, 1878, and transferred from Pachylinae Sørensen, 1884 to Roeweriinae Carvalho & Kury, 2018, and (2) the specific combination *Parasadocus catharinensis* (Mello-Leitão, 1923) is also restored. *P. catharinensis* comb. rest. is here redescribed, and its geographical record of “Itatiaia” is contested. Finally, a lectotype is proposed here to solve questions about the type series of “*Lycomedicus brasiliensis* Soares & Soares 1949” (junior synonym of *P. catharinensis* comb. rest.).

Keywords: Arthropoda, Arachnida, Laniatores, Atlantic forest
<https://doi.org/10.1636/JoA-S-22-029>

Gonyleptidae Sundevall, 1833 is the most diverse family of harvestmen, presenting 708 valid species (Kury et al. 2023). Currently, more than 40% of that diversity is concentrated in the subfamily Pachylinae Sørensen, 1884 (Kury et al. 2023), a taxon that is consistently not recovered as a clade in the recent literature (e.g., Pinto-da-Rocha et al. 2014; Hara 2016; Benavides et al. 2021; Carvalho et al. 2021; Pessoa-Silva et al. 2021). After several revisions of Pachylinae genera, it is not unusual to find species names with a taxonomic history linked to more than two or three generic entities (e.g., Bragagnolo & Pinto-da-Rocha 2009; Hara & Pinto-da-Rocha 2010; Carvalho et al. 2018; 2021).

In the context of systematic instability within Pachylinae, a case that deserves attention is that of *Discocyrtus catharinensis* (Mello-Leitão, 1923), whose main events were: (1) initially described in *Sadocus* Sørensen, 1886 (Mello-Leitão 1923); (2) transferred shortly after to *Parasadocus* Mello-Leitão, 1927 (Mello-Leitão 1927); (3) after sixty years, was transferred to *Discocyrtus* Holmberg, 1878 (Soares & Soares 1987). Moreover, due to the chaotic interpretation of the armature on the male’s dorsal scutum and free tergites, *D. catharinensis* was linked to more specific entities (nowadays in its synonymy list) which were described in *Gonyleptes* Kirby, 1819 and *Lycomedicus* Soares & Soares, 1949 (Mello-Leitão 1932; Soares & Soares 1949b). This chaotic scenario of multiple descriptions and transferences directly reflects the form of systematization applied in the last century, as summarized in Soares & Soares (1987). The predominance of the use of quick-assessment meristic characters (as the state of division of the dorsal scutum areas III/area IV and the number of tubercles on areas I–IV or free tergites I–III) was highly susceptible to a significant level of subjectivity and caused the neglect of many other diagnostic characters. Nowadays, the presence of *D. catharinensis* in *Discocyrtus* is justified only by the short and ambiguous diagnosis of the genus (Soares & Soares 1954: 245), which turned it into the most diverse genus of Pachylinae until a few years ago (Kury 2003; Kury et al. 2023).

Nevertheless, after the proposal of (1) *Discocyrtus sensu stricto* [clade formed by *Discocyrtus testudineus* (Holmberg,

1876) (type species of *Discocyrtus*) and other four or five species] (Carvalho & Kury 2018, 2020, 2022), (2) DRMN-group [composed by *Discocyrtus sensu stricto*, Roeweriinae Carvalho & Kury, 2018, Mitobatinae Simon, 1879 and Neopachylinae Carvalho & Kury, 2020] (Carvalho & Kury 2018, 2020) and (3) the taxonomical review of *Sadocus* (Pessoa-Silva et al. 2021), the placement of *D. catharinensis* in *Discocyrtus* and/or Pachylinae was directly questioned. As exposed by Pessoa-Silva et al. (2021), the male genitalia of *D. catharinensis* shows almost all the diagnostic characters of Roeweriinae—contrasting with the conservative patterns of *Discocyrtus sensu stricto* and Pachylinae *sensu stricto* [circumscribed to *Pachylus* Sørensen, 1884 (type genus of the subfamily) and other three genera] (Pinto-da-Rocha et al. 2014).

To answer these questions, we tested herein the position of *D. catharinensis* inside Gonyleptidae by a cladistic analysis. After that, *D. catharinensis* is here transferred to *Parasadocus* gen. rest. and *Parasadocus* gen. rest. is transferred from Pachylinae to Roeweriinae. *P. catharinensis* comb. rest. is also redescribed using modern standards, including the first scanning electron microscopy (SEM) images of its male genitalia. Finally, the type material of “*L. brasiliensis*” (subjective junior synonym of *P. catharinensis* comb. rest.) is herein revised, and a lectotype is proposed.

METHODS

Descriptive section.—The bibliographic survey was conducted through Opiliones taxonomical catalogs (Mello-Leitão 1932; Soares & Soares 1954; Kury 2003; Kury et al. 2023). The majority of the papers were obtained in the website “OmniPaper Project” (Kury 2003+), organized and made available by the Laboratório de Aracnologia (Museu Nacional, Universidade Federal do Rio de Janeiro).

The methods used herein to (re)describe *P. catharinensis* comb. rest. follow Carvalho & Kury (2020).

The diagnosis given here is comparative among *Parasadocus* gen. rest. and: (1) the other genera nowadays placed in Roeweriinae Carvalho & Kury, 2018 (*Amazochroma* Carvalho & Kury, 2018; *Bunopachylus* Roewer, 1943; *Discocyrtanus* Roewer, 1929; *Khazaddum* Carvalho, Kury & Hara, 2020 and *Roeweria* Mello-Leitão, 1923); (2) *Discocyrtus* Holmberg, 1878, where *P. catharinensis* comb. rest. was allocated since Soares & Soares (1987); and (3) *Sadocus* Sørensen, 1886, a former genus with which the target species was combined when originally described.

Biogeographic units used here are from Morrone's regionalization of the Neotropics ("provinces"; Morrone 2014).

Photographs were taken with a Leica MZ16A stereomicroscope coupled to a Leica DFC 500 digital camera. SEM was carried out with a JEOL JSM-6390LV at the Center for Scanning Electron Microscopy of Museu Nacional/UFRJ. All measurements are in millimeters (mm).

Abbreviations of the repositories cited here are: CGPC (Private Collection Mr. Carlos Nicolau Goffejer, presently in MZSP), MNRJ (Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil—Curator: A. Kury), MNRJ-HS (Private Collection Helia Soares, presently in MNRJ) and MZSP (Museu de Zoologia, Universidade de São Paulo, São Paulo, São Paulo, Brazil—Curator: R. Pinto-da-Rocha). All the specimens of MNRJ and MNRJ-HS examined here were lost in the unforgettable fire of Museu Nacional (Kury et al. 2018).

Abbreviations used to external body parts are: AL = abdominal scutum length, AS = abdominal scutum, AW = abdominal scutum maximum width, Ch = chelicera, Cl = claw, CL = carapace length, CW = carapace maximum width, Cx = coxa, DS = dorsal scutum, Fe = femur, Mt = metatarsus, Pa = patella, Pp = pedipalpus, Ta = tarsus, Ti = tibia, Tr = trochanter. Abbreviations for the male genitalia are: VP = ventral plate, MS = macrosetae, macrosetae A1–A4 = basal macrosetae of VP, B = ventro-basal macrosetae of VP, C1–C4 = distal macrosetae of VP, D = dorso-lateral subdistal small setae of VP, E1–E2 = ventro-distal macrosetae of VP.

Choice of terminals.—The primary target of the analysis is to estimate the phylogenetic position of *Discocyrtus catharinensis* in Gonyleptidae. To recover that information, we combined the taxon and character proposals of two previous analyses (Carvalho et al. 2021, Pessoa-Silva et al. 2021) to have more comprehensive data for Pachylinae and Roeweriinae. Here, we can divide those taxa into six groups: (1) *Ampycus telifer* (Butler, 1873): a member of Ampycidae Kury, 2003, a taxon closely related to Gonyleptidae (Pinto-da-Rocha et al. 2014; Benavides et al. 2021), used as the root of the analysis; (2) nine species in five genera that are currently in Pachylinae, including *Pachylus chilensis* (Gray, 1833) (type species of the subfamily type genus) and three species of *Sadocus* Sørensen, 1886 (the genus in which *P. catharinensis* was originally described); (3) eight species of four Roeweriinae genera, including representatives of *Roeweria* Mello-Leitão, 1923 (type species of the subfamily); (4) five species of three genera included in the DRMN-group (excluding Roeweriinae), which include *Discocyrtus testudineus* (Holmberg, 1876), type-species of *Discocyrtus* Holmberg, 1878; (5) *Gonyleptes horridus* Kirby, 1819, a member of the paradigmatic group K92 (Kury 1992); and (6) *Goniosoma varium* Perty, 1833, indicated as the sister group of DRMN-group in the previous literature (Carvalho & Kury 2018,

Carvalho & Kury 2020, Carvalho & Kury 2024, Carvalho et al. 2021).

Maximum parsimony (MP) analysis.—The characters and character states proposals were tabulated in a matrix using Mesquite 3.61 (build 917) (Maddison & Maddison 2019). The list of characters is provided in Table 1, which observes the following pattern: (1) one asterisk (*) for characters originally proposed in Pessoa-Silva et al. 2021, (2) two asterisks (**) for characters formerly proposed in Carvalho et al. 2021, and (3) three asterisks (***) for characters that are presented in both previous works. The matrix of characters states and terminals (22 taxa; 92 characters; 1766 scorings; 258 missing data) is in Table 2. TNT (Goloboff & Catalano 2016) was used to search the trees, whose memory space was made available to store up to 99999 of them, and 100 replicates with 10000 trees each were carried out. The protocol established by Mendes (2011) was applied to evaluate the stability of results under different concavity values ($k = 1, 2, 3, 4, 5, 6, 10, 15, 20$); the results were summarized on space plots in Fig. 1. Absolute symmetric frequencies (SFq; Goloboff et al. 2003) was used to estimate clades' stability by TNT (10000 replicates, cut = 50, change probability = 33). Absolute Bremer support (Bremer 1994) was also used to evaluate the data substantiation in TNT. The character distribution was studied with WINCLADA (Nixon 2002, online at: <http://www.cladistics.com>), using ACCTRAN optimization (Fig. 2).

RESULTS

Results of the phylogenetic analysis.—TNT provided a single tree for all k -values tested here (larger groups are summarized in Fig. 1; characters are mapped in Fig. 2). The most frequent topology was obtained using k -values = 3, 4, 5, 6, 10, 15 and 20 (consistency index = 52; retention index = 69; 271 steps long), which is the chosen tree for our discussion. SFq and Bremer's values are shown in Fig. 1.

As the primary result, *Discocyrtus catharinensis* (blue clade, Fig. 1) is retrieved inside Roeweriinae (yellow clade, Fig. 1), without any direct relation with *Discocyrtus sensu stricto* (magenta clade, Fig. 1) or Pachylinae *sensu stricto* (green clade, Fig. 1). The position of *D. catharinensis* recovered here does not allow its insertion in a valid genus of Roeweriinae without forming a paraphyletic taxon (Fig. 1). Based on that, the genus *Parasadocus* is herein restored from the synonymy list of *Discocyrtus* to include only *Parasadocus catharinensis* comb. rest. *Parasadocus* gen. rest. shows two non-homoplastic synapomorphies — "Ventral process of the glans with half of the stylus diameter [15 (0)]" and "DS area II with a transversal row of conspicuous tubercles on the medial extension, presenting the central portion ducted to the anterior portion [50 (4)]" — and nine other homoplastic synapomorphies (Fig. 2B). *P. catharinensis* comb. rest. is recovered here as the sister group of the Roeweriinae's original core (*Roeweria* + (*Discocyrtanus* + *Amazochroma*)), without relevant SFq support (= 53) and an average Bremer support (= 3).

The DRMN-group is not recovered here since *Goniosoma* is retrieved as the sister group of Mitobatinae (Fig. 1). That point might be an indirect result of the primary focus of this cladistic analysis, which neglected some characters of groups without direct relation to the *P. catharinensis* comb. rest. taxonomical history (mainly *Discocyrtus sensu stricto* and Pachylinae *sensu stricto*).

Table 1.—Character descriptions and states used in the present analysis. One asterisk (*) indicates characters originally proposed in Pessoa-Silva et al. 2021, two asterisks (**) indicate characters proposed in Carvalho et al. 2021, and three asterisks (***) indicate characters that are presented in both previous works.

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- 1) **Penis, podium, relative position to the ventral plate***** ($L = 1, CI = 100, RI = 100$): 0. reaching longitudinally half or more of the ventral plate height; 1. reaching a third of the ventral plate height longitudinally
 - 2) **Penis, glans, dorsal prominence in the distal region of the sac*** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 3) **Penis, glans, pedestal**** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 4) **Penis, glans, pedestal, shape**** ($L = 4, CI = 100, RI = 100$): 0. cylindrical, apical diameter less than the basal; 1. cylindrical, slightly curved to the dorsal portion; 2. a monticule; 3. trapezium, apical part less than the basal; 4. a square on a trapezium, with prominent dorsal base
 - 5) **Penis, glans, pedestal, insertion angle of the stylus on the pedestal**** ($L = 2, CI = 100, RI = 100$): 0. 90 degrees for dorsal portion; 1. more than 90 degrees for dorsal portion; 2. 45 degrees for dorsal portion
 - 6) **Penis, glans, stylus, stem, shape**** ($L = 7, CI = 85, RI = 90$): 0. with subapical curvature, ventrally oriented; 1. medially inclined 45° to ventral portion; 2. sigmoid; 3. straight; 4. ventrally convex; 5. medially inclined 90° to dorsal portion; 6. sub straight
 - 7) **Penis, glans, stylus, stem, medial spines**** ($L = 2, CI = 50, RI = 50$): 0. absent; 1. present
 - 8) **Penis, glans, stylus, apical portion**** ($L = 6, CI = 83, RI = 88$): 0. longitudinally flattened; 1. transversely flattened; 2. only an extension of the stylus; 3. plateau with dorsal curvature; 4. as a tubular process, dorsally curved; 5. swollen in relation to the stem
 - 9) **Penis, glans, stylus, apical winglets***** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 10) **Penis, glans, stylus, apical winglets, spines**** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 11) **Penis, glans, ventral process***** ($L = 3, CI = 33, RI = 60$): 0. extremely reduced or absent; 1. present
 - 12) **Penis, glans, ventral process, organization***** ($L = 1, CI = 100, RI = 100$): 0. without subdivisions, subconical, with ampulliform projections; 1. stem plus flabellum
 - 13) **Penis, glans, ventral process, shape of stem**** ($L = 1, CI = 100, RI = 100$): 0. inverted subconical; 1. tubular
 - 14) **Penis, glans, ventral process, flabellum, mono-frame, type***** ($L = 5, CI = 100, RI = 100$): 0. scallop-shaped; 1. hand-shaped; 2. only an extension of the ventral process; 3. fan-shaped; 4. flattened circular; 5. rectangular with pointed projections
 - 15) **Penis, glans, ventral process, diameter**** ($L = 5, CI = 60, RI = 50$): 0. half of the stylus; 1. a third or less than the stylus; 2. same diameter of the stylus diameter; 3. wider than the stylus
 - 16) **Penis, ventral process, length compared to the stylus***** ($L = 3, CI = 33, RI = 75$): 0. stylus shorter than ventral process; 1. stylus longer than ventral process
 - 17) **Penis, ventral plate, border of the basal portion**** ($L = 3, CI = 66, RI = 85$): 0. straight; 1. elliptical; 2. diagonal
 - 18) **Penis, ventral plate, basal lobes (dorsally oriented)*** ($L = 2, CI = 50, RI = 0$): 0. absent; 1. present
 - 19) **Penis, ventral plate, border of the basal portion, laterally expanded when compared with the distal part**** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 20) **Penis, ventral plate, basal convex format**** ($L = 2, CI = 50, RI = 66$): 0. absent; 1. present
 - 21) **Penis, ventral plate, shape of distal portion***** ($L = 4, CI = 25, RI = 40$): 0. straight; 1. with a groove
 - 22) **Penis, ventral plate, distal portion with a groove, type***** ($L = 3, non-informative$): 0. slightly concave; 1. U-shaped cleft, not reaching the medial portion of VP; 2. "V"-shaped cleft, not reaching the medial portion; 3. U-shaped deeply cleft, reaching the medial portion of VP
 - 23) **Penis, ventral plate, distal portion straight, type***** ($L = 1, CI = 100, RI = 100$): 0. trapezium, apical major base; 1. trapezium, apical minor base
 - 24) **Penis, ventral plate, transversely proportion between distal and basal parts**** ($L = 4, CI = 50, RI = 83$): 0. same proportion; 1. basal twice wider than distal; 2. basal one-third wider than distal
 - 25) **Penis, ventral plate, macrosetae A on the medial part**** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 26) **Penis, ventral plate, macrosetae C, diameter**** ($L = 6, CI = 50, RI = 70$): 0. same diameter between macrosetae A and C; 1. macrosetae A 0,001 thicker than the C; 2. macrosetae A 0,002 thicker than the C; 3. macrosetae A 0,003 or more thicker than the C
 - 27) **Penis, ventral plate, macrosetae C, length**** ($L = 7, CI = 28, RI = 37$): 0. 0,06 mm or more; 1. between 0,04 and 0,05 mm; 2. less than 0,035 mm
 - 28) **Penis, ventral plate, macrosetae C1-C3, longitudinal arrangement**** ($L = 2, CI = 50, RI = 50$): 0. straight; 1. diagonal, basal part oriented to the dorsal region
 - 29) **Penis, ventral plate, macrosetae E, longitudinal distribution pattern**** ($L = 2, CI = 50, RI = 85$): 0. macrosetae E2 ventrally below of the range of distribution of macrosetae C; 1. macrosetae E ventrally inside of the range of distribution of macrosetae C
 - 30) **Penis, ventral plate, shape of field of type 1 microsetae**** ($L = 3, CI = 66, RI = 83$): 0. field strongly reduced to a pair of latero-basal patches; 1. field entire, occupying most of VP; 2. field restricted to proximal third of VP
 - 31) **Chelicera, basal article, relation with the anterior margin of DS**** ($L = 1, CI = 100, RI = 100$): 0. covered mainly by the previous margin; 1. well exposed
 - 32) **Chelicerae, bulla, proximal margin, ectal spines**** ($L = 3, CI = 33, RI = 77$): 0. absent; 1. present
 - 33) **Chelicerae, bulla, proximal margin, spines, ectal portion quantity**** ($L = 1, CI = 100, RI = 100$): 0. one; 1. two
 - 34) **Pedipalp, tibia, type of retrolateral apical seta*** ($L = 1, non-informative$): 0. single; 1. bifid
 - 35) **Ocularium, position on the carapace in relationship to the insertion of legs**** ($L = 3, CI = 66, RI = 83$): 0. at second pair of legs; 1. between the second and third pairs of legs; 2. at third pair of legs
 - 36) **Ocularium, shape (in frontal view)**** ($L = 6, CI = 33, RI = 60$): 0. convex, without depression; 1. convex, with medial depression; 2. rectangular, without depression
 - 37) **Ocularium, armature***** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
 - 38) **Ocularium, armature, quantity of spines or tubercles**** ($L = 2, CI = 50, RI = 50$): 0. one; 1. two
 - 39) **Ocularium, armature, pair, pattern of the spines or tubercles**** ($L = 3, CI = 33, RI = 71$): 0. parallel; 1. divergent
 - 40) **Body and appendages, dry marks, aspect**** ($L = 3, CI = 100, RI = 100$): 0. forming cruciform pattern on dorsal scutum; 1. around the tubercles all over the dorsal scutum; 2. restricted to tip of tubercles of dorsal scutum; 3. restricted to posterior portion of carapace
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Table 1.—Continued.

- 41) Dorsal scutum, DS maximum width* ($L = 4, CI = 25, RI = 57$): 0. maximum width in the middle of the abdominal scutum; 1. maximum width in the posterior region of the abdominal scutum
- 42) Dorsal scutum, DS length and width ratio* ($L = 3, CI = 33, RI = 50$): 0. wider than long; 1. longer than wide
- 43) Dorsal scutum, dry marks*** ($L = 3, CI = 33, RI = 60$): 0. absent; 1. present
- 44) Dorsal scutum, mesotergum, width of the grooves between the areas** ($L = 2, CI = 50, RI = 50$): 0. very narrow, not totally visible; 1. ordinary, visible
- 45) Dorsal scutum, mesotergum, area I, state of fusion* ($L = 1, non-informative$): 0. with a longitudinal division between areas I and II (even though the groove of area II invades area I); 1. divided by the groove of area II (groove II in contact with the groove I; no longitudinal groove)
- 46) Dorsal scutum, mesotergum, area I, armature*** ($L = 4, CI = 25, RI = 40$): 0. absent; 1. present
- 47) Dorsal scutum, mesotergum, area I, distribution pattern of tubercles*** ($L = 3, CI = 100, RI = 100$): 0. transversely row covering all the medial extension; 1. transversely row of four dome-shaped tubercles; 2. pair of conspicuous tubercles; 3. two pairs of conspicuous tubercles
- 48) Dorsal scutum, mesotergum, area II, lateral invasion of the area I** ($L = 3, CI = 33, RI = 80$): 0. absent; 1. present
- 49) Dorsal scutum, mesotergum, area II, armature*** ($L = 4, CI = 25, RI = 50$): 0. absent; 1. present
- 50) Dorsal scutum, mesotergum, area II, distribution pattern of tubercles*** ($L = 4, CI = 100, RI = 100$): 0. transversal row in all medial extension; 1. transversal row with four dome-shaped tubercles; 2. two anterior e six posterior; 3. a pair of conspicuous tubercles; 4. transversal row in the medial extension, with the central portion deflected to the anterior portion
- 51) Dorsal scutum, mesotergum, area III, armature*** ($L = 1, non-informative$): 0. absent; 1. present
- 52) Dorsal scutum, mesotergum, area III, armature, type*** ($L = 2, CI = 50, RI = 50$): 0. transversal row in all medial extension; 1. only a paramedian armature
- 53) Dorsal scutum, mesotergum, area III, paramedian armature, type** ($L = 9, CI = 33, RI = 40$): 0. pair of conical tubercles; 1. pair of spines; 2. pair of domes; 3. pair of tiny acuminate tubercles
- 54) Dorsal scutum, mesotergum, area III, highlighted tubercles between the paramedian armature** ($L = 6, CI = 16, RI = 50$): 0. absent; 1. present
- 55) Dorsal scutum, mesotergum, area III, highlighted tubercles between the paramedian armature, quantity** ($L = 4, CI = 50, RI = 60$): 0. one pair; 1. two pairs; 2. three pairs
- 56) Dorsal scutum, mesotergum, area III, paramedian armature, domes, shape** ($L = 4, CI = 75, RI = 66$): 0. ellipses with little height; 1. circular, slight compressed on lateral portions; 2. circular, longitudinally slight compressed; 3. almost forming a globe
- 57) Dorsal scutum, mesotergum, relation between area III and area IV** ($L = 6, CI = 33, RI = 33$): 0. parallel to each other; 1. area III invading the area IV; 2. area IV invading area III
- 58) Dorsal scutum, mesotergum, relation between area IV and DS posterior margin** ($L = 3, CI = 66, RI = 66$): 0. area IV invading DS posterior margin; 1. parallel to each other; 2. DS posterior margin invading area IV
- 59) Dorsal scutum, mesotergum, posterior margin of the dorsal scutum, armature*** ($L = 2, CI = 50, RI = 50$): 0. absent; 1. present
- 60) Free tergites II, conspicuous paramedian armature*** ($L = 2, CI = 50, RI = 66$): 0. absent; 1. present
- 61) Free tergites II, conspicuous paramedian armature, type*** ($L = 1, non-informative$): 0. unpaired; 1. paired
- 62) Free tergites III, conspicuous paramedian armature* ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
- 63) Ventral area, coxa I, spines row pattern** ($L = 3, CI = 33, RI = 75$): 0. transversely juxtaposed; 1. transversal row in regular intervals
- 64) Ventral area, coxa II, medial constriction by coxa III** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
- 65) Legs (most markedly III-IV), trichromatic striped pattern in yellow, black and red** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
- 66) Leg II, coxa, prodorsal proximal spine** ($L = 4, CI = 75, RI = 83$): 0. conical, geminated, anterior larger and swollen; 1. triad, central larger and swollen; 2. conical, not geminated; 3. conical, geminated, posterior larger and swollen
- 67) Leg II, femur, retrodorsal distal spur** ($L = 3, CI = 33, RI = 50$): 0. absent; 1. present
- 68) Leg III, femur, shape** ($L = 3, CI = 33, RI = 66$): 0. straight; 1. sinuous
- 69) Leg III, femur, retrodorsal distal spur** ($L = 4, CI = 25, RI = 57$): 0. absent; 1. present
- 70) Leg IV, coxa, torsion on the Cx IV* ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
- 71) Leg IV, coxa, angle in relation to the body axis** ($L = 3, CI = 33, RI = 60$): 0. oblique; 1. parallel
- 72) Leg IV, coxa, prolateral margin, tubercles** ($L = 2, CI = 50, RI = 50$): 0. absent; 1. present
- 73) Leg IV, coxa, prolateral margin, tubercles, shape** ($L = 1, CI = 100, RI = 100$): 0. convex; 1. acuminate
- 74) Leg IV, coxa, prodorsal apophysis, basal thickness in relation to the medial portion** ($L = 1, CI = 100, RI = 100$): 0. about the same; 1. swollen
- 75) Leg IV, coxa, prodorsal apophysis, swelling in the posterior medial portion** ($L = 1, CI = 100, RI = 100$): 0. absent; 1. present
- 76) Leg IV, coxa, prodorsal apophysis, medial-distal second branch** ($L = 4, CI = 25, RI = 62$): 0. absent; 1. present
- 77) Leg IV, coxa, retrolateral apophysis** ($L = 3, CI = 33, RI = 66$): 0. absent; 1. present
- 78) Leg IV, coxa, retrolateral apophysis, shape** ($L = 2, CI = 100, RI = 100$): 0. stunted, with a tiny geminated branch; 1. stunted, single branch; 2. developed, bigger than the prodorsal
- 79) Leg IV, trochanter, shape*** ($L = 6, CI = 50, RI = 66$): 0. trapezoid, distal base bigger; 1. trapezoid, proximal base bigger; 2. approximately quadrangular; 3. rectangular
- 80) Leg IV, trochanter, size in relation to the width of the trochanter III** ($L = 5, CI = 20, RI = 55$): 0. less than or equal to 1.5x the size of the trochanter III; 1. 2x or more the size of the trochanter III
- 81) Leg IV, trochanter, prodorsal distal apophysis*** ($L = 4, CI = 25, RI = 66$): 0. absent; 1. present
- 82) Leg IV, trochanter, prolateral distal apophysis* ($L = 3, CI = 33, RI = 33$): 0. absent; 1. present
- 83) Leg IV, trochanter, retrolateral proximal apophysis** ($L = 2, CI = 50, RI = 75$): 0. absent or inconspicuous; 1. conspicuous
- 84) Leg IV, trochanter, torsion between Tr-Pa IV* ($L = 2, CI = 50, RI = 75$): 0. absent; 1. present
- 85) Leg IV, femur, shape (in dorsal view)** ($L = 9, CI = 44, RI = 28$): 0. C-shaped, dorsal concavity; 1. approximately straight; 2. S-shaped, sinuous; 3. C-shaped, prolateral concavity; 4. entirely straight
- 86) Leg IV, femur, retrolateral face, armature*** ($L = 6, CI = 16, RI = 50$): 0. only ordinary tubercles; 1. conspicuous armature

Table 1.—Continued.

- 87) Leg IV, femur, retrolateral face, conspicuous armature, type*** ($L = 1$, non-informative): 0. conspicuous tubercles; 1. apophyses (Carvalho et al. 2021 = spines)
- 88) Leg IV, femur, retrolateral portion, conspicuous armature, apophyses, forming a comb, type*** ($L = 1$, $CI = 100$, $RI = 100$): 0. almost united; 1. spaced in equal intervals
- 89) Leg IV, femur, retrolateral face, medial-distal spine** ($L = 4$, $CI = 25$, $RI = 40$): 0. absent; 1. present
- 90) Leg IV, patella, proventral distal spur** ($L = 6$, $CI = 16$, $RI = 50$): 0. absent; 1. present
- 91) Leg IV, patella, proventral distal spur, size in relation to the width of the own patella** ($L = 2$, $CI = 50$, $RI = 75$): 0. approximately one-fifth the size; 1. approximately one-third the size
- 92) Leg IV, patella, retroventral row of tubercles** ($L = 2$, $CI = 50$, $RI = 50$): 0. absent; 1. present

Discocyrtus sensu stricto presents relevant branch support (Bremer = 6; SFq = 97) and is recovered here with Neopachylinae as the sister group of Roeweriinae. In the case of Pachylinae *sensu stricto*, the branch supports are the best presented here (Bremer = 8; SFq = 99), and its position is well marked far from *Parasadocus* gen. rest.

In our hypothesis, *Sadocus* constitutes a monophyletic group, sister of a clade (*Nanophareus*, Roewer, 1929 + *Neogonyleptes* Roewer, 1913) (Figs. 1, 2A). That clade is poorly supported by both Bremer (= 1) and SFq (< 50) methods but is recovered by almost all k-values tested here (Fig. 1). Here, the clade (*Sadocus* + (*Nanophareus* + *Neogonyleptes*)) is considered a member of Pachylinae *sensu lato* once it is closer to other Gonyleptidae than to Pachylinae *sensu stricto*. On the other hand, Pachylinae *sensu stricto* is one of the more stable clades retrieved here (Bremer = 8; SFq = 99) and does not show any close relation with other Pachylinae *sensu lato* and DRMN members.

SYSTEMATIC ACCOUNTS

Roeweriinae Carvalho & Kury, 2018

Genus *Parasadocus* Mello-Leitão, 1927 gen. rest.

Parasadocus Mello-Leitão, 1927: 20; Roewer, 1930: 425; Mello-Leitão, 1932: 329; Mello-Leitão, 1935: 104; [synonym of *Sadocus* Sørensen, 1886 by B. Soares 1944a: 166] [removed from *Discocyrtus*, *Sadocus* and considered synonym of *Discocyrtus* Holmberg, 1878 by Soares & Soares, 1987: 458].

Type species.—*Sadocus catharinensis* Mello-Leitão, 1923, by original designation.

Diagnosis.—*Parasadocus* gen. rest. can be distinguished from *Discocyrtus*, *Sadocus* and the other Roeweriinae by: (1) Area II with a row of conspicuous tubercles, arched to proximal (in the central portion) (Figs. 3A, 4A, 6A); (2) Area III posterior border invading area IV in the central portion (as in *Roeweria*) (Fig. 3A); (3) Tr IV prolateral proximal apophysis hook-shaped on males (Figs. 3A, 4A, F, J); (4) Tr IV dorsal central portion with a conical apophysis on males (Figs. 3A, 4A, F, 6A); (5) Fe IV dorsal with a row of spines on the proximal half (as in most of the *Discocyrtanus*) (Figs. 3A, 4F, J–K); (6) Ti IV retroventral of males with two outstanding spines on the distal third (as in some *Bunopachylus occultus* Carvalho, Kury & Hara, 2021) (Figs. 4I–K); (7) VP of penis hexagonal-shaped (as in *Roeweria garrincha* Bragagnolo & Pinto-da-Rocha, 2009) (Figs. 5A, C); (8) Six Macrosetae of type C on the VP distally (Figs. 5A–C);

Included species.—*Parasadocus catharinensis* (Mello-Leitão, 1923) comb. rest.

Distribution.—*Parasadocus* is known from the states of Paraná and Santa Catarina, Brazil.

Parasadocus catharinensis (Mello-Leitão, 1923) comb. rest. (Figs. 3A–B, 4A–K, 5A–F, 6A–F)

Sadocus catharinensis Mello-Leitão, 1923: 152; B. Soares, 1944a: 166; B. Soares, 1944b: 222; B. Soares, 1945: 364; Soares & Soares, 1949a: 211; H. Soares, 1966: 90.

Parasadocus catharinensis: Mello-Leitão, 1927: 20; Roewer, 1930: 425; Mello-Leitão, 1932: 329.

Discocyrtus catharinensis: Soares & Soares, 1987: 458, Figs. 3–6; Kury, 2003: 161; Pessoa-Silva et al. 2021: 96, Figs. 11K–L.

Sadocus aquifugus Mello-Leitão, 1931: 136, fig. 8; Mello-Leitão, 1935: 106 [junior subjective synonym of *Sadocus catharinensis* Mello-Leitão, 1923 by B. Soares, 1944b: 166].

Gonyleptes pugilator Mello-Leitão, 1932: 303, fig. 163; B. Soares 1944b: 222; Soares & Soares, 1949a: 180 [junior subjective synonym of *Sadocus catharinensis* Mello-Leitão, 1923 by Soares & Soares, 1987: 458].

Lycomedicus brasiliensis Soares & Soares 1949b: 52, figs. 6–8; Soares & Soares 1954: 271 [junior subjective synonym of *Sadocus catharinensis* Mello-Leitão, 1923 by Pessoa-Silva et al. 2021: 130].

Sadocus brasiliensis: Kury 2003: 191.

Gonyleptes acanthopus Mello-Leitão, 1945: 156 [nec Quoy & Gaimard, 1824] – misidentification of *Sadocus catharinensis* Mello-Leitão 1923, as noted by Soares & Soares (1987: 458)].

Type material.—*Sadocus aquifugus*: Five syntypes males: Brazil, Santa Catarina, Joinville (MNRJ 11390, examined).

Sadocus catharinensis: Six syntypes males: Brazil, Santa Catarina, Joinville (MNRJ 1510, lost before 2018).

Gonyleptes pugilator: Holotype male: Brazil, Santa Catarina (MNRJ, lost before 2018).

Lycomedicus brasiliensis: Lectotype male (herein designated) and paralectotype female: Brazil, Paraná, Piraquara, Banhado (MZSP 36165, old collection CGPC, examined); *Paralectotype male*: Brazil, Paraná, Piraquara, Banhado (MZSP 1029, old collection CGPC, examined).

Remarks.—As stated by Kury (2003), Mello-Leitão (1923) referred to this species as having been described in an earlier paper in 1920. However, this is a mistake as that work has never appeared before (see the complete list of 1920s papers discussing Opiliones in Kury 2020: 99).

Published records.—BRAZIL: Rio de Janeiro: Itatiaia (Soares & Soares 1987) (locality probably incorrect; see discussion section below).

Table 2.—Matrix of character states for the cladistic analysis presented here.

TAXA	CHARACTERS																														
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
<i>Ampycus telifer</i>	0	0	1	0	0	1	0	0	0	-	0	-	-	-	0	2	0	-	0	1	3	-	0	0	0	3	0	0	0	0	1
<i>Pachylus chilensis</i>	0	0	1	1	1	0	0	0	0	-	1	0	-	-	0	0	0	-	0	0	-	0	2	0	0	0	1	0	0	0	0
<i>Acanthopachylus aculeatus</i>	0	0	1	1	1	0	0	0	0	-	1	0	-	-	0	0	0	-	0	0	-	0	2	0	0	0	0	0	0	0	0
<i>Nanophareus araucanus</i>	0	1	1	0	0	1	0	2	0	-	1	1	5	2	0	0	0	0	0	1	0	-	0	2	0	0	0	1	0	0	1
<i>Neogonylptes docilis</i>	0	1	1	0	0	6	0	2	0	-	1	1	4	3	1	0	0	0	0	0	0	-	0	2	0	0	1	0	0	1	1
<i>Sadocus asperatus</i>	0	1	1	0	0	6	0	2	0	-	1	1	4	3	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	1	1
<i>Sadocus ingens</i>	0	1	1	0	0	6	0	2	0	-	1	1	4	2	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	1	1
<i>Sadocus polyacanthus</i>	0	1	1	0	0	6	0	2	0	-	1	1	4	3	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	1	1
<i>Gonylptes horridus</i>	1	0	1	0	0	6	?	3	0	-	1	1	3	3	0	1	1	0	1	1	1	1	-	2	0	0	1	0	0	1	1
<i>Goniosoma varium</i>	1	0	1	2	0	6	0	4	0	-	1	1	0	-	1	1	1	0	1	0	-	0	0	0	0	0	2	0	0	-	1
<i>Mitobates triangulus</i>	1	0	1	4	0	5	1	5	0	-	1	1	0	-	3	1	1	0	0	1	1	2	-	0	0	1	1	1	0	1	1
<i>Neopachylus bellicosus</i>	1	0	1	3	2	3	0	3	0	-	1	1	1	1	1	1	0	0	1	1	0	-	0	0	0	1	1	0	0	1	1
<i>Discocyrtus textidneus</i>	1	0	1	4	2	3	1	2	0	-	1	1	1	0	2	1	1	0	0	1	0	-	0	0	1	2	2	1	1	1	1
<i>Discocyrtus flavigranulatus</i>	1	0	1	4	2	3	1	2	0	-	1	1	0	2	1	1	0	0	1	0	-	0	0	1	2	2	1	0	1	1	1
<i>Bunopachylus armatissimus</i>	1	0	0	-	-	-	2	0	1	1	1	1	2	-	1	1	0	0	1	0	-	?	0	0	2	0	0	0	1	1	1
<i>Roeweria virescens</i>	1	0	0	-	-	-	4	0	1	1	0	0	-	-	1	1	0	1	1	0	-	1	1	0	3	0	0	1	2	1	1
<i>Roeweria bitencourti</i>	1	0	0	-	-	-	4	0	1	1	0	0	-	-	1	1	0	1	1	0	-	1	1	0	3	0	0	1	1	1	1
<i>Amazochroma carvalhoi</i>	1	0	0	-	-	-	2	0	1	1	1	0	-	-	1	1	0	1	1	0	-	1	1	0	3	0	0	1	1	1	1
<i>Amazochroma pedroi</i>	1	0	0	-	-	-	2	0	1	1	1	1	1	1	1	1	2	0	-	1	0	-	1	0	1	1	1	0	1	1	1
<i>Discocyrtanus goyazius</i>	1	0	0	-	-	-	2	0	1	1	1	0	-	-	1	1	0	1	1	0	-	1	1	0	3	0	0	1	1	1	1
<i>Discocyrtanus pertenuis</i>	1	0	0	-	-	-	2	0	1	1	1	0	-	-	1	1	0	1	1	0	-	1	1	0	3	0	0	1	1	1	1
<i>Parasadocus catharinensis</i>	1	0	0	4	2	2	0	1	1	0	1	1	1	1	0	0	1	1	0	1	0	-	1	1	0	3	0	0	1	1	1

TAXA	CHARACTERS																														
	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
<i>Ampycus telifer</i>	1	0	0	1	1	1	1	0	-	0	1	0	1	0	1	3	1	?	?	?	?	0	1	0	-	0	0	0	1	0	?
<i>Pachylus chilensis</i>	0	-	0	0	0	1	0	-	0	1	0	0	0	0	1	0	0	1	0	1	0	2	0	-	0	2	1	1	0	-	0
<i>Acanthopachylus aculeatus</i>	0	-	0	0	0	1	0	-	0	1	0	0	0	0	1	0	0	1	0	1	0	2	0	-	0	2	1	1	0	-	0
<i>Nanophareus araucanus</i>	0	-	1	2	2	0	-	-	0	1	0	1	0	0	-	0	0	-	1	0	1	0	1	2	-	0	?	0	0	-	0
<i>Neogonylptes docilis</i>	0	-	0	2	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	-	2	0	-	1	1	?	0	0	-	0
<i>Sadocus asperatus</i>	0	-	0	2	0	1	1	0	0	1	0	1	1	0	0	-	0	1	0	1	1	3	0	-	-	1	?	0	1	1	1
<i>Sadocus ingens</i>	0	-	0	2	0	1	1	0	-	1	0	0	1	0	0	-	0	1	0	1	1	0	0	-	-	0	?	0	1	1	1
<i>Sadocus polyacanthus</i>	0	-	0	2	0	1	1	0	-	1	0	0	1	0	1	2	0	1	0	1	1	2	0	-	-	-	?	0	1	1	1
<i>Gonylptes horridus</i>	0	-	0	1	2	1	1	0	-	1	0	0	1	0	0	-	0	0	-	1	1	2	0	-	-	-	0	0	0	-	0
<i>Goniosoma varium</i>	0	-	0	1	2	1	1	0	3	1	0	1	1	1	1	2	0	0	-	1	1	1	0	-	-	-	0	0	-	0	0
<i>Mitobates triangulus</i>	0	-	0	1	2	1	1	1	-	1	1	0	1	0	0	-	0	0	-	1	1	1	1	2	-	1	2	0	0	-	0
<i>Neopachylus bellicosus</i>	?	?	0	1	0	1	0	-	-	0	0	0	1	0	1	2	1	1	3	1	1	2	1	0	3	0	2	1	0	-	0
<i>Discocyrtus textidneus</i>	0	-	0	1	0	1	1	1	-	1	0	0	1	0	1	2	0	0	-	1	1	2	0	-	2	0	2	0	0	-	0
<i>Bunopachylus flavigranulatus</i>	1	0	0	1	0	1	1	1	-	1	0	0	1	0	1	2	1	1	?	1	1	2	1	2	2	0	2	0	0	-	0
<i>Bunopachylus armatissimus</i>	1	1	0	1	1	1	1	1	-	1	0	0	1	0	1	1	1	0	-	1	1	2	1	0	2	0	1	0	0	-	0
<i>Roeweria virescens</i>	1	1	0	1	1	1	1	1	-	1	0	0	1	0	1	2	1	0	-	1	1	1	0	-	1	1	0	0	-	0	0
<i>Roeweria bitencourti</i>	1	1	0	1	1	1	1	1	-	1	0	0	1	0	1	2	1	0	-	1	1	1	0	-	1	1	0	0	-	0	0
<i>Amazochroma carvalhoi</i>	1	1	0	1	1	1	1	1	1	0	0	1	1	0	1	2	1	?	2	1	1	1	1	1	-	0	1	0	-	0	0
<i>Amazochroma pedroi</i>	1	1	0	1	1	1	1	1	1	0	0	1	0	1	2	1	?	2	1	1	2	1	1	1	1	0	1	0	-	0	0
<i>Discocyrtanus goyazius</i>	1	1	0	1	1	1	1	1	2	1	0	1	1	0	1	2	1	0	-	1	1	3	1	1	-	0	1	0	-	0	0
<i>Discocyrtanus pertenuis</i>	1	1	0	1	1	1	1	1	1	2	1	0	1	1	0	1	2	1	0	-	1	3	1	1	-	0	1	0	-	0	0

Table 2.—Continued.

TAXA	CHARACTERS																													
	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
<i>Ampycus telifer</i>	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	-	0	0	-	1
<i>Pachylus chilensis</i>	0	1	0	2	0	1	0	0	1	0	-	0	0	0	0	-	1	0	0	0	0	0	0	0	0	-	0	1	1	1
<i>Acanthopachylus aculeatus</i>	0	1	0	2	0	1	0	0	1	0	-	0	0	0	0	-	1	0	0	0	0	0	0	0	0	-	0	1	1	1
<i>Nanophareus araucanus</i>	1	0	0	2	0	0	0	0	0	0	1	0	0	1	0	-	2	0	1	1	0	0	3	1	1	-	0	1	0	1
<i>Neogonyleptes docilis</i>	1	0	0	2	0	0	0	0	0	0	-	0	0	1	0	-	2	1	1	0	0	0	1	0	-	1	0	-	1	
<i>Sadocus asperatus</i>	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	0	1	1	1	1	1	0	-	1
<i>Sadocus ingens</i>	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1
<i>Sadocus polyacanthus</i>	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1
<i>Sadocus polyacanthus</i>	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1
<i>Gonyleptes horridus</i>	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	-	2	0	0	0	0	0	1	1	1	?	0	0	-	1
<i>Goniosoma varium</i>	1	0	0	0	0	1	1	0	0	1	0	0	0	1	0	1	2	3	1	0	1	0	0	0	0	-	0	0	-	1
<i>Mitobates triangulus</i>	1	0	0	3	0	0	0	0	0	1	0	-	-	-	-	-	3	1	0	0	0	0	4	0	-	-	0	0	-	1
<i>Neopachylus bellicosus</i>	?	?	0	0	0	1	0	0	0	1	0	0	0	1	1	0	3	1	1	0	1	0	0	1	1	-	0	0	-	1
<i>Discocyrtus testudineus</i>	1	0	0	0	1	1	1	0	1	1	0	1	0	0	1	0	3	1	1	1	1	1	0	3	0	-	0	1	1	1
<i>Discocyrtus flavigranulatus</i>	1	0	0	0	1	1	1	0	1	1	0	1	0	0	1	0	2	0	1	1	1	1	0	0	0	-	0	1	1	1
<i>Bunopachylus armatissimus</i>	0	0	0	0	0	1	1	0	0	1	0	0	0	1	1	1	3	1	1	0	0	0	2	1	1	-	1	0	-	1
<i>Roeweria virescens</i>	0	0	0	0	0	1	0	1	0	1	0	0	0	0	1	1	3	1	0	0	0	1	1	0	-	-	0	1	0	1
<i>Roeweria bittencourti</i>	0	0	0	0	0	1	0	1	0	1	0	0	0	0	1	1	3	1	0	0	0	1	1	0	-	-	0	0	-	0
<i>Amazochroma carvalhoi</i>	0	0	1	1	1	1	1	0	0	1	1	0	0	0	1	1	2	0	0	0	0	0	0	0	-	-	0	1	0	0
<i>Amazochroma pedroi</i>	0	0	1	1	1	1	1	0	0	1	1	0	0	0	0	-	2	0	0	0	0	0	0	1	1	0	0	1	0	0
<i>Discocyrtanus goyazius</i>	0	0	0	1	0	1	1	0	0	1	0	0	1	0	1	1	3	1	1	0	1	0	2	1	1	1	0	0	1	0
<i>Discocyrtanus pertenuis</i>	0	0	0	1	0	1	1	0	0	1	0	0	1	0	1	1	3	1	1	0	1	0	2	1	1	0	0	1	0	1
<i>Parasadocus catharinensis</i>	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	3	0	1	0	0	0	0	1	1	1	1	0	-	1

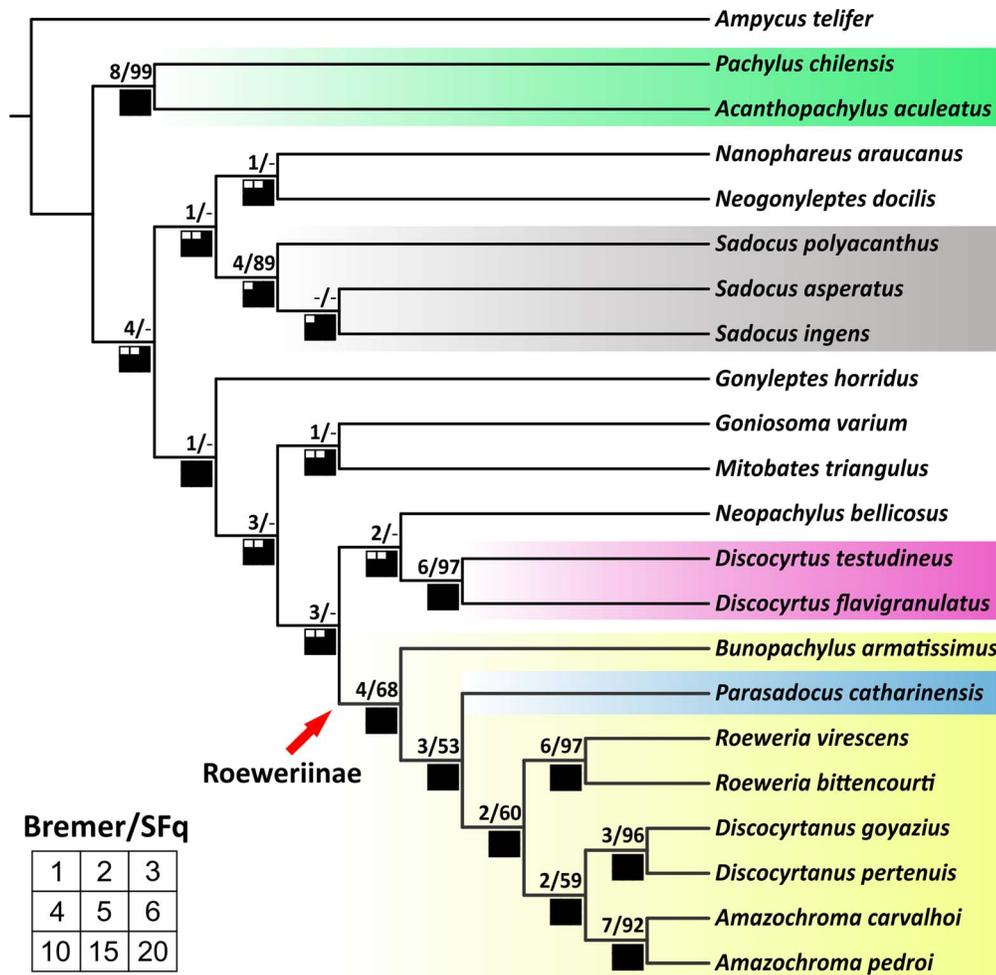


Figure 1.—The most frequent tree (k-values = 3, 4, 6, 10, 15 and 20; 271 steps, consistency index = 52; retention index = 69) retrieved by the clastic protocol applied. Clade support values are indicated above the branches (absolute Bremer support values/absolute symmetric frequencies). Clade stability is indicated below the branches by the sensitivity plots ('Navajo rugs'), which indicate different concavity values (k) tested (black squares indicate monophyly; white squares indicate non-monophyly). Some groups herein discussed have colored branches: *Discocyrtus sensu stricto* (in magenta), *Pachylinae sensu stricto* (in green), *Parasadocus* gen. rest. (in blue), *Roeweriinae* (in yellow) and *Sadocus* (in grey).

Other material examined.—BRAZIL: *Rio de Janeiro: Itatiaia* (locality probably incorrect; see discussion section below): 9 ♂ (MNRJ 1488), Moreira, C. leg. *Santa Catarina: Joinville:* 1 ♂ (MZSP 36419), March 1947, Goffergé leg. *Rio dos Cedros:* 1 ♂ (MNRJ-HS 701), Alto Palmeiras, 19–28 March 1966, Jim, J. leg. *São Bento do Sul:* 1 ♂ (MNRJ 9198), Rio Natal, 14 December 1984, Jim, J. et al. leg.

Diagnosis.—As for the genus.

Description, adult male.—Based on MZSP 36165 (and some references to the male specimen MNRJ-HS 701): Measurements: CW 3.4, CL 2.3, AW 6.3, AL 3.3. Fe I–IV measurements: I = 2.58, II = 5.69, III = 4.45, IV = 5.71. Right/left tarsal (distitarsal) counts: 6(3)/6(3) - 8(3)/9(3) - 7/7 - 7/7. Based on MNRJ 9198 and MNRJ 11390: for illustrations of genitalia (Figs. 5A–F).

Dorsum. DS type gamma, wider than long, with lateral margins of AS strongly convex, widest at scutum areas II–III and thickest at scutum area III, with sinuous posterior margin (Figs. 3A, 4A, C). Carapace with tubercles on central and posterior regions, with two pairs of large paramedian tubercles (Figs. 4A, C). Cheliceral sockets shallow, with a small apophysis in the center (Figs. 3A,

4A). Ocularium elliptical (in dorsal view), high (ca. 3.5x the eye diameter), perpendicularly placed in the middle of the carapace, with a pair of parallel spines (Figs. 3A, 4A, C). Mesotergum divided into four clearly defined scutum areas (Figs. 3A, 4A, C). Scutum areas I and IV divided into left and right halves by a median groove (Fig. 3A). Scutum area II anterolateral border invading scutum area I and posterior-lateral border invading the scutum area III (Figs. 3A, 4A). AS lateral borders with ordinary tubercles from the carapace posterior portion on posteriorly (Figs. 3A, 4A). All scutum areas tuberculate (Figs. 3A, 4A, C). Scutum area I with a pair of large dome-shaped paramedian tubercles, higher than the others (ca. thrice the ordinary tubercles) (Figs. 3A, 4A, C). Scutum area II with a row of large dome-shaped tubercles, higher than the others (ca. twice the ordinary tubercles), arched (in the central portion) to proximal (Figs. 3A, 4A, C). Scutum area III with a pair of conical spines (ca. 13x the ordinary tubercles), with two pairs of highlighted large tubercles (ca. twice the ordinary tubercles) between them (Figs. 3A, 4A, C). Scutum area IV with two pairs of large dome-shaped paramedian tubercles, higher than the others (ca. twice the ordinary

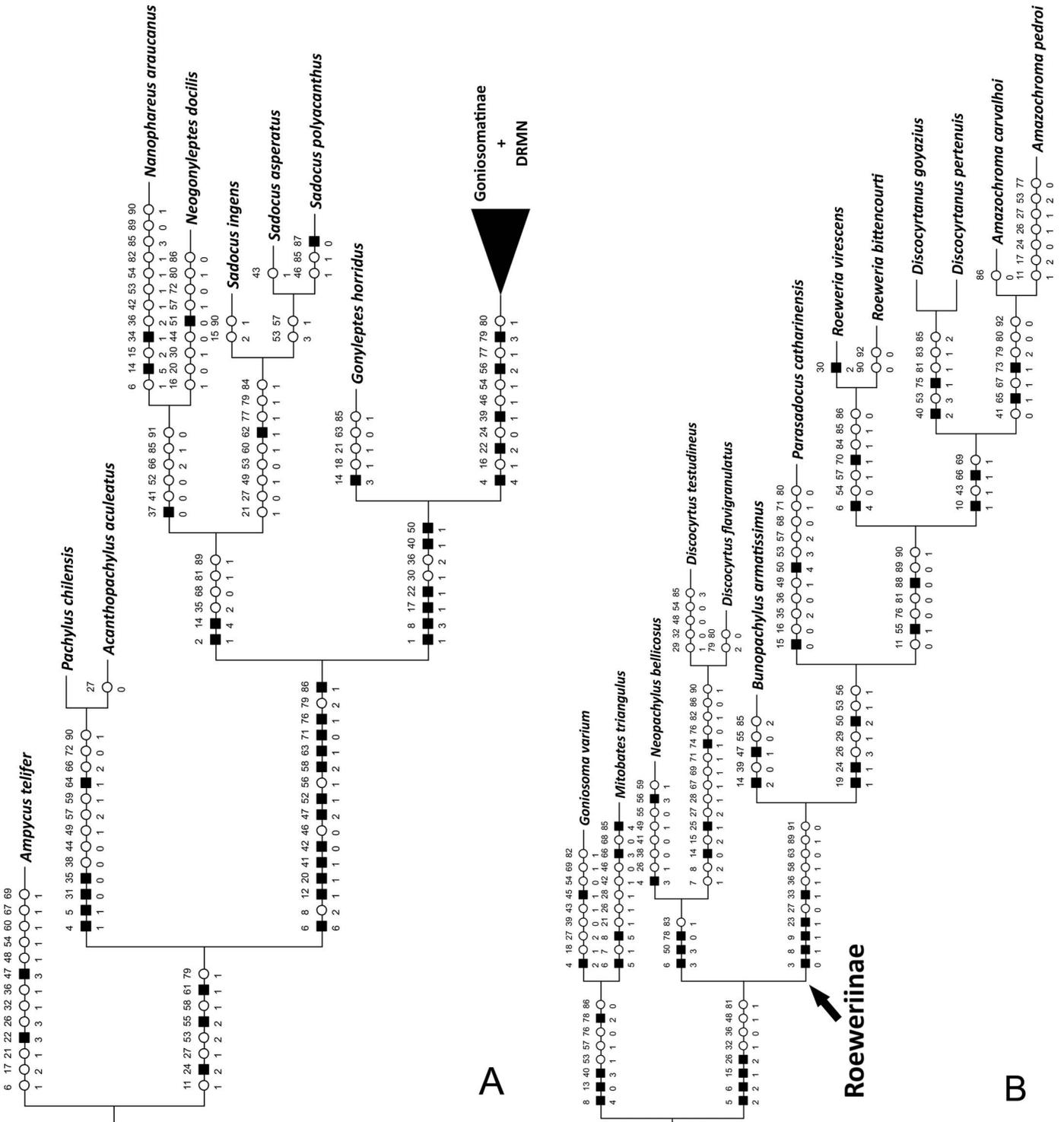


Figure 2.—A. Cladogram representing the basal relationships obtained from the most frequent topology recovered by the cladistical protocol applied, with synapomorphies for each mapped clade optimized by ACCTRAN. B. Goniosomatinae + DRMN clade expanded, showing placement of *Parasadocus catharinensis* (Mello-Leitão, 1923), comb. rest. within Roeweriinae in the most frequent topology recovered by the cladistical protocol applied. The synapomorphies for each mapped clade were optimized by ACCTRAN. Black squares = non-homoplastic synapomorphies; white circles = homoplastic synapomorphies.

tubercles) (Figs. 3A, 4A, C). Posterior border of DS and free tergites I–III with a transversal row of tubercles (increasing in height toward the center), with a pair of conspicuous paramedian tubercles (ca. 2.5x the ordinary tubercles, on the free tergite III acuminate) (Figs. 4A, C).

Venter: Cx I–III parallel to each other, each with ventral longitudinal rows of setiferous tubercles (Cx I rows with comparatively higher and sharper tubercles) (Fig. 4B). Cx II with a retroventral distal row of five acuminate tubercles (Fig. 4B). Cx III with a retroventral distal row of 11 acuminate tubercles (Fig.

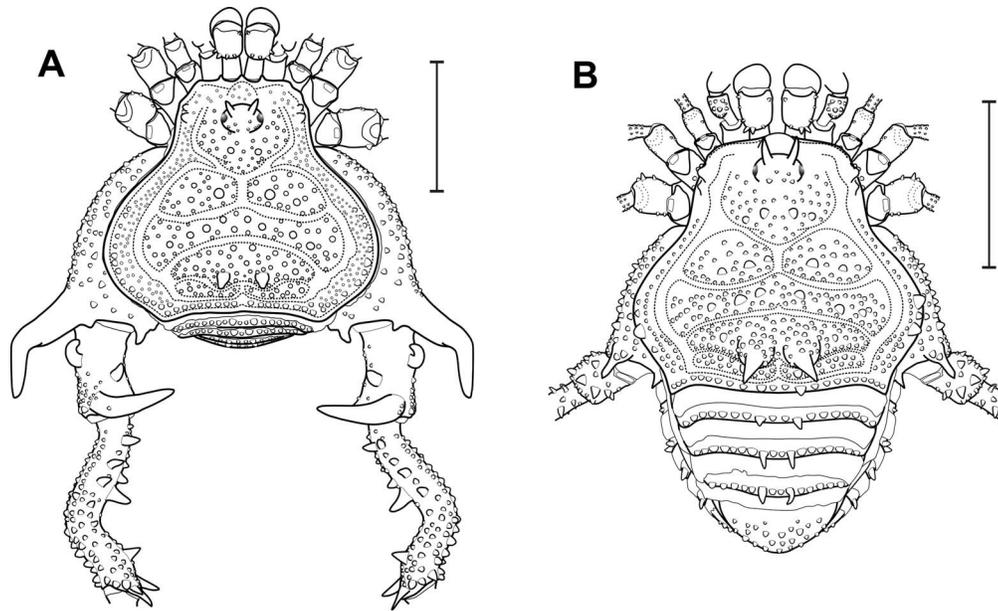


Figure 3.—*Parasadocus catharinensis* (Mello-Leitão, 1923), comb. rest.: A. Male (MNRJ-HS 701), habitus, dorsal view; B. Female (MZSP 36165), habitus, dorsal view. Scale bars = 3 mm.

4B). Cx IV much larger than the others, directed obliquely (Fig. 4B). Stigmatic area Y-shaped, clearly sunken relative to the distal part of coxa IV, with visible stigmata (Fig. 4B). Intercostal bridges well marked (Fig. 4B). Free sternites and anal operculum, each with one transverse row of ordinary tubercles (Fig. 4B).

Chelicera: Basichelicerite elongate, well-marked bulla, with marginal setiferous tubercles—two ectal, two posterior, two mesal (Figs. 3A, 4A); hand not swollen.

Pedipalpus: Tr ventral with two geminate setiferous tubercles (Fig. 4B). Fe with a mesal apical setiferous tubercle (Fig. 4B) and one ventral basal setiferous tubercle. Pa unarmed. Ti setation: four (liIi) ventro-mesal and ventro-ectal. Ta setation: three (Ili) ventro-mesal, four (IiIi) ventro-ectal.

Legs: Tr I–III each with several ventral tubercles (Fig. 4B). Fe I–II straight. Fe and Ti I–II with proventral and retroventral rows of small tubercles. Leg III sub-straight (Figs. 4D,E). Fe III and Ti III with proventral and retroventral rows of small acuminate tubercles (Figs. 4D,E). Fe III retrodorsal apical portion with a retrodorsal spur (Figs. 4D,E). Cx IV reaching the posterior margin of DS (Figs. 4D,E). Cx IV with a thick prolateral apical falciform apophysis, with a small accessory blunt branch (Figs. 3A, 4A–C, F,G). Cx IV with a retroventral spiniform apophysis (Figs. 3A, 4a,b, F,G). Cx IV tuberculate between prodorsal and ventral faces (Figs. 3A, 4A–C). Tr IV dorsal central with a prominent conical apophysis (Figs. 3A, 4A, F, J,K). Tr IV with prodorsal distal apophysis forming a stout hook (Figs. 3A, 4A, C, F, J,K). Tr IV with prolateral proximal apophysis caniniform-shaped (Figs. 3A, 4A, F,G). Tr IV with small distal retrolateral conical apophysis (Figs. 4F,G, K). Tr IV ventral and retrolateral faces tuberculate (Figs. 4B, G, K). Fe IV C-shaped, arched on the central portion toward dorsal (Figs. 3A, 4F,G, J,K). Fe IV dorsal face with a row of five spines on the proximal half (Figs. 3A, 4F, J,K). Fe IV prodorsal face with a row of ordinary tubercles (Figs. 3A, 4F, J). Fe IV prolateral face with a row of prominent subconical tubercles along its entire length (Figs. 3A, 4F,G, J). Fe IV proventral face with a row of four spines (interpolated by tiny subconical

tubercles) on the distal half (Figs. 4G, J). Fe IV retroventral face with (1) prominent subconical tubercles on the proximal and distal thirds and (2) a row of five conical spines (iiIII) on the central third (Figs. 4G, K). Fe IV retrolateral face with (1) a comb of three spines on the proximal half (iiI) and (2) three spines (iiI) on the distal half (not forming a comb) (Figs. 4F,G, K). Fe IV retrodorsal face with a conical spine on the distal third (Figs. 3A, 4F, K). Pa IV dorsal face covered by subconical tubercles (Figs. 3A, 4H, J,K). Pa IV proventral with a row of three regular spines (Figs. 4I,J). Pa IV retroventral with a row of two outstanding spines on the distal half (Figs. 4I, K). Ti IV dorsal, prolateral and retrolateral faces tuberculate (Figs. 4H–K). Ti IV proventral with a row of 10–11 conical spines along its entire length (Figs. 4I–J). Ti IV retroventral with a row of 10 conical spines, increasing in size towards to distal portion (Figs. 4H,I, K). Mt IV proventral and retroventral faces with an apical spur.

Penis: VP hexagonal, with the proximal dorsal and ventral surfaces entirely covered with microsetae of type 1 (Figs. 5A–C). MS C1–C6 on the distal part of the VP, divided into two groups: (1) C1–C4 cylindrical and elongate (united between them) and (2) C5–C6 reduced, equally spaced between them and C1–C4 (Figs. 5A–C). MS A1–A3 forming a longitudinal row placed on the VP dorsal face (A1 with asymmetrical heights on left and right sides) (Figs. 5A,B, E). MS B significantly reduced, inserted ventrally below the height of the A3 (Fig. 5B). MS D very short, inserted on lateral border of VP, close to C6 (Figs. 5A,B, E). MS E1–E2 significantly reduced, located on the laterodistal flange of VP – E1 between the height of MS C3–C4, E2 beside MS D (Fig. 5B). Glans sac arising from the middle bulge on podium, not extended as a dorsal process (Figs. 5A,B, E). Stylus and the axis of its ventral process fused basally (forming a long pedestal) (Figs. 5A,B, D,E). Ventral process with half of the stylus length, with a flabellum armed by eight tiny spines (Figs. 5B, D,E). Stylus stout, unarmed, cylindrical and proximally bent almost 90 degrees to the apical portion (Figs. 5A–F). Apex of the stylus depressed and unarmed, with two lateral flaps (Figs. 5A–F).



Figure 4.—*Parasadocus catharinensis* (Mello-Leitão, 1923), comb. rest., male lectotype (MZSP 36165): A. Habitus, dorsal view; B. Same, ventral view; C. Same, lateral view; D. Fe III, dorsal view; E. Same, retroventral view; F. Tr and Fe IV, dorsal view; G. Same, ventral view; H. Pa and Ti IV, dorsal view; I. Same, ventral view; J. Tr–Ti IV, prolateral view; K. Same, retrolateral view. Scale bars = 3 mm (A–C, F–K), 1 mm (D–E).

Color (*in alcohol*) (Figs. 4A–K): DS background Moderate Orange (53), with lateral margins Deep Reddish Brown (41) Ocularium, pair of spines on the scutal area III, DS posterior margin and free tergites I–III and Cx IV background Moderate Reddish Brown (43). Carapace with anterior and posterior portions Dark Reddish Orange (38). Tubercles on carapace and mesotergum Moderate Orange Yellow (71). Tubercles on free tergites I–III Dark Orange Yellow (72). Ch background Moderate Orange Yellow (71), with honeycombed Moderate Reddish Brown (43) reticle. Pp background Light Orange Yellow (70), with honeycombed Strong Brown (55) reticle. Cx I–III background Moderate Orange Yellow (71). Tr I–III background Moderate Yellow (87), with a semicircle Strong Brown (55) on the distal half. Fe–Mt I–III background Grayish Greenish Yellow (105). Tr IV background and apophyses Very Dark Red (17). Fe IV background and spines Dark Reddish Orange (38). Pa IV background Moderate Orange Yellow (71), with spines

Moderate Greenish Yellow (102). Ti IV with (1) proximal and medial thirds background Dark Reddish Orange (38), (2) distal third background Grayish Yellow (90) and (3) tubercles and spines Moderate Yellow (87) along its entire length. Mt IV background Grayish Yellow (90).

Description, adult female.—Based on MZSP 36165: *Measurements*: CW 3.1, CL 2.2, AW 6.3, AL 3.4. Fe I–IV measurements: I = 2.57, II = 5.58, III = 4.17, IV = 5.25. Right/left tarsal (distitarsal) counts: 6(3)/6(3) - 9(3)/9(3) - 7/7 - 7/7. DS gamma type with AW narrower than the male (Fig. 6B). Area III with a pair of paramedian outstanding spines (slightly inclined to posterior) (Figs. 6B, D). Free tergites I–III with a pair of prominent paramedian spines (Figs. 6B, D). All the free sternites with two or three tiny spines on the lateral portions (Figs. 6C,D). Cx IV is narrower than males, with (1) prodorsal apophysis reduced to an outstanding spine (Figs. 6B–D) and (2) retroventral face unarmed (Figs. 6B,C). Tr IV prolateral proximal portion only

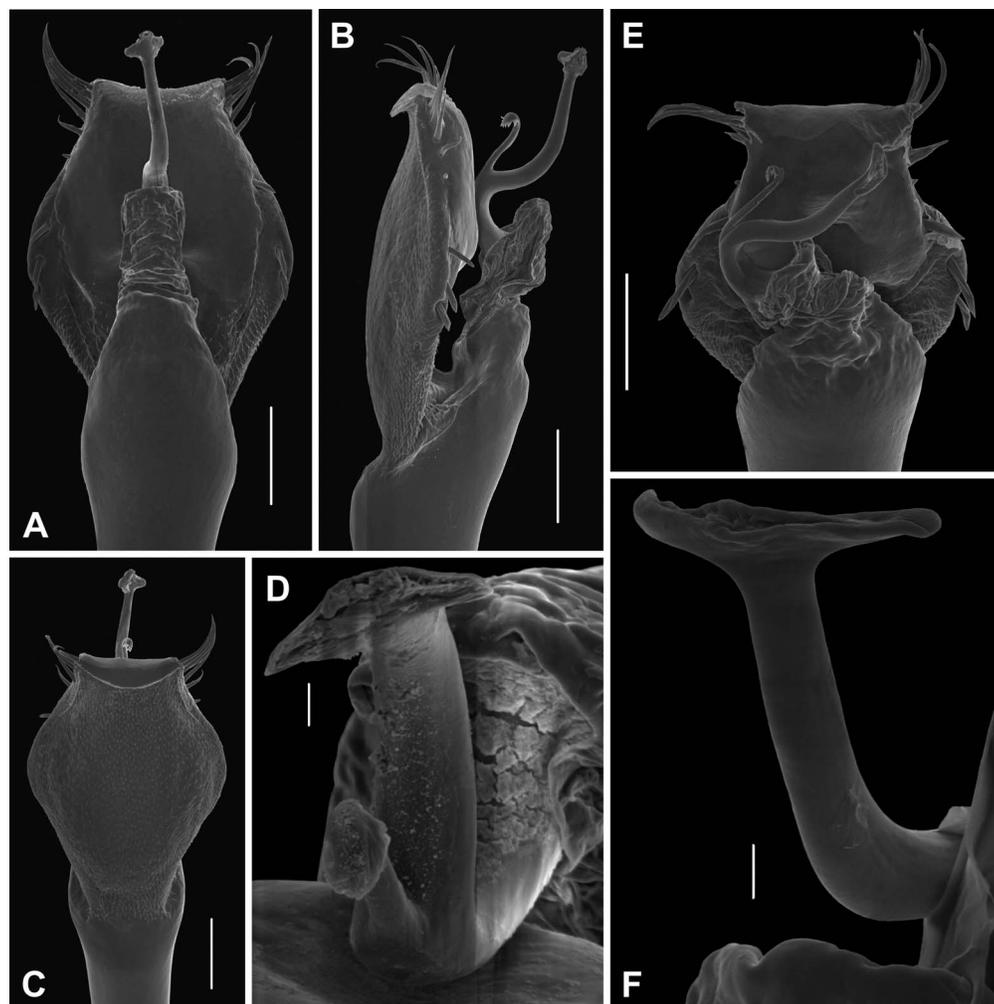


Figure 5.—*Parasadocus catharinensis* (Mello-Leitão, 1923), comb. rest., male, genitalia, distal part: A. (MNRJ 9198), dorsal view; B. Same voucher, lateral view; C. Same voucher, ventral view; D. Same voucher, stylus, apical view, showing ventral process and flabellum; E. (MNRJ 11390), dorsal view; F. Same voucher, stylus, dorsolateral view. Scale bars: 100 μ m (A–C, E), 10 μ m (D, F).

covered by subconical tubercles (Figs. 6B–E). Tr IV retrolateral face with short conical apophyses on proximal and distal portions (Figs. 6B,C, E,F). Fe IV thinner than the male, with rows of prominent spines on dorsal, retroventral and retrolateral faces (Figs. 6D–F).

Intraspecific variation.—Among *major morph males*: (1) the tubercles on DS area IV, DS posterior margin and free tergites I–III can vary between regular and prominent sizes (Figs. 4A, 6A); (2) Cx IV prodorsal apophysis can vary its apical portion angle (in relation to the DS), between 90 degrees and more than 90 degrees (Figs. 3A, 4A, 6A). In the material studied herein, neither one *minor morph male* nor an intraspecific variation among females was found.

Distribution (new records with an asterisk).—*Parasadocus catharinensis* has been collected from Paraná (Piraquara) and Santa Catarina (Joinville, Rio dos Cedros*, São Bento do Sul*).

DISCUSSION

The main objectives of this study were to review and test the positioning of *Parasadocus catharinensis* comb. rest., a species

with a convoluted taxonomic history. The present study is an indispensable step towards understanding and resolving what was previously considered *Discocyrtus*.

Considering the internal systematics of Gonyleptidae, *P. catharinensis* comb. rest. is here transferred from Pachylinae to Roeweriinae as previously suggested by Pessoa-Silva et al. (2021). Some of the main diagnostic characters of Roeweriinae are clearly recognizable in *P. catharinensis* comb. nov. as (1) stylus sinuous (Figs. 5A–B, D–F), (2) apical portion of the stylus transversely flattened, with lateral winglets (Figs. 5D, F), (3) VP distal half trapezium-shaped (apical part reduced compared to basal) (Figs. 5A, C, E) and (4) Ch proximal margin with two spines on the ectal portion (Fig. 3A). However, as in *Bunopachylus* (see Carvalho et al. 2021), *P. catharinensis* comb. nov. does not possess the inverted T-shaped VP, which increasingly transforms this character into an important synapomorphy for the internal resolution of Roeweriinae.

Pessoa-Silva et al. (2021) also discussed the hypothesis of transferring *P. catharinensis* comb. nov. to *Discocyrtanus*. Even with the similarities among the genitalia and Fe IV of *P. catharinensis* comb. rest. and *Discocyrtanus* males (see Kury &

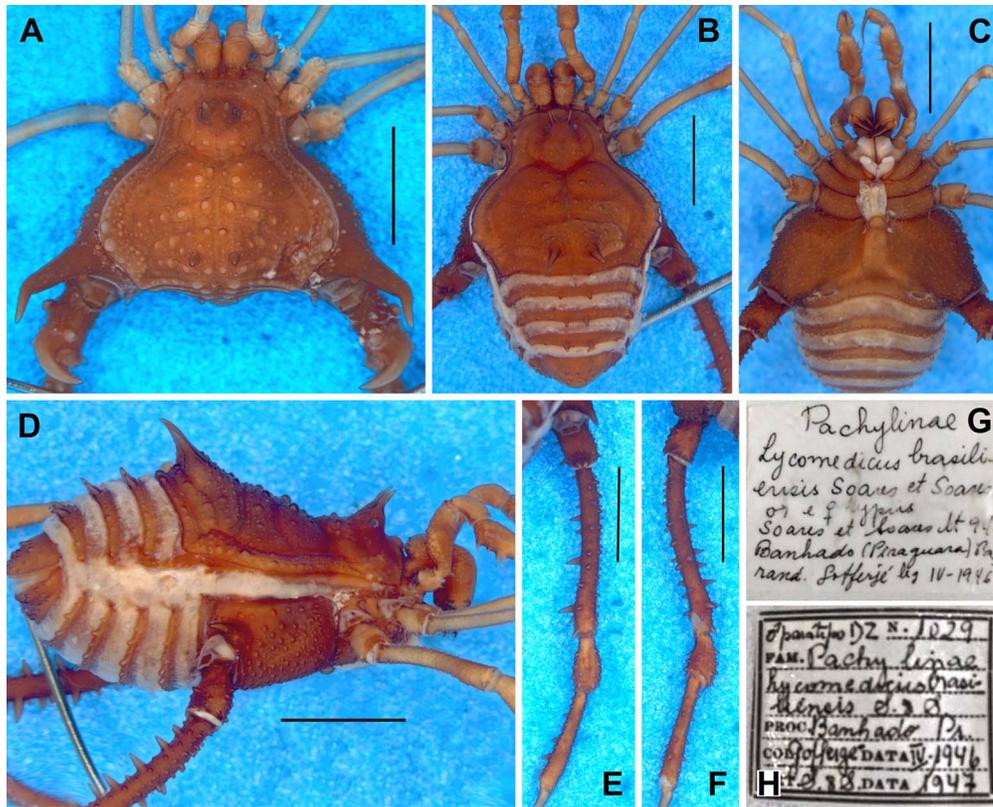


Figure 6.—*Parasadocus catharinensis* (Mello-Leitão, 1923), comb. rest.: A. Male paralectotype (MZSP 1029), habitus, dorsal view; B. Female paralectotype (MZSP 36165), habitus, dorsal view; C. Same voucher, habitus, ventral view; D. Same voucher, habitus, lateral view; E. Same voucher, Tr–Ti IV, dorsal view; F. Same voucher, Tr–Ti IV, retroventral view. G. Original label by Soares & Soares for the MZSP 36165 specimens. H. Current label of the MZSP 1029 specimen. Scale bars: 3 mm (A–F).

Carvalho 2016 and Carvalho & Kury 2017), a fundamental issue prevents this act. According to the cladistic result retrieved here (Figs. 1–2), *P. catharinensis* comb. rest. is the sister group of (*Roeweria* + (*Discocyrtanus* + *Amazochroma*)).

Therefore, the only way to have a monophyletic taxon that includes *P. catharinensis* comb. rest. and *Discocyrtanus* would be to synonymize the four genera in question (an implausible and undesirable taxonomic act that is not proposed here).

The possible close relation of *P. catharinensis* comb. rest. and *Sadocus* is denied by our results, which corroborates the data presented by Pessoa-Silva et al. (2021) (Figs. 1–2). Herein, *Sadocus* is recovered as the sister group of other Chilean genera (represented here by *Nanophareus* and *Neogonyleptes*) as shown by previous analyses (Pinto-da-Rocha et al. 2014; Benavides et al. 2021; Pessoa-Silva et al. 2021). However, even though currently all its members are included in Pachylinae, the clade (*Sadocus* + (*Nanophareus* + *Neogonyleptes*)) do not have any closer relation with Pachylinae *sensu stricto* (Fig. 1). This result contradicts the cladistical data from Pinto-da-Rocha et al. (2014) and reaffirms the data obtained by Pessoa-Silva et al. (2021), where *Sadocus* is pointed as a sister group of a clade composed of only Brazilian “pachylines” *sensu lato*.

Analyzing the geographic data, the distribution of *P. catharinensis* comb. rest. accessed here demonstrate its restricted association with the Atlantic province (Fig. 7). Such distribution pattern is unique inside Roeweriinae, given that both *Bunopachylus* and *Roeweria* have part of these occurrences also detected in the Araucaria Forest

province or Paraná Forest province (Bragagnolo & Pinto-da-Rocha 2009; Carvalho et al. 2021). As a final note, the record of *P. catharinensis* comb. rest. assigned to Itatiaia by Soares & Soares (1987) appears as an outlier in our distributional data. The identity of the nine males contained under the voucher MNRJ 1488 is here confirmed as *P. catharinensis* comb. rest., but its presence in “Itatiaia” seems to be contestable (Fig. 7). Beyond Soares & Soares’s (1987), specimens of *P. catharinensis* comb. rest. were never reported from (1) “Itatiaia” (both Minas Gerais and Rio de Janeiro regions) nor (2) São Paulo coast (a region well-sampled and studied concerning its opilionological biodiversity), the state of Brazil between Paraná (where the northernmost point of its distribution is recognized here) and “Itatiaia” (Fig. 7). Furthermore, (1) the region of “Itatiaia” has been sampled for Opiliones historically and recently, but no specimens of *P. catharinensis* comb. rest. have ever been collected, despite many other Opiliones taxa being there, and (2) it is not common in the Opiliones literature to find a species recorded in Santa Catarina and “Itatiaia” simultaneously (see records listed by Kury 2003). Based on these facts, even with the scarcity of vouchers analyzed here, the record of *P. catharinensis* comb. rest. from “Itatiaia” is here considered doubtful.

Focusing on the material used in this study, it is evident that the type material of *P. catharinensis* comb. rest. and its synonymous entities suffered losses over time. Currently, only the material attributed to “*Lycomedicus brasiliensis*” is still accessible (Figs. 4A–K, 6A–F), making this type material highly relevant to future studies covering *P. catharinensis* comb. rest. However, this material

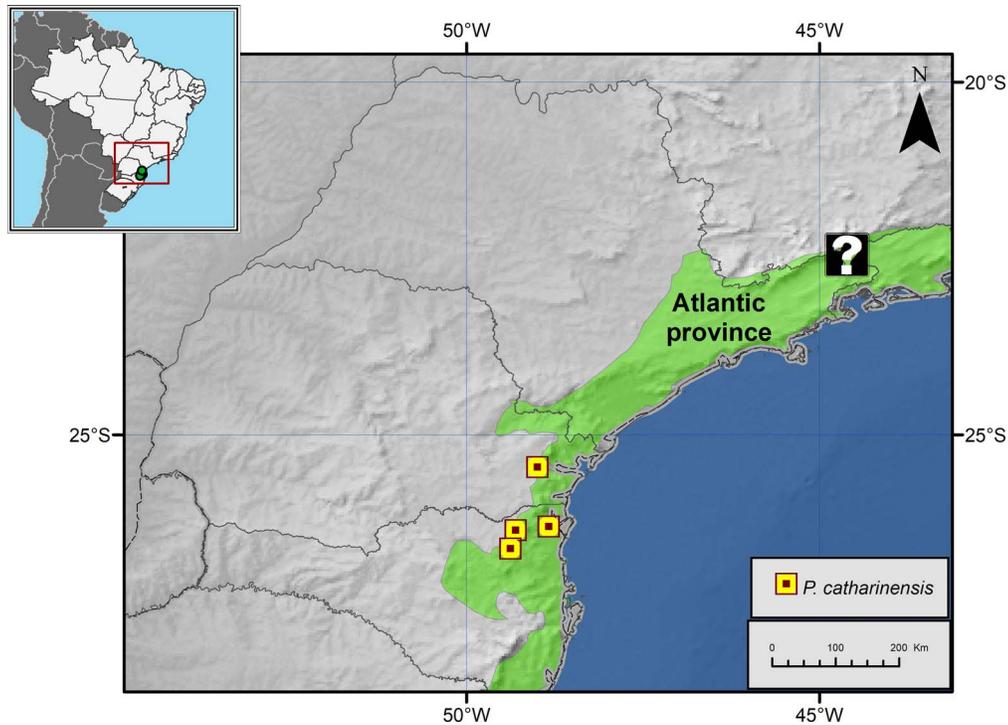


Figure 7.—Brazil, showing the expanded distribution of *Parasadocus catharinensis* (Mello-Leitão, 1923) comb. rest. The question mark indicates the locality of “Itatiaia”, which is probably doubtful. The green shaded area in the background represents the Atlantic province as proposed by Morrone (2014).

presents some problems regarding its identification since Soares & Soares (1949b: 53) did not clarify how many specimens are part of the type series (only mentioned as “Types: ♂ and ♀, in Gofferjé collection”). Accessing the labels of the “*L. brasiliensis*” material denoted as “types” (Figs. 6G,H) in the MZSP collection (which today preserves the material previously deposited in the CGPC collection), we found (1) a male and a female (currently numbered as MZSP 36165) designated as “types” (Figs. 4A–K, 6B–F) and (2) a male (currently numbered as MZSP 1029) designated as “paratype” (Fig. 6A). This “type/paratype” division pattern (without designation of a holotype) is explicitly mentioned by Soares & Soares (1949b: 55) in the description of *Piresa langei* Soares & Soares, 1949, where it is clear that all specimens in question must be treated as syntypes. Herein, considering the statement in Art. 72.4.1.1. from ICZN code (ICZN, 1999) [“For a nominal species or subspecies established before 2000, any evidence, published or unpublished, may be taken into account to determine what specimens constitute the type series”], as both specimens (MZSP 1029 and MZSP 36165) derive from the same collection event cited in the original description [Brazil, Paraná, Piraquara, Banhado, iv. 1946, Gofferjé leg.] (Figs. 6G,H), they must be considered syntypes of “*L. brasiliensis*”. As an extra step to stabilize understanding of the “*L. brasiliensis*” type series, the male specimen MZSP 36165 (Figs. 4A–K), which shows the same tarsal counts presented in the original male description, receives herein the status of lectotype. At the same time, the other syntypes treated herein acquire the status of paralectotypes (6A–F).

Such detailed information given here (from extensive investigative work based on type material and original descriptions) is not the primary focus of large genus or comprehensive revisions (which are even more time-consuming). However, some nomenclatural issues cannot be solved without a more focused historical/taxonomical

work, which provides a better understanding of the Gonyleptidae systematics and evolution.

ACKNOWLEDGMENTS

This study has been supported by: (1) 145594/2018–1 [scholarship grant] from the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), (2) E-26/205.766/2022 and (3) E-26/205.767/2022 [postdoctoral grants] from Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ) to R. N. Carvalho; and (4) 170412/2018-0 to M. Pessoa-Silva. The SEM micrographs were taken in the Center for Scanning Electron Microscopy of Museu Nacional/UFRJ (financed by PETROBRAS), with the kind assistance of Beatriz Cordeiro and Camila Messias. We thank Adriano Kury (MNRJ) and Ricardo Pinto-da-Rocha (MZSP) for giving us access to the material studied here. We are grateful to Adriano Kury for the revision and the criticisms made on the initial version of the manuscript. We also thank Alexandra Rizzo and Amanda Mendes (UERJ) for assisting R. N. Carvalho in their laboratory after the loss of the Laboratório de Aracnologia/MNRJ in the fire in 2018. Finally, we are grateful for the existence of the Omnipaper Project and the World Catalogue of Opiliones (WCO-Lite), both coordinated by Adriano Kury, for providing free access to Opiliones literature for the entire community.

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Manuscript received 18 May 2022, revised 27 September 2022, accepted 3 November 2022.