

PONTIFÍCIA UNIVERSIDADE CATÓLICA DO RIO GRANDE DO SUL  
FACULDADE DE BIOCÊNCIAS  
PROGRAMA DE PÓS-GRADUAÇÃO EM ZOOLOGIA

**PHYLOGENETIC RELATIONSHIPS OF THE WOLF SPIDER GENUS  
*ORINOCOSA* CHAMBERLIN, 1916 (ARANEAE, LYCOSIDAE)**

**Williams Paredes Munguía**

**DISSERTAÇÃO DE MESTRADO**

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**2013**

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**Orientador: Dr. Arno Antonio Lise**

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Dissertação apresentada como requisito para a  
obtenção do título de Mestre em Zoologia pelo  
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Aprovada em \_\_\_\_\_ de \_\_\_\_\_ de 2013.

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## **ADVERTÊNCIA**

Esta dissertação não é uma publicação válida, conforme descrito no capítulo 3 do Código Internacional de Nomenclatura Zoológica. Portanto, nomes novos e mudanças taxonômicas aqui propostas não têm validade para fins de nomenclatura ou prioridade.

## **WARNING**

This dissertation is not valid as publication, as described in the chapter 3 of the International Code of Zoological Nomenclature. Therefore, taxonomic changes and new names proposed here are not valid for nomenclatural or priority purposes.

Acredito na essencial unidade do homem,  
e, portanto na unidade de tudo o que vive.  
Por conseguinte, se um homem progredir espiritualmente,  
o mundo inteiro progride com ele, e se um homem cai,  
o mundo inteiro cai em igual medida.

**Mahatma Gandhi**



To my beloved mother Emilia  
Julia.

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## RESUMO

Poucas foram às pesquisas que tentaram resolver as relações filogenéticas de Lycosidae ate agora. Os estudos mais atualizados sob filogenia de Lycosidae usaram genes para descobrir e explicar as relações inter-genéricas das mesmas. Neste trabalho, se estudaram as espécies de *Orinocosa*, um gênero pouco conhecido da família Lycosidae distribuída mundialmente.

As espécies de *Orinocosa* foram analisadas para descobrir suas relações filogenéticas internas e externas. Analisaram-se um total de 27 táxons colocados como grupo interno e 25 táxons pertencentes a 16 gêneros, que formaram o grupo externo. Extraíram-se um total de 114 caracteres nesta análise, a maioria deles binários e discretos, entre sexuais e não sexuais. O grupo externo foi representado por pelo menos duas espécies das quatro subfamílias consideradas neste estudo, perfazendo um total de 52 táxons analisados. *Agalenocosa* foi um dos gêneros incluído numa matriz de dados filogenéticos aqui pela primeira vez. A construção da matriz de dados foi feita no programa Mesquite e as árvores resultantes, assim como a árvore de consenso, foram editadas no Winclada. Os dados foram analisados usando buscas heurísticas e posteriormente as Novas Tecnologias do software ASADO que usa os algoritmos de TNT e NONA juntos.

Esta análise resultou em um total de cinco árvores mais parcimoniosas, cada uma totalmente resolvida, com os seguintes valores para o consenso:  $L = 884$ ,  $Ci = 18$  e  $Ri = 40$ . O valor de suporte de Bremer para *Orinocosa* foi de dois; para o resto dos ramos variaram entre um e três. *Orinocosa sensu stricto* emergiu como um grupo polifilético. A nova proposta de *Orinocosa* é suportada por dois caracteres não-homoplásicos: ausência de órgão estridulatorio e a quilha ventral da Apófise Media reto. De todas as espécies revisadas que pertencem ao elenco de *Orinocosa*, o 60% delas não pertenceriam ao gênero. Em conclusão, apenas a fêmea de *Orinocosa aymara* corresponderia com a descrição original; as demais espécies não se encaixaram com o conceito de *Orinocosa* e serão transferidos baseando se nos caracteres genéricos diagnósticos. Das 21 morfoespécies de *Orinocosa*, somente 16 se agruparam dentro do gênero. As morfoespecies restantes se alocaram fora do gênero provavelmente por ter somente a fêmea em cada terminal. *Trochosa* resultou ser o grupo irmão de *Orinocosa*. Sugere-se no futuro, incluir mais espécies de *Trochosa* para obter resoluções mais amplas e completas.

## ABSTRACT

There are few studies that have tried to resolve the phylogenetic relationships of Lycosidae until now. The current studies on phylogeny used genes to discover and explain the intergeneric relationships of the family. In this work, all the *Orinocosa* species distributed worldwide and poor little known genus of Lycosidae was studied.

*Orinocosa* species were analyzed to discover their internal and external phylogenetic relationships. A total of 27 taxa were placed as internal group and 23 taxa belonging to 17 genera, which formed the outgroup were analyzed. A total of 114 characters were obtained in this analysis, most binary and discrete, between sexual and non-sexual. The out-group was represented by at least two species of four subfamilies considered in this study, making a total of 52 taxa analyzed. *Agalenocosa* was one of the genera included in a data matrix phylogenetic here for the first time. The construction of the data matrix was made in the program Mesquite and the resulting trees, as well as the consensus tree have been edited in Winclada. Data were analyzed by heuristic search and then the new technologies included in the software ASADO that uses the algorithms of TNT and NONA.

This analysis resulted in a total of five most parsimonious trees, each fully resolved, with the following values for consensus: L = 884, C = 18 and R = 40. The value of Bremer support to *Orinocosa* was two; for the rest of the branches varied between one and three. *Orinocosa sensu stricto* emerged as a polyphyletic group. The new proposal of *Orinocosa* was supported by two non-homoplasious characters: absence of stridulatory organ and ventral keel of Median Apophysis straight. From all species belonging and revised to the group of *Orinocosa*, 60% of them do not belong to the genus. In conclusion, the merely female of *Orinocosa aymara* correspond to the original description, the other species did not fit with the concept of *Orinocosa* and will be transferred based on the diagnostic generic characters in a future proposal. Of the 21 morphospecies of *Orinocosa*, only 16 were grouped within the genus. The remaining morphospecies were allocated outside the genre, probably because the only female in each terminal. *Trochosa* proved to be the sister group of *Orinocosa*. It is suggested in the future to include more *Trochosa* species to get wider and complete resolution.

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## APRESENTAÇÃO

A Família Lycosidae é a terceira família mais diversa de todas as aranhas com 2.393 espécies (Platnick, 2013). Podem ocupar vários habitats tais como desertos, floresta úmida amazônica e pântanos (Paredes, 2012). Estas aranhas se caracterizam porque as fêmeas carregam sua ooteca no abdômen e possuem o padrão de olhos 4-2-2. Também podem construir abrigos subterrâneos, sob a serrapilheira, fazer abrigos paralelos à superfície, bem como teias em forma de funil.

A taxonomia desta família foi resolvida principalmente nas regiões holártica (Hentz, 1842; Dondale & Redner, 1979; Brady, 1986; Kronstedt & Marusik, 2002; Marusik et al., 2003; Marusik et al., 2011), asiática (Wang et al., 2012), africana (Alderweireldt, 1991) e australiana (Framenau, 2002). Na região neotropical, os estudos taxonômicos ainda são escassos, mas a tendência é a aumentar por ser esta a terceira família de aranhas mais diversa no mundo (Platnick 2013) porém não a menos endêmica (Piacentini & Grismado, 2009). Segundo estimativas, na região Neotropical eles representariam um 8,82% de representatividade para famílias que ocorrem somente nessa região (Silva, 1996).

A posição taxonômica de vários gêneros neotropicais ainda é incerta, mas o progresso nas tentativas de agrupá-los e estudá-las continuam (Piacentini & Grismado, 2009; Piacentini, 2011; Santos & Brescovit, 2001; Silva & Lise 2009). Um claro exemplo de gêneros ainda não resolvidos é *Orinocosa*, que representa um problema taxonômico que se pretende resolver através de uma hipótese filogenética que seja concordante com uma posterior proposta de classificação taxonômica.

É, por tanto, que através de este artigo se visa, com ferramentas modernas resolver as relações filogenéticas internas das espécies do gênero *Orinocosa* bem como a sua relação com os demais gêneros de Lycosidae.

No artigo: "Phylogenetic relationships of the wolf-spider genus *Orinocosa* (Araneae: Lycosidae)" se propõe uma hipótese filogenética das espécies de *Orinocosa*. Este artigo será submetido na revista on-line Zoologica Scripta.

## PRESENTATION

Lycosidae is the third most diverse family of all spiders with 2393 species (Platnick, 2013). They are adapted to live in various habitats environments such as Amazonian jungle, deserts and wetlands (Paredes, 2012). These wolf spiders are characterized by carry their ootheca at the tip of the abdomen and have an eye patterns of 4-2-2. By the same way, they build underground shelters, on litter, making shelters parallel to the surface as well as funnel-shaped webs.

The taxonomy of this family have has been resolved mainly in the Holarctic (Hentz, 1842; Dondale & Redner, 1979; Brady, 1986; Kronestedt & Marusik, 2002; Marusik et al. 2003; Marusik et al., 2011), Asian (Wang et al., 2012), African (Alderweireldt, 1991) and Australian Region (Framenau, 2002). In the Neotropics, the taxonomic studies are still scarce, but the trend is increasing because this is the third most diverse family of spiders in the world (Platnick 2013) however not to less endemic (Piacentini & Grismado, 2009). According to estimates, in the Neotropical region they would represent the 8.82% of representatively for families that occur only in this region (Silva, 1996).

The taxonomic position of several Neotropical genera is still uncertain, but the constant efforts has been focused on resolve the taxonomic obscure position of some groups (Piacentini & Grismado, 2009; Piacentini, 2011; Brescovit & Santos, 2001; Lise & Silva 2009). A clear example of this uncertainty is the unresolved genus *Orinocosa*, which represent a taxonomic problem tentatively to be solved through a phylogenetic hypothesis that would be consistent with a subsequent proposal of taxonomic classification.

It is, therefore, that through this article seeks to solve with modern tools the internal phylogeny of the genus *Orinocosa* as well as their relationship with other genera from Lycosidae.

In the article entitled: "Phylogenetic relationships of the wolf-spider genus *Orinocosa* (Araneae: Lycosidae)" is proposed a phylogenetic hypothesis of species *Orinocosa*. This article will be submitted online in the journal *Zoologica Scripta*.

**PHYLOGENETIC RELATIONSHIPS OF THE WOLF SPIDER GENUS *ORINOCOSA*  
CHAMBERLIN, 1916 (ARANEAE: LYCOSIDAE)**

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**Abstract.**

*Orinocosa*, a little-known genus of wolf spiders, were analyzed to discover their phylogenetic relationships. Through an analysis of 114 characters, mostly binary and discrete, 27 taxa were placed as in-group and the remaining 25 formed the out-group. The out-group was represented by at least one species of each of the four subfamilies of Lycosidae included here making a total of 52 taxa analyzed. Species included in this study accounted for five of the six major biomes of the world. The algorithm used to analyze the matrix was heuristic search and "New Technologies" included in ASADO program. The analyze resulted in five most parsimonious trees of L = 884, Ci = 18 and Ri = 40, all fully resolved. In the consensus tree, *Orinocosa* emerged as a polyphyletic group. *Trochosa* was the sister group of *Orinocosa* and it is suggested to include more species of *Trochosa* in future analyses to obtain more consistent resolutions. The 60% of described *Orinocosa* species do not belong to the genus. The new proposal of *Orinocosa* is supported by two putative diagnostic characters: absence of stridulatory organ and ventral keel of Median Apophysis straight.

**Key words:**

*Systematic, wolf spider, evolution, Neotropical region, biogeography*

## Introduction

The division into subfamilies within Lycosidae Sundevall 1833 was very intricate over time. The first proposals for divisions began with Simon (1892, 1898), who divided the family into groups without emphasizing important diagnostic morphological characters such as the genitalia. Then, Petrunkevitch (1928), Roewer (1959, 1960) and Homann (1971) proposed more subdivisions at subfamily level. Those previous proposals were then discussed by Platnick (1979) considering some plesiomorphic characters. Subsequently, Dondale (1986) proposed another division that included five subfamilies: Allocosinae, Lycosinae, Pardosinae, Venoniinae and Sossipinae, presenting a rudimentary phylogenetic hypothesis based mainly on morphology of the male palp. Within the Dondale's proposal, Lycosinae Simon 1898 would be divided into two groups. One group named as *Trochosa* group C. L. Koch, 1847 consisting of *Hogna* Simon, 1885, *Geolycosa* Montgomery, 1904, *Hippasa* Simon, 1885, *Ocyale* Audouin, 1826, *Hesperocosa* Gertsch & Wallace, 1937 and *Schizocosa* Chamberlin, 1904 recognizable by possessing the terminal apophysis at the base of the embolus and the tegular lobe ear-shaped function as conductor. The *Lycosa* group, composed by *Lycosa* Latreille, 1804, *Arctosa* C. L. Koch, 1847, *Alopecosa* Simon, 1885, *Varacosa* Chamberlin & Ivie, 1942, *Hygrolycosa* Dahl, 1908 and *Melocosa* Gertsch, 1937, recognized by possessing the terminal apophysis lobe like, situated on retrolateral margin of palea. Seven years later Zyuzin (1993) suggests the formation of three Lycosinae's tribes (Trochosini, Hippasini and Lycosini) stating that there is a functional correspondence of the male median apophysis ventral spur and the atrium of the female epyginal septum during the copula. However, after the results of molecular analysis of Vink et al (2002) they found that Dondale's and Zyuzin's proposals form polyphyletic groupings.

Within all this controversy, many new proposed genera historically described to date, were not discussed about its phylogenetic position amongst others existing genera nor on their position within a subfamily. Such is the case of *Orinocosa* Chamberlin 1916, a genus composed of ten species worldwide distributed mainly from mountainous habitats never revised until now. The systematic position of this genus is uncertain and the limits thereof were not defined because the male of the type species is still unknown.

During the expedition of the University of Yale in 1911 in Peru, Dr Foote collected many arachnids and all these specimens were deposited in the Museum of Comparative Zoology,



Harvard University. From all this material, 82 species and 12 new genera of arachnids were described by Chamberlin (1916) and among them the type species of the genus *Orinocosa* were erected based on the single female of *Orinocosa aymara* Chamberlin, 1916 from Santa Ana, Cusco. Subsequently six more species were included in the genus, where some of them (*Orinocosa guentheri* (Pocock, 1899) (♂♀), *Orinocosa stirlingae* (Hogg, 1905) (♂♀), *Orinocosa paraguensis* (Gertsch & Wallace, 1937) (♂), *Orinocosa pulchra* Caporiacco, 1947 (♂♀), *Orinocosa priesneri* Roewer, 1959b (♂) and *Orinocosa celerierae* Cornic, 1976 (♂♀)) were described from either both sexes or only males without having established the diagnostic characters for the males of the genus. The remaining three species were described based on females and juveniles only (*Orinocosa securifer* (Tullgren, 1905) (juv), *Orinocosa hansii* (Strand, 1916) (♀) and *Orinocosa tropica* Roewer, 1959 (♀)). This means that 60% of the species were described without having established diagnostic characteristics for males. This disorder need to be resolved to know the position of the species of the genus *Orinocosa* as well as the position of the genus within the family Lycosidae. Henceforth, the taxonomic position of the new taxa described should be discussed addressing their relations with other groups already described. Also, try to place them in any existing subfamily suggesting some possible subsequent phylogenetic relationships.

The goal of this paper is therefore to propose a phylogenetical hypothesis of evolutionary relationships of the *Orinocosa* species as well as discover the taxonomic position of the genus and compare this with previous proposals. The diagnostic structures to *Orinocosa* were used to compare them with the Zyuzin and Dondale's structures used on their tests. First, it is likely that *Orinocosa* may belong to Lycosinae because males possess the Median Apophysis disposed transversely to the cymbium and females have a T-shaped format of the septum which would grouping them with the rest of the *Trochosa* group. Second, according to the groupings within Lycosinae proposed (Dondale, 1986; Zyuzin, 1993) and comparing the morphology of the terminal apophyses and tegular lobe, *Orinocosa* tentatively should fit in the group or tribe *Trochosa*. The *Orinocosa* position and the relationship of its species are tested here as well as discussion about the morphology of the new male described here.

## Materials and Methods

### *Specimens*

All the specimens examined in this study belong to the following institutions (abbreviations and curators in parentheses). All institutions appear from North to South and from Holarctic to Neotropical main collections:

Museum of Comparative Zoology, Harvard University, Cambridge, USA (MCZ, G. Giribet); American Museum of Natural History, New York, USA (AMNH, N.I. Platnick); California Academy of Sciences, San Francisco, USA (CAS, C.E. Griswold); Museo di Storia Naturale Firenze, ITALY (MZUF, L. Bartolozzi); Forschungsinstitut und Naturmuseum Senckenberg, Senckenberg, Frankfurt, GERMANY (SMF, P. Jaeger); Colección de Aracnología del Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, COLOMBIA (ICN, Dr. E. Flores); Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Bogotá, COLOMBIA (IAvH, C. A. Medina Uribe); Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, PERU (MUSM, G. Lamas); Museu Paraense Emílio Goeldi, Belém, BRASIL (MPEG, A.B. Bonaldo); LAMG – Laboratório de Aracnologia, Universidade Federal de Minas Gerais, Belo Horizonte (A.J. Santos); Instituto Butantã, São Paulo, BRAZIL (IBSP, D.M Barros-Battesti); Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, BRASIL (MNRJ, A.B. Kury); Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, BRAZIL (MCN, R. Ott); Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, BRAZIL (MCTP, A.A. Lise)

### *Morphological Abbreviations*

**MLB**, Median Longitudinal Band; **AME**, Anterior Median Eyes; **ALE**, Anterior Lateral Eyes; **PME**, Posterior Median Eyes; **PLE**, Posterior Lateral Eyes; **LA**, Labium; **EN**, Endites; **ALS**, Anterior Lateral Spinnerets; **PLS**, Posterior Lateral Spinnerets; **TA**, Terminal Apophysis; **STA**, Subterminal Apophysis; **C**, conductor; **E**, embolus; **PP**, Pars Pendula; **ST**, subtegulum; **T**, tegulum; **VA**, ventral apophysis of tibia; **MA**, median apophysis; **RTA**, retrolateral apophysis of

tibia; **DG**, Dorsal Groove; **CD**, copulatory duct; **CO**, copulatory opening of epigynum; **EA**, Epigynal Atrium; **FD**, fertilization duct; **HS**, head of spermatheca; **HSm**, Mast of the Head of Spermatheca; **LL**, lateral lobes of epigynum; **LS**, Longitudinal Septum; **TS**, Transversal Septum, **ML**, median lobe of epigynum; **MS**, median sector of epigynum; **STP**, sclerotized tegular process; **BS**, base of spermatheca; **VK**, Ventral Keel.

### ***Laboratory procedures***

All individuals were examined and measured immersed in 80% alcohol under a Leica MZ 12.5 stereomicroscope. Original figures from this study are referred to throughout the text as 'Fig/Figs', and figures published elsewhere as 'fig/figs'. All measurements are in millimetres. Female internal genitalia were dissected, cleaned and immersed on tripsine enzymatic solution at room temperature for 24h, then examined submersed in clove oil (Levi 1965). To examine the male copulatory apparatus, the pedipalpi were immersed in a 10% warm KOH solution for about 5 minutes and then transferred to distilled water for complete expansion. Expanded pedipalpi were examined immersed in alcohol or, for visualization of internal details, in clove oil. Drawings were made using a Camera Lucida. For scanning electron microscopy all structures were excised from the individuals. The structures were critical-point dried before mounting on stubs with double-face adhesive tape or on the tip of metal pins. This material was sputter coated with gold and examined under a Phillips XL-30 (EDS) SEM microscope at Electron Microscopy and Microanalysis Center (CEMM), Pontifícia Universidade Católica do Rio Grande do Sul.

### ***Phylogenetic Analysis***

The matrix of characters included 17 genera, represented in some cases by more than one species per genera. Additionally, seven of the ten *Orinocosa* species described to date (Table 1), as well as 21 new *Orinocosa* morphospecies were included (Table 2). The material was chose considering its availability and geographical distribution. The representatives of each genus within Lycosinae were chosen following the Dondale's grouping criteria (Dondale, 1986). From *Lycosa* group, three species of *Arctosa* were included, one from the Holarctic region and two

from the Neotropical. Three species of *Lycosa* and one of *Alopecosa* were included too, representing the 50% of all this grouping. From *Trochosa* group, *Trochosa*, *Hippasa*, *Schizocosa* and *Ocyale* were included and represented the 71.42% of all the grouping. At least one species of each subfamily were included in this analysis: Lycosinae (16spp); Sossipinae (3spp); Piratinae (2spp); Pardosinae (2spp); Allocosinae (1sp) and Evippinae (1sp) previously included in a phylogenetical analysis (Vink et al 2002). All the Lycosidae species included in this analysis are worldwide distributed representing five of the six biogeographical regions. *Orinocosa* has a good representativeness because were recorded in five of the six biogeographic regions too (Platnick, 2013), however all the new morphospecies were restrictedly distributed to Neotropics.

The character matrix was assembled and edited using Mesquite (Maddison & Maddisson 2011), Inapplicable characters were inserted as "-" and those unknown characters were scored as "?". Inapplicable states were coded when a character state did not apply for an absence of one character. When the specimens examined were not in a good state of preservation or the information obtained came from not detailed previous characters discussed, they were coded as "?". Taxonomic information generated in Alvarez (2009) was used to codify *Lycosa tarantula* (Linnaeus, 1758). The software "ASADO" Version 1.89 was chosen for the matrix data analysis. The choice was because this software integrates both Nona algorithms as TNT (Goloboff et al. 2003). All characters were selected and treated as non-additive (Fitch) to avoid the default series transformation option. When characters were treated as non-additive meant that were not assumed that states passed from 0 to 1 and 1 to 2 automatically, but the series of transformation would be treated as disarrayed. The first heuristic analysis was performed by an unconstrained search with Multiple TBR+TBR (mult max) and 300 replications retaining 100 trees per replica. Finally was subjected to analysis with New Technologies. The following options were then activated: Ratchet, Drift, Tree Fusion and TBR-Max simultaneously with 200 iterations and drifting 50 trees per iteration.

The resulting shortest trees were filtered looking for duplicate trees of any length and then a strict consensus (Nelsen) was performed saving it on the temporal memory RAM. Branch support was estimated through the Bremer Support. The first measures support of a clade as the minimum length of suboptimal trees in which the clade is not fully supported by the data, collapsing in the strict consensus (Goodman et al 1982; Bremer 1994).

The trees were rooted in *Xerolycosa nemoralis* considering the ultimate findings of Murphy (2006) and Vink et al (2002) and considering being the most ancestral taxon in this data matrix. Of the 52 species coded, 114 characters were analyzed, avoiding as much as possible multistate characters and preferring in most cases binary characters following the principle of parsimony (Wiley et al 1991). The characters were extracted after reviewed previous analysis on Lysocoidea and some genera of Lycosidae (Alvarez, 2009; Silva, 2003; Stratton, 2005; Langlands & Framenau, 2010; Marusik et al 2011; Griswold et al 2005; Griswold, 1993; Santos 2007; Framenau & Baehr, 2007).

Species	Country	Sex	Depository	Author	Revised
<i>Orinocosa aymara</i> Chamberlin, 1916	Peru	♀ -	MCZ	Chamberlin, 1916	Yes
<i>Orinocosa celerierae</i> Cornic, 1976	Ivory Coast	♀♂	MNHN	Cornic, 176	Yes
<i>Orinocosa guentheri</i> (Pocock, 1899)	Iran	♀♂	BMNH	(Pocock, 1879)	No
<i>Orinocosa hansii</i> (Strand, 1916)	Southern Africa	♀-	SMF	(Strand, 1916)	Yes
<i>Orinocosa paraguensis</i> (Gertsch & Wallace, 1937)	Paraguay	- ♂	AMNH	(Gertsch & Wallace, 1937)	Yes
<i>Orinocosa priesneri</i> Roewer, 1959	Egypt	- ♂	SMF	Roewer, 1959	Yes
<i>Orinocosa pulchra</i> Caporiacco, 1947	Guyana	♀♂	MZUF	Caporiacco, 1947	Yes
<i>Orinocosa securifer</i> (Tullgren, 1905)	Argentina	juv	NHRM	(Tullgren, 1905)	No
<i>Orinocosa stirlingae</i> (Hogg, 1905)	New South Wales	♀♂	SAMA	(Hogg, 1905)	No
<i>Orinocosa tropica</i> Roewer, 1959	Uganda	♀ -	SMF	Roewer, 1959	Yes

**Table 1.** Checklist of *Orinocosa* species revised and not revised in this work. Not all the species have both sexes and one species is a juvenile (Platnick, 2013). **SAMA** South Australian Museum, Adelaide; **NHRM**, Naturhistoriska Riksmuseet, Sweden; **BMNH**, British Museum (Natural History), London

## Phylogenetic Characters

### *Carapace*

**01** *Carapace profile in lateral view in both sexes*: (0) different in both sexes; (1) the same in shape, both trapezoidal or wedge shaped.

In this case specimens were observed in lateral view as in the case of the Char 67 of Silva (2003). Due to the evidence of fossorial behaviour in some Lycosidae species of *Geolycosa*, *Pardosa* and *Lycosa*, through this character an attempt to explore the influence of the difference in the wedge or trapezoidal shaped state of the carapace was performed. In the state (0) all females had the trapezoidal carapace profile excepting in *Orinocosa* sp B3 where female has wedge shaped and male trapezoidal. In the case of *Aglaoctenus lagotis*, *Aglaoctenus castaneus*, *Lycosa tarantula* and *Arctosa perita* all males had wedge shaped carapace and females trapezoidal. The state (1) was coded for species where both male and female had the trapezoidal shape; the majority of taxa presented this state.

**02** *Carapace hirsute*: (0) absent; (1) present (Fig 44).

This term was extracted from Jocque & Dippenaar-schoeman (2006) to recognize the presence of setae on the dorsal carapace side. The carapace surface posses setae that form distinguishable patterns in dorsal view. When it is not present the dorsal surface can be shiny or dull. Dully carapace was present in *Orinocosa paraguensis* and *Allocosa avara* only (Fig. 44). Both species were codified as (0) in the matrix. The rest of taxa were codified as (1) because there is a distinguishable pattern of bristles (Fig. 31; 36)

**03** *Median Longitudinal Band (MLB)*: (0) present (Fig. 31, 36, 45); (1) absent (Figs. 44, 94)

MLB is recognized here as a different colored line running through the middle dorsal carapace which may or may not be including some spots or patterns that recur at generic level. The nature of this character is analyzed to see how it affects the grouping of genres. *Allocosa funerea* and *Orinocosa paraguensis* were the only ones who did not possess this MLB, therefore was codified as (1). The rest of the taxa present MLB.

**04** *Median Longitudinal Band (MLB), shape*: (0) Y shaped; (1) irregular shaped; (2) Straight and thin; (3) straight and uniform in all its extension; (4) Straight and tapered towards the thoracic

division; (5) Straight and tapered towards the thoracic division and containing two dots just behind the ocular area; (6) Tapered towards the cephalic area and containing two parallel lines starting just behind the ocular area; (7) tapered towards the thoracic area with a tuning fork-shaped stripe behind the ocular area. The patterns contained in MLB varied into generic level. The state (0) grouped the two Sosippinae species; the V shaped stripe pattern is behind the fovea (Santos & Brescovit, 2001: Plate 1, figs a & b). The state irregular (1) was present only in Lycosinae species as *Ocyale* sp, *Arctosa perita* (Fig. 16) and *Arctosa* sp. nov. In *Pirata* species the tuning fork shaped is visible and notorious but the apex is ahead of the fovea (2) (Dondale & Redner, 1990: figs 384, 403 & 420). The state (3) was present in *Lycosa tarantula*, *Hogna yauliensis* (Brescovit & Alvarez, 2011; fig. 6), *Trochosa terricola* and *Orinocosa hanshi* which meant that only one species of the ingroup possessed this character. The state (4) was present in Pardosinae, Allocosinae and Lycosinae species. This state could be useful to test the grouping of these three subfamilies according to Dondale's criteria (Dondale, 1986). The state (5) was present in the majority of the ingroup excepting in some morphotypes. *Orinocosa aymara* presented this pattern and it served to recognize other *Orinocosa* females. Males also presented this state being useful to match them with females. In the type-species of *Trochosa*, *Trochosa ruricola* (De Geer, 1778) is diagnosed by the presence of a pair of two longitudinal stripes in the MLB between the posterior margin of ocular quadrangle and the fovea (state 6 in this matrix). This pattern was present in *Trochosa terricola* and two *Orinocosa* species. The state (7) was grouping Piratinae species and was not present in any other terminal. The analysis of this character was previously considered and discussed in any previous phylogeny of the *Schizocosa* genus (Stratton, 2005; Ch 2)

**05** *Whitish line of setae throughout the lateral border of the cephalothorax:* (0) absent; (1) present. Present in *Ocyale*, *Pirata* and Gen Nov aff *Trochosa*. This refers to a row of white setae noticeable and distinct that runs along the submarginal area of the cephalothorax.

**06** *Submarginal stripes in males:* (0) present (Fig. 57); (1) absent (Fig. 87)

This character was present in most of the taxa (Table 1). Coded as (0) in *Aglaoctenus* spp, *Pardosa* spp. some *Lycosa* spp., *Hippasa* sp, *Schizocosa ocreata*, *Arctosa* spp. and *Hogna*. Some *Orinocosa* spp. has submarginal stripes. Its absence (1) was only coded in *Orinocosa hanshi*,

*Orinocosa pulchra*, *Ocyale* sp, *Alopecosa kochii*, *Xerolycosa nemoralis* and *Lycosa schenkelli* all of them considered Lycosinae.

**07 Submarginal stripes in females:** (0) present; (1) absent. In the case of *Lycosa schenkelli*, *Arctosa perita*, Gen Nov aff *Trochosa*, *Orinocosa* sp. D and *Orinocosa* sp. P females did not present the submarginal stripes when males had present. Probably these sexual differences could influence visually the male courtship and determine the copula.

**08 Pars cephalica (caput):** (0) marked (Fig 45); (1) inconspicuous (Fig 94).

Named as cephalic region of the cephalothorax by Jocque & Dippenaar-Schoeman (2006) this character was marked in both *Aglaoctenus* species in this analysis, *Pardosa lugubris* and *Arctosa* sp. nov. (Brazil). The majority of terminals in this study have an inconspicuous pars cephalica.

**09 Sternum general pattern:** (0) totally light; (1) with an incomplete transversal median band; (2) with a complete transversal median band; (3) totally dark (Fig 88).

Interpreted by Stratton (2005) as (0) for states from yellow to light brown and (1) for orange, black or dark brown. Here is reinterpreted in a simplified way as light (0) and dark (3) because the other intermediate states were scored depending on the size of the median band. Totally light (0) was coded in the majority of taxa. This means that the sternum was clearer than the coxae. In most cases, this clearly meant to be yellow to light yellow. The state (1) was founded only in *Orinocosa aymara* and *Aglaoctenus lagotis*; in that case, the incomplete band was clearer than the background and regular in shape. The complete median band (2) grouped *Aglaoctenus castaneus*, *Pardosa fastosa*, *Lycosa thorelli*, *Hippassa* sp, *Hogna yauliensis*, and Gen Nov Aff *Trochosa*; no *Orinocosa* was codified for this state. Coded as (3) when dark as in *Xerolycosa nemoralis*, *Allocosa funerea*, *Lycosa tarantula*, *Alopecosa kochii* and *Orinocosa hansii*. Apparently the state (3) was restricted only for Allocosinae and Lycosinae.

**10 Posterior part of the sternum, shape:** (0) not projected between coxae; (1) slightly projected between coxae IV; (2) notoriously projected between coxae IV forming a knife-shaped projection.

Named as “sternum base” by Silva (2003) is here defined as the posterior area near the coxae IV



that could be projected or not in different degrees. The interpretation was modified from Silva (2003). The state (0) is when this part is not projected between coxae IV (Fig. 90). This state was restricted for *Arctosa* and some *Orinocosa* species. In the state (1) is where the sternum is projected but not necessarily passes through between the coxae. It is present in *Aglaoctenus oblongus* where the coxa is notoriously projected between coxae IV. Within the in-group this character varied in its three states. Similarly was present in few species where the base was not projected.

**11 Diameter of AME in relation to the Clypeus height, length:** (0) the diameter of the AME larger than the clypeus height; (1) both lengths equal; (2) the diameter of the AME less than the clypeus height.

**12 Labium:** (0) longer than wide (Fig. 106); (1) wider than long (Fig. 108); (2) as wider as long (Fig. 24, 41).

Each measurement was taken in ventral view from each of the outermost edges of the labium.

**13 Cheliceral boss:** (0) present; (1) absent

The boss is a retrobasal swelling on the paturon that varies in size and shape (Ch 43, Griswold et al 1995: figs 129 A, C-D). Treaty as absent in many lower araneomorphs according to Griswold et al (2005: figs 126A, 128A) in this study were coded as absent in a few taxa as *Allocosa*, *Pardosa* and a species of *Orinocosa*. The presence of this character did not imply the size or development.

**14 Cheliceral boss:** (0) developed; (1) not developed.

Griswold et al (2005, Ch 44) codified the developmental stages of this structure as small and large. Here developed (0) is treated as large and not developed (1) as small (Fig. 43). (Griswold et al 2005, figs 129C-D).

**15 Disposition of endites:** (0) convergent, teardrop shape (Fig 24); (1) parallel, rectangular shape (Fig 41).

The endites are the basal segment of the palpus, also called maxilla or gnathocoxa (Jocque &

Dippenaar-schoeman, 2006). The stated of this character varied both in the outgroup as in the ingroup however, a patterns was observed in all taxa. Both forms such as teardrop-shaped were always convergent (0) and all rectangular shapes were always presented as parallel in all cases (1).

**16** *Chilum, in males*: (0) present; (1) absent. Chilum is a small sclerite at base of chelicerae, just under clypeus (Jocque-Dippenaar-schoeman, 2006). This character was codified for each sex because differences were observed. Independent of the sex, in some species was not clearly visible because of the poor preservation of the specimen.

**17** *Chilum condition in males*: (0) divided (bilateral) (Fig. 111); (1) entire (median).

**18** *Chilum in females*: (0) present; (1) absent.

**19** *Chilum, condition in females*: (0) divided (bilateral) (Fig 43); (1) entire (median) (Fig 39)

In all males and females where the chilum was present, it was not always had the same state in both sexes (entire or divided), i.e. not always both sexes showed the same state of the chilum. This variation occurred in approximately 10% of all terminals. The reinterpretation from Griswold et al (2005) contemplates in this case codify separated by sexes.

**20** *Cheliceral furrow promarginal teeth, number*: (0) three (Fig 23); (1) two.

The variation of teeth and denticles has been discussed in Silva (2003) after analyzing *Cyclotenus* species (Ctenidae) and some components of outgroup analyzed in this work. As stated by Silva (2003) in its Ch 73 promarginal teeth appear to be more stable than retromarginals. In Lycosidae, Enghelhardt (1964) made remarkable observations in reference to the instraespecific variation of teeth in *Trochosa spinipalis* which effectively observed variation of promarginal teeth.

In this work, throughout the ingroup promarginal teeth were always three. The retromarginals also was three in number excepting *Orinocosa hansii* who had two (Fig. 98).

**21** *Cheliceral furrow retromarginal teeth, number*: (0) three (Fig 13) (1) two

**22** *Ratio Total Chelicera length/ cheliceral fang length, in frontal view:* (0) cheliceral fang length less than half the chelicerae total length; (1) cheliceral fang same length than the half total length of the chelicera; (2) cheliceral fang length more than the half eh chelicerae total length. (0) was coded in the majority of the taxa included in this analysis. (1) *Orinocosa* sp B3, The state (2) is present in *Pirata piraticus*, *Orinocosa tropica*, *Orinocosa* sp G and *Orinocosa* sp I. This proportion was never previously evaluated in Lycosidae

**23** *Notch at the base of the labium:* (0) absent; (1) present.

This character was analyzed based on the description by Chamberlin (1916: plate 25 fig 7). The position of this notch is very variable but the presence or absence was noticed. In the same way, this could explain in some way the relationship with the other species of the ingroup.

**24** *Labium, shape:* (0) trapezoidal; (1) quadrangular. Regarded as trapezoidal (Fig. 106), this character was present and shared in six outgroup taxa and in two ingroup taxa (*Orinocosa* sp B3 and *Orinocosa hansii*). Trapezoidal meant that distal part was shorter than the basal. The condition of quadrangular (Fig. 108) was present in most of the terminals analyzed and mean that measures of both extremes (distal and proximal) did not differ significantly.

**25** *Sternum, size:* (0) longer than wide (Piacentini, 2011; fig 14b); (1) as longer as wide; (2) wider than longer.

### ***Ocular area***

**26** *Alignment of the ALE and AME eyes, in frontal view:* (0) procurved (Fig 22); (1) recurved; (2) straight (Figs 14, 111). The alignment of the eyes was observed in frontal view. In the ingroup procurved condition prevailed and it was present in *Orinocosa aymara*. The state straight (2) was more common in the outgroup.

**27** *ALE position:* (0) over a protrusion of the cephalothorax (Fig. 104); (1) not over any protrusion.

Eyes when positioned directly on the cephalothorax show no protrusion. The boundaries of the cornea of the ALE are fused directly to the cephalothorax. When there is a protrusion in the case of the two species of *Aglaoctenus*, the cornea of the ALE are not directly in contact with the cephalothorax but with an elevation of this (Piacentini, 2011; fig 19e).

**28 ALE diameter:** (0) as AME (Piacentini, 2011; fig 19e); (1) bigger than AME; (2) about half or less AME (Fig. 93).

**29 Distance between both PME:** (0) less than the diameter of PME; (1) equal to the diameter of PME; (2) more than the diameter of PME. The inter-distances were measured in frontal view from the tangent to the lens between them.

**30 Clypeal condyle:** (0) present (Figs 5, 69); (1) absent.

This character was observed in the newly described species of *Navira* by Piacentini & Grismado (2009, Fig 73) treated this character as typical of this Neotropical genus. Almost all species of the ingroup possess this structure, excepting *Orinocosa hansii* and *Orinocosa paraguayensis*.

**31 PLE resting position:** (0) on a protrusion; (1) not on a protrusion. This character was coded as (0) in both species of *Aglaoctenus* (Piacentini, 2011; figs 14a, c), the rest of terminal was coded as (1).

### ***Legs***

**32 Annuli on the femora:** (0) absent; (1) present (Figs 28, 32)

The annuli is recognized here as a complete set of circular bands that are present mainly in the femora and may occupy the full extent of the tibiae sometimes. This structure is present in the holotype *Orinocosa aymara* and could possibly be useful to resolve generic relationships with other genera that belong or not Lycosinae. (Griswold, 1993; char 55; Silva, 2003; char 94)

**33 Tarsi:** (0) straight; (1) slightly bent. (Silva, 2003; Char 116).

The straight tarsi were present throughout the ingroup, excepting *Orinocosa* B4 sp. The reinterpretation of this character considered only two of the three states observed by Silva (2003)

**34** *Tarsus I and II, scopula females*: (0) present (Logunov, 2010; Fig 16); (1) absent (Fig x).

This brush of setae was restrictedly distributed on the ventral side of the tarsi and is designed to improve grip on substrate or prey (Jocque & Dippenaar-schoeman, 2006). The presence of this structure could be related to wandering habits.

**35** *Tarsus III and IV, scopula females*: (0) present (Logunov, 2010; Fig 17); (1) absent.

**36** *Tarsus I and II, scopula males*: (0) present; (1) absent

**37** *Tarsus III and IV, scopula males*: (0) present; (1) absent

**38** *Tarsus I & II, spinules, males*: (0) absent; (1) present

“Spinules” is a term that refers to the same structures that Zyuzin (1990) and Logunov (2010; figs 16-17) used to refer to a set of fairly thick setae ventrally distributed in the tarsus. These structures were present in *Lycosa tarantula* and the scoring of this character was extracted from Logunov (2010). In many cases the spinules were present on legs III and IV both in ingroup as outgroup. There were always present in the legs I and II. When present was always orderly.

**39** *Tarsus III & IV, spinules, males*: (0) absent; (1) present

**40** *Tarsus I & II, spinules, females*: (0) absent; (1) present

**41** *Tarsus III & IV, spinules, females*: (0) absent; (1) present

**42** *Coloration on the male leg I and or II different from the III and IV. The coloration becomes different from the distal half of the tibia and keeps the same until the end of the tarsus*: (0) absent (Fig 92); (1) present (Figs 52, 58). In some genera as *Trochosa*, *Orinocosa* and *Schizocosa* the coloration of the male I and II legs suffered a modification in the tegument which turns them different in coloration, frequently clearer than the rest of the articles; it could involve a role during male courtship. This character is associated only to males.

**43** *Setae with the curled apex on all the legs*: (0) absent; (1) present (Fig. 89)

These setae either cover all sides of all legs. Were observed also covering other parts of the body, particularly the abdomen but less concentrated than in the legs. These setae have the apex curved and seem to help to keep the individual on water to avoid breaking out surface tension.

**44** *Iridescent scales on male femora*: (0) absent; (1) present (Fig 86)

There are modified scale-like setae with iridescent properties. These setae are distributed on the prolateral side of all femora. Possibly are involved in male courtship and be exclusive of males although these scales were found in the female of *Orinocosa* sp C.

**45** *Female palpal tarsus, claw*: (0) short (Fig 105); (1) median size; (2) large

The proportion of short claws (0) and median claws (1) was distributed in similar proportions among all taxa. It is considered state (0) when the claw teeth end with the most distal part of the claw. Median was considered when there is a projection besides of the claw teeth; large was scored when the most distal portion of the claw exceeded almost in twice its total length.

### ***Abdomen***

**46** *Heart mark*: (0) present; (1) absent.

Also named as cardiac mark, it is a lanceolate mark on the antero dorsal abdominal surface. Sometimes is irregularly shaped and is located on the heart. It was absent in *Pardosa lugubris*, *Lycosa schenkelli*, *Arctosa* sp nov (brasil), *Orinocosa pulchra* and *O. tropica*. The rest of taxa had present.

**47** *Heart mark, shape*: (0) irregular or poorly visible (Fig 19); (1) arrowhead shaped; (2) fusiform-shaped (Fig 90)

**48** *Female colulus*: (0) absent; (1) present (Fig 110)

**49** *Basal segment of the Antero Lateral Spinneret (ALS), diameter* : (0) equal to the length of the

basal segment; (1) a half the length of the basal segment; (2) less than half of the length of the basal segment; (3) more than the half of the length of the basal segment (Fig. 109)

**50** *Basal Segment of the Postero lateral Spinneret (PLS)*, diameter: (0) equal to the length of the basal segment (Fig. 42); (1) a half the length of the basal segment; (2) less than a half the length of the basal segment (Fig. 27); (3) more than a half of the length of the basal segment (Fig. 109).

**51** *Length of the distal segment of the PLS*: (0) the same the length of the basal segment; (1) a half the basal segment length of the PLS; (2) less than a half the length of the basal segment of the PLS (Fig 76).

**52** *ALS shape (aspect of the basal segment)*: (0) truncated cone; (1) cylindrical (Figs. 27, 40, 47, 76). The basal segment of ALS was presented as a truncated cone when the basal diameter was greater than the distal diameter. The ALS was scored as cylindrical when the diameters of the basal and distal were similar. *Aglaoctenus lagotis*, *A. castaneus* and *Schizocosa ocreata* have both ALS and PLS as truncated cone. All the ingroup have cylindrical ALS.

**53** *PLS shape (aspect of the basal segment)*: (0) truncated cone; (1) cylindrical.

The same as in the Char 52. In *Varacosa avara*, *Agalenocosa singularis*, *Alopecosa kochii* and *Pirata piscatorius* both basal segments were different in shape. In rest of taxa, basal segments of both ALS and PLS were equal.

**54** *Female palpal tarsus, distal part*: (1) truncated, diagonal section at the tip; (0) conical, tapering to the tip.

This character describes the shape of the distal part of female palp. Capocasale (1990) and Aisenberg et al (2007) found that in *Allocosa brasiliensis* structures involved in digging retreats for their fossorial habits are chelicerae and palps. This behavior is present in both sexes. When the palpal tarsus is truncated mean that the more distal end has a diagonal cut (Fig. x). When scored as conical, the more distal part of the tarsus becomes tapering towards the end (Fig. x).

**55** *Tubercle in the outer edge of the male chelicerae fang*: (0) absent; (1) present (Fig 9). In

frontal view the tubercles are visible as a pointed bulge in both male chelicerae fang. Present only in *Trochosa ruricola* and some *Orinocosa* species.

## **Sexual characters**

### ***Male***

**56** *Distinctive setae on the ventral side of the male pedipalpal femur:* (0) absent; (1) present (Fig 65).

This group of setae appeared only in males (Piacentini & Grismado, 2009, Fig 79). No other observations in other genres of Lycosidae were made before.

**57** *Stridulatory organ (dorsal face of the palpal tibiae, between the cymbium and the apex of the tibiae):* (0) present; (1) absent. Present in *Lycosa*, *Hogna*, *Pavocosa*, *Trochosa*, *Schizocosa* and *Gen Nov aff Trochosa* (Fig. 100).

**58** *Macrosetae on the apical third of the cymbium:* (0) present (Fig. 37); (1) absent (Fig. 15)

**59** *Macrosetae on the apical third of the cymbium:* (0) one and strong (Fig 38); (1) two or more than two and arranged in a visible ordered pattern; (2) more than two and disordered (Fig. 96; Langlands & Framenau, 2010; Fig 1I)

**60** *Male tibial of the palpus:* (0) cylindrical shape; (1) swollen in the middle portion; (2) distally conic; (3) distally conic.

The male tibia showed different states that were defined considering its general aspect. This character were modified from Silva (2003; Char 1). Almost all taxa scored as cylindrical (0), including the majority of ingroup. *S. ocreata* and *Gen Nov. aff Trochosa* were the only ones to have swollen tibia (1) (Fig. 99). *Orinocosa paraguensis*, *Varacosa avara* and *Trochosa terricola* were the ones who presented the conical shaped tibia (3).

**61** *Terminal Apophysis (TA):* (0) absent; (1) present

Named as TA on Langlands & Framenau (2010; Fig 7A-D, Fig 8A-B) (Stratton, 2005 Fig 15,



Char 21) is the most apical sclerite that inserts into embolus via a distal haematodocha (Jocque & Dippenaar-schoeman, 2006). *O. hansii*, *Agalenocosa singularis*, *Aglaoctenus lagotis* and *A. castaneus* were the ones that did not present TA. All Sosippinae lost the TA (Dondale, 1986; Fig 2). The rest of subfamilies considered in this study possess TA.

**62 Terminal Apophysis (TA), position:** (0) begins at the edge of the palea (Figs 64, 67); (1) begins at the middle distal part of the tegulum (Fig. 101); (2) begins at the base of the embolus working as a conductor (Alvarez, 2009; fig 12). The state (0) was scored in all species of the ingroup. State (1) was only present in *Arctosa perita*. The position of TA in state (2) is a state that could group all Lycosinae and the function as a conductor is tested here due to all Lycosinae did not present conductor.

**63 Terminal Apophysis (TA), shape:** (0) fine spine-shaped curved counterclockwise; (1) lobulated; (2) tooth-like; (3); shaft-like; (4) lamellar shaped; (5) beak-like shaped; (6) sickle-shaped.

The different shapes were coded based on Dondale (1986) terminology. All the ingroup have sickle-shaped TA. The TA in *Pardosa fastosa* were coded as tooth-like and *Pardosa lugubris* as lobulated contrary to the definition of Dondale (1986) were all Pardosinae species have tooth-like TA.

**64 Terminal apophysis (TA), orientation:** (0) counterclockwise; (1) apical

The orientation of the TA was analyzed with the cymbium in ventral view and was observed where the base of the TA begins, how the path does through the paleal area and where it ends.

**65 Terminal Apophysis (TA), size:** (0) short; (1) median; (2) large

The size of the TA was observed in reference to the tegular lobe. Short was encoded in a few cases within the ingroup. There were variations in size between species of the same genus.

**66 Terminal Apophysis (TA), shape:** (0) curved (Fig. 91); (1) straight (Fig 67)

**67 Subterminal apophysis (STA):** (0) absent (Framenau & Baehr, 2007: Fig 6A); (1) present (Fig

56)

Langlands & Frameau (2010; Char 18) used this character to analyze the phylogenetic relationships of the species of *Hoggicosa*. In this study, six of 27 ingroup species have subterminal apophyses. In the Outgroup, six of the 26 species did not have STA present (Table 2) (Fig. 101).

**68** *Palea*: (0) absent; (1) present

A palea is a distal, at least partially membranous part of the tegulum, well separate from the rest of the sclerite (Jocque & Dippenaar-schoeman, 2006). Present in all the ingroup it was absent only in *Aglaoctenus lagotis*, *A. castaneus*, *Xerolycosa nemoralis* and the two *Pirata* species analyzed here (Fig. 102).

**69** *Palea, shape*: (0) rounded (Fig 79); (1) elongated; (2) irregular

When present, there were three types of palea. The state rounded (0) predominated throughout the ingroup with the exception of *Orinocosa preisneri* which was irregular (2) in shape as *Allocosa* sp the two species of *Pardosa* and *X. nemoralis*. *Lycosa tarantula*, *Arctosa* spp, *Schizocosa ocreata*, *Varacosa avara* and *Orinocosa paraguensis* were the only scored as elongated palea (1) (Alvarez, 2009; Fig 12).

**70** *Palea, size*: (0) occupying 50% of the total palear area (Fig 79); (1) occupying more than 50% of the total palear area (Fig. 72).

The cymbium was divided into two areas, the tegular area (basal) and the palear area (distal). The tegular area is one that occupies all the sclerotized part of tegulum and is visible ventrally considering the presence of the MA when present. The palear area is the membranous part (not always) of the tegulum. Then, the size of the palea in relation to the total palear area occupied was evaluated. In the majority of ingroup palea occupied the 50% of the total area.

**71** *Palea, size of the sclerotized region*: (0) more than 50% of the total area (Fig 12, Fig. 91); (1) less than 50% of the total area; (2) totally membranous (Fig 56; Brescovit & Alvarez, 2011; fig 7).

**72** *Palea, process*: (0) absent; (1) present

Palea process is a structure that is pointed at the distal cymbium. This structure has served to group *Schizocosa ocreata* and *Varacosa avara* (Stratton, 2005; fig 15-16; Chamberlin, 1908, plate 20, fig 3).

**73** *Conductor*: (0) absent; (1) present. State (0)

**74** *Conductor*: (0) partially sclerotized (Pardosinae); (1) hyaline or translucent (Pardosinae);(2) sclerotized (Pardosinae)

**75** *Conductor, insertion*: (0) median, insertion near middle of tegulum; (1) retrobasal, insertion near proximal margin of tegulum.

**76** *Retrolateral ridge of the tegular lobe*: (0) present; (1) absent

**77** *Retrolateral ridge of the tegular lobe, general aspect*: (0) membranous (Figs 10, 79); (1) sclerotized.

**78** *Origin of the embolus*: (0) median apical; (1) pro-lateral; (2) retro-lateral

**79** *Embolus, position on rest*: (0) free, resting on the tegular lobe; (1) passing through the branch of the dorsal channel of the MA functioning as a conductor (Fig 55); (2) Parallell or following a path similar to the TA.

**80** *Embolus direction of curve*: (0) counterclockwise; (1) apical.

In the lycosid group of higher lycosoids the embolus arises from the apical division and curves back across the middle of the bulb. Into the generic variation only the species of *Pirata* presented the state of apical (1); a short and stout structure hidid by the Median Apophysis in ventral view. The counterclockwise shape means that embolus arises from the retrolateral part of the palea en does a C path-shaped (Fig. 49)

**81** *Embolus, aspect*: (0) slender (Fig. 37); (1) thick

**82** *Embolus, curvature*: (0) curved (Fig 15); (1) stout

**83** *Pars pendula*: (0) absent; (1) present (Figs 6, 64).

**84** *Median Apophysis apex (ramifications)*: (0) uniaxial; (1) bifurcate

This structure was also named as Tegular Apophysis by Zyuzin (1993). In that case is used the standar terminology of Median Apophysis.

**85** *Median Apophysis, dorso-basal protubreance*: (0) absent; (1) present

**86** *Median Apophysis, ventro-basal protuberance*: (0) absent; (1) present

Discussed by Zyuzin (1993) who demonstrate that this basal protuberance has a direct correlation with the female atrium during copulation.

**87** *Median Apophysis, distal extreme*: (0) absent; (1) triangular (Fig 12); (2) digitiform short directed ventrally; (3) digitiform and median directed ventrally; (4) rectangular (Fig 80)

**88** *Median Apophysis, position in relation to the cymbium*: (0) longitudinal; (1) transverse

**89** *Median Apophysis, dorsal groove*: (0) absent; (1) present (Figs 17, 53)

Possibly functioning as conductor as discussed and shown by Zyuzin (1993). The presence of this "dorsal groove" is a character present in Lycosinae and Evippinae. Although the arrangement of this groove is different in each subfamily, here is coded as present or absent without major implications.

**90** *Median Apophysis apex (ramifications)*: (0) absent; (1) noticeable sclerotized (Fig 12, 15).

**91** *Median Apophysis, shape*: (0) laminar shaped (Piacentini, 2011; Fig 15d); (1) large, swollen, with two apical lobes (Marusik et al 2011; Fig 14); (2) triangular in cross section, simple (Fig

91); (3) hooked and bent distally (Fig 96; Brescovit & Alvarez, 2011; Fig 7).

**92** *Ventral Keel in the MA*: (0) absent; (1) curved (Alvares, 2009; fig 145; Fig 12); (2) straight (Fig 91)

**93** *Tegular notch*: (0) rounded (Fig. 64); (1) quadrangular or rectangular (Fig 37); (2) straight (Fig. 79).

### ***Female***

**94** *Epyginal configuration*: (0) triangular shaped (Fig. 21, 50); (1) plate shaped (Fig 95); (2) T-shaped

The general format of epygino was coded according to the general disposition of the transverse and longitudinal septum. When both septa were present was encoded as triangular or T-shaped, depending on their disposition. When they were not visible, either one or both of the septa, a single plate without any particular shape was observed.

**95** *Narrowing in the longitudinal septum*: (0) absent (Fig 59-60); (1) present

A similar approach to the interpretation of this character was conducted by Stratton (2005, Char 35, figs. 19-22). Here, due to the diversity of genera included in the analysis, the approach was modified.

**96** *Narrowing of the longitudinal septum, position*: (0) anterior position (Fig. 66, 73); (1) posterior position (Fig. 71)

Similar to the previous character, the position of the constriction in the longitudinal septum was analyzed. The position of the narrowing was observed in ventral view and was in relation to the disposition of the body. When anterior (0) meant to be positioned closer to the cephalothorax and posterior (1) to the spinnerets.

**97** *Excavation on the longitudinal Septum*: (0) absent; (1) present.

The excavation or depression in the longitudinal septum was observed in the most anterior part near the hood. It was observed only on four taxa of the ingroup (Table 1; Fig 51, 73, 74).

Possibly be an autoapomorphy for this group of species.

**98** *Transversal Septum, posterior border*: (0) curved (Fig. 34, 50); (1) straight (Fig 48)

**99** *Lateral lobes*: (0) absent; (1) present

Probably homologous to the lateral lobes of Sierwald (1989, figs 3, 9). Griswold (1993, Ch 29:0) assessed this character in Licosoidea but watch more states due to the inclusion of more variety of terminals. However, in Figure 48 is best seen what is being evaluated in this work.

**100** *Lateral lobes parallel to the median septum*: (0) sclerotized (Fig. 50; 66); (1) not sclerotized (Fig 61).

The ontogeny of this structure was analyzed and discussed previously (Sierwald 1989: figs 3, 9; Griswold 1993: figs 28, 48). This is a reinterpretation of this structure also present in Pisauridae and used as Char. 29 in Griswold (1993). The degree of sclerotization was interpreted and adapted for Lycosidae (Figs. 66, 74, 81).

**101** *Copulatory duct, position*: (0) parallel to the body axis; (1) perpendicular to the body axis.

**102** *Copulatory duct, width*: (0) narrow (Fig 59); (1) broad (Figs 34, 50, 77)

**103** *Head of the spermathecae (HS), protuberance in the anterior zone*: (0) absent; (1) present (Fig 83).

**104** *Head of spermathecae (HS), size*: (0) smaller than BS; (1) larger than BS (Fig 60); (2) HS and BS equal in size.

**105** *Base of the Spermathecae (BS), shape*: (0) simple (Fig. 73); (1) lobed (Fig 71, 75); (2) long, sinuous (Dondale & Redner, 1990; fig. 112).

**106** *Secondary receptacle*: (0) present; (1) absent (Brescovit & Alvarez, 2011, fig. 10).

Present in *Trochosa*, *Arctosa*, *Schizocosa*, *Alopecosa*, *Pavocosa* Gen Nov. aff *Trochosa* (Fig. 83).

The function of this structure is still unknown. It was always placed in a position dorsal to copulatory duct

**107** *Anterior expansion of the longitudinal septum*: (0) absent; (1) present

This is a longitudinal septum expansion which begins almost half of its total size and is projected anteriorly (Fig. 34). Present in some *Orinocosa*, Gen Nov Aff *Trochosa* and the two species *Trochosa* (Fig. 11). This extension was considered as present or absent.

**108** *Hood, dorsal view*: (0) absent; (1) present

**109** *Hood, dorsal view*: (0) curved directing to the median axis and not completing a loop (Fig. 83); (1) curved directing to the median axis and completing one loop (Fig. 50); (2) curved directing to the median axis and completing more than one loop (Fig. 33, 60, 71); (3) straight (both parallel) (Brescovit & Alvarez 2001; fig.10)

**110** *Hood aperture, ventral view*: (0) joined (Figs 48, 61); (1) not joined. (Fig 74)

Named as “Anterior Pocket” (Zyuzin 1993: fig 5) this structure is part of the copulatory complex system that together with the median Apophysis (MA) and the Dorsal Groove (DG) helps to complete the key-padlock system of copulation. The functionality is explained more extensively in Zyuzin (1993).

**111** *Epigynal atrium*: (0) present; (1) absent (Santos & Brescovit, 2001; fig 5c-5d).

Defined as internal chamber at entrance of copulation tract in female haplogyne spiders according to Jocque & Dippenaar-schoeman (2006). Into the ingroup the atrium was present (Marusik et al 2011; figs 35, 37; Fig. 70) in all taxa. Its presence or absence were varied into the outgroup.

**112** *Epigynal atrium* (EA): (0) parallel to the longitudinal septum (Fig. 11); (1) oval in its anterior portion (Fig 82) (Marusik et al 2011; figs 35, 37).

The position of the atrium was evaluated with reference to the longitudinal septum because both were close when present. Parallel meant that the atrium either broad or narrow followed the

similar path of longitudinal septum. When atrium had an enlarged a curved shape, usually anteriorly, was encoded as oval.

**113** *Epigynal atrium, size*: (0) wide (Fig. 11); (1) narrow (Fig. 82).

This character was scored as narrow in much of the ingroup taxa. In Sossipinae and *Pirata* species was not coded for being absent. The type species of *Orinocosa* have a narrow atrium (Fig. 33).

**114** *HS general format (HS)*: (0) bowling pin-shaped or club-shaped (Figs 33, 75); (1) rounded (Fig 54)









## Results

### *Cladistic analysis*

The molecular analyzes resultant from Murphy et al (2006) and Vink et al (2002) showed that among the most basal taxa analyzed demonstrate that were not the most basal subfamily of Lycosidae. Based on these findings and considering that *Xerolycosa nemoralis* was the most basal taxa on those molecular results, it was rooted in the matrix analyzed here. After the analysis was observed that the more basal Lycosidae after *X. nemoralis* were: *O. hansii*, *H. yauliensis* and (*Lycosa tarantula* (*Schizocosa ocreata* + *Varacosa avara*)) (Fig 1-2). This grouping was constant in both all the 5 more parsimonious trees and tree consensus obtained (Appendix).

The most noticeable topology differences between the most parsimonious trees were noted in the first and fifth tree. Trees 2 with 3 and 4 com 5 were similar in overall topology (Appendix 2-6). In the latter two cases, the changes were minor and were observed in the inner group.

In all cases the terminals of clade B were observed in the consensus tree remained constant (Fig 1, Appendix 2-6). This proved to B, be a strongly supported clade. In the 5 most parsimonious trees *Orinocosa tropica* + *Orinocosa* sp. J always remain next to each other and were not belonging to clade A (Appendix 2-6).

In all cases, it was observed that *Orinocosa* sp. J and *Orinocosa* sp. M did not remain next to “clade A”. Finally *Orinocosa* sp. K and *Orinocosa* sp. P were always basal to the clade C and did not change in position among the five most parsimonious trees (Appendix 2-6).

In the consensus tree was observed that the topologies described above were maintained (Fig. 1). The two species of *Trochosa* and Gen Nov. aff *Trochosa* were sister clades in each of the most parsimonious trees but resulted non resolved in the consensus tree (Fig. 1-2). The groupings: (*Orinocosa aymara* + *Orinocosa* sp H), (*Orinocosa* sp. O + *Orinocosa* sp. C) and the topology of [(*Orinocosa* sp. E + *Orinocosa* sp. N) (*Orinocosa* sp. B4 + *Orinocosa* sp. G)] remained strongly supported in the resulting trees as well as in the consensus tree.

*Orinocosa* strictu sensu proved to be a polyphyletic genus (Fig. 2). *Orinocosa hansii* resulted to be a sister taxa of *Xerolycosa nemoralis*. Then appeared as sister taxa *Alopecosa kochii* and *Hogna yauliensis*. The clade of *Lycosa tarantula*, *Varacosa avara* and *Schizocosa ocreata* were recovered and are recognized as Lycosinae species concordant to Dondale’s

proposal (1986).

The "clade A" was not fully resolved because the lack of characters to support them. Within this group, two *Orinocosa* species and three *Orinocosa* morphospecies were considered grouped with *Trochosa* with unclear relationships. It is proposed to transfer *Orinocosa priesneri* and *Orinocosa tropica* to *Trochosa* as well as *Orinocosa* sp J, *Orinocosa* sp L and *Orinocosa* sp M based on the following characters 106:1, 107:1 and 110:1 (Table 2).

In the clade B *Orinocosa pulchra* and *Lycosa schenkelli* proved to be sisters by the autoapomorphy in ch 43:1 and a high Bremer support index (Fig. 1). Although the distinct coloration of the legs I and II in males was not exclusive to this clade, their grouping was supported also by the male characters as the presence of a dorso-basal protuberance in the MA (ch 85: 1), palpal tarsus claw median in size on females (45:1) and the absence of macrosetae in the cymbium (58:0) that place them all grouped in most parsimonious trees. Another unique character of these two species was the presence of curled setae in all legs and body (Table 2).

The groupings proposed by Dondale (1986) were not reflected in this analysis. Monophyletic Subfamilies was not recovered in any case. This was due to differences in the conformation of this matrix and the previous matrix assessed. Still, some relationships and the monophyly of *Pardosa* spp and the fact that Sosippinae is not the most basal subfamily were demonstrated also with this analysis, as well as the low supported clade of Neotropical *Orinocosa* morphospecies (clade C, Fig 1, 2).

### ***Internal Phylogeny of Orinocosa:***

Spermathecae basis, lobulated (females), curvature of the hood (109:1-2), the sickle shaped TA (63:6) on males, sclerotized region of the palea (71:1) and a sclerotized region of the palea represents autoapomorphies to grouping *Orinocosa* (Table 2).

The clades *Orinocosa aymara* + *Orinocosa* sp. H (*Orinocosa* sp. O + *Orinocosa* sp. C) remained well supported in each of the most parsimonious trees as well as in the consensus tree even with low values of Bremer support.

## Discussion

### Lycosidae internal phylogeny

The status of Lycosidae as a monophyletic family is well supported (Dondale, 1986; Griswold, 1993). In order to increase the studies in this family, and considering molecular findings showing controversial Lycosidae taxonomic status (Zehethofer & Sturmbauer, 1998; Murphy et al, 2006), this paper aims to discuss the interesting implications of a new and updated phylogentic proposal of *Orinocosa* genus.

Sossipinae is characterized by the loss of the Terminal Apophysis, Tegular Groove functioning as conductor and embolus lying among cluster of Tegular Process (Dondale, 1986). If Sossipinae were considered as monophyletic based on the two species assessed here it has a strongly supported Bremer values (Fig 1). In Murphy et al (2006: Fig 2) and Dondale (1986) this clade of Sossipinae proved to be a monophyletic clade. Probably because a few species were included here was not enough to analyze the great picture of the internal relationships of this subfamily. There were a few characters that grouped *Aglaoctenus* species (3:0; 26:0, 30:0) (Fig. 4A).

The composition of Allocosinae sensu strict contained *Arctosa* contain as an additional component. *Arctosa* should belong to Lycosinae (Dondale, 1986) by possessing the MA in transversal position in males and the MA bifurcated. In this case, the grouping of *Allocosa* with *Arctosa* has a weakly supported Bremer index. However, the relationship between the type species of the genus *Allocosa* and *Orinocosa paraguensis* were strongly supported (Fig. 1, 2), by two shared two synapomorphies (1:0) and (2:1) and always were kept together in each of the most parsimonious trees.

In the case of Venoniinae, the only two species of this subfamily always remained strongly supported in each of the most parsimonious trees. *Pirata* species evaluated in other studies always showed basal position in trees as demonstrated by Zehethofer & Sturmbauer (1998), Murphy et al (2006) and Vink et al (2002). Contradictory here these results were not obtained as anterior authors.

When Pardosinae was erected was based only on *Pardosa* as well as Venoniiane contained six genera. From these six genera, two species of *Pirata* were included here.

Within Pardosinae, *Pardosa* was recovered as an unresolved grouping; results were consistent with molecular analysis but contradictory in the case of *Pardosa* which resulted

polyphyletic (Zehethofer & Sturmbauer, 1998, Vink et al 2002, Murphy et al 2006, Park et al 2007). *Pardosa* genus is widely distributed in the Holarctic, Nearctic and Asian region, where were most studied (Yu et al 1987, Yin et al, 1997; Kronestedt 1975; Kronestedt, 1988). Such is the diversity of *Pardosa* that only in North America and Canada, Dondale & Redner (1984, 1986, 1990) recognized 16 groups of species on its classification. Attempts to continue creating groupings in Asiatic and European regions also yielded resulted in the creation of more groups of *Pardosa* species characteristic of each geographic region (Kronestedt & Marusik et al 2012b; Marusik & Ballarin 2011; Marusik et al 2011). In this manuscript *Pardosa* were not resolved and probably needs to include more than one Neotropical species to improve the phylogentic resolution. Anyways, the close relationship with *Agalenocosa singularis* gives the idea that a possible relationship with Neotropical genera could be occurring.

The status of Hippasinae as a subfamily was denied (Dondale 1986) including *Hippasa* (Hippasinae genus type) within Lycosinae. Capocasale (1990) reviewed specimens of American Hippasinae and despite not having revised any specimen of *Hippasa*, he finally accepted the synonymy of Hippasinae with Lycosinae as proposed by Dondale. In this study, after analyzing the position and shape of MA of the male *Hippasa* sp, this appears bifurcated and the characteristic dorsal channel from Lycosinae was not observed

The "*Lycosa* group" and "*Trochosa* group" proposed by Dondale (1986) did not emerge here apparently and consistently with the molecular analysis from Vink et al (2002), Murphy et al (2006) and Park et al (2007).

### **Internal Phylogeny of *Orinocosa***

The new findings on the classification of *Orinocosa* were notorious and highly debatable according to the results. Chamberlin (1916) erected *Orinocosa* based on a single female specimen used to raise the genus *Orinocosa* and not for a set of species that were subsequently added into a genre by other authors. The only trait that was considered diagnostic was the presence of median dorsal spines on the tibiae III and IV. These characters were too vague to diagnose a genus, much less in the case of a few females revised (including the paratype). This section discusses and clarifies many aspects about these characters that define the genus as well as to consider which morfospecies could match with the female type species. In an attempt to find some relationship with *Orinocosa*, Chamberlin (1916) said that could be related with

*Pardosa* for possessing two strictly dorsal spines on the posterior patellae (Fig 29). A similar approach happened to the dorsal bristles on “tarsus I” supposedly diagnostic to recognize *Arctosa* species, subsequently accepted by later authors. After the revision of *Arctosa* by Dondale & Redner (1983), they demonstrated the invalidity of such structures be diagnostic for the genus as well as the presence of dorsal spines on the hind legs.

Consequently, the characters to recognize the *Orinocosa* species would be: Cheliceral condyle, present (13:0) and not developed or not (14:1), sternum longer than wide (25:0), Distal diameter of the basal segment of ALS more than a half the basal segment (49:0) and Spermathecae base, lobulated (105:1). This would work when *Orinocosa* be conformed from *Orinocosa* sp. K onwards in the cladograma (Fig 4B). If *Orinocosa* were considered from *Orinocosa* sp. P onwards, the number of characters grouped in this hypothetical clade with a strong support than before (chars 33:1; 103:0; 111:1). If *Orinocosa* were considered from *O. aymara* onwards, the Bremer support would be the same than consider *Orinocosa* since *O. sp P*. The characters stridulatory organ, absent (57:1) and ventral keel on MA straight (92:2) would support equal than the last proposal. In biological terms, the more stable and logical diagnostic characters would be those sexual ones. Therefore, a new classification of *Orinocosa* would begin from *Orinocosa aymara* onwards and will comprise a total of 16 new morphotypes, including the type species, distributed in the Andes of Peru and Ecuador. The Neotropical species from Bolivia and Colombia (*Orinocosa* sp K, J and M) do not fit to this concept because there are no synapomorphies to group them.

The answer to this question can be found by adding more species of Neotropical and Nearctic *Trochosa* to more fully understand their evolutionary relationships.

Evolutionarily and according to these results, the two most ancient were *Orinocosa* sp K and *Orinocosa* sp P from Colombia and Ecuador. Looking at Figure 4B is likely that *Orinocosa* population arose from an ancestor from the northern Neotropics that followed its southward route at most until Cuzco and Madre de Dios (Peru). Further south, there has been no species of this genus, much less for the Brazilian Amazon.

The type species was grouped with species distributed in a geographic area surrounding but with a most preserved forest. The current type locality of *O. aymara* is destined now for large coffee and tea plantations and the fragmentation of their forest made it difficult to find a male who tentatively would be grouped with that female. Finally and after revised more material from



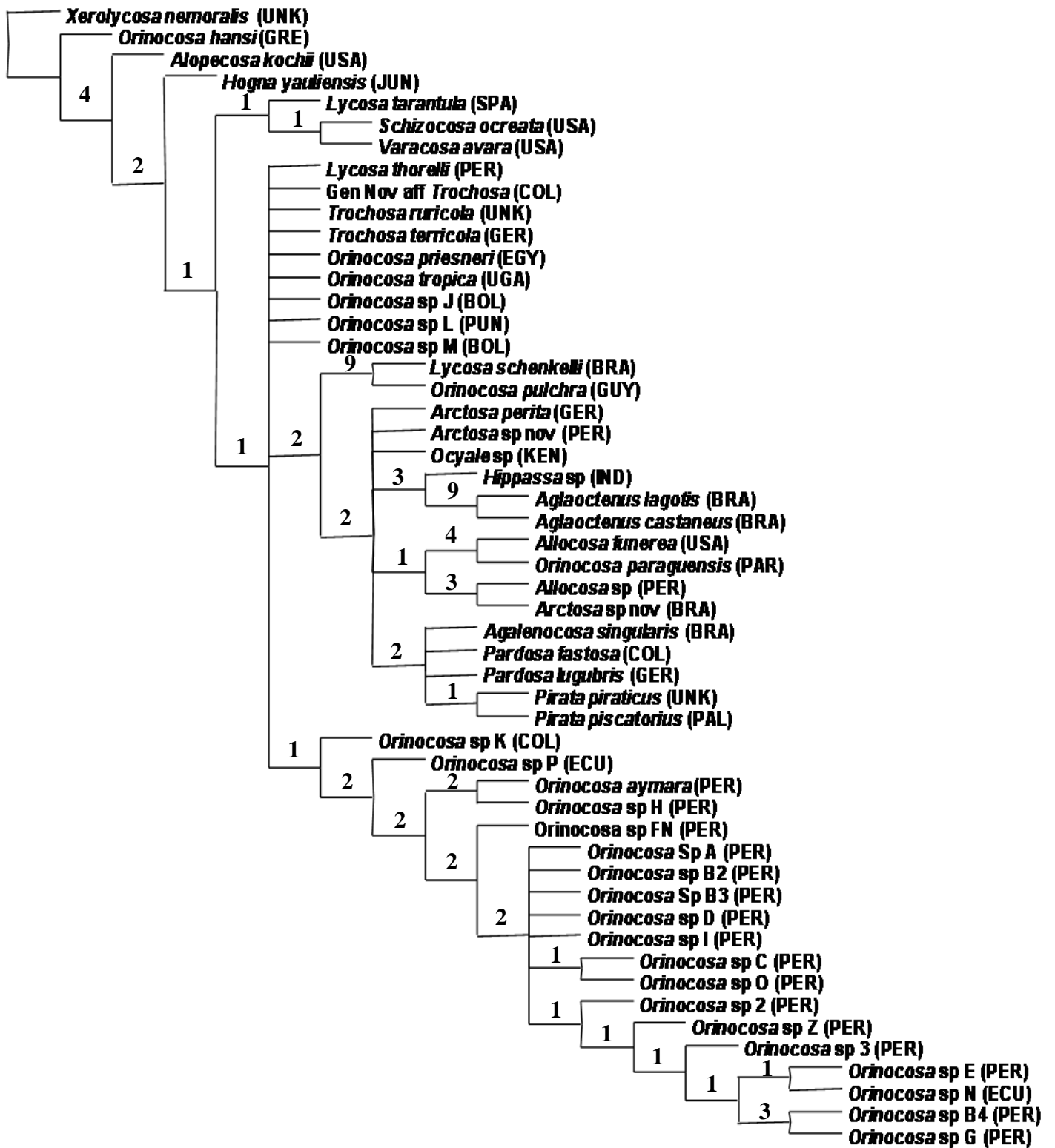
the same geographic region was possible to find the male of *Orinocosa aymara*.. Currently, the new species would be described into this genus and because this phylogenetic tree, there is more certainty to state what is and what is not an *Orinocosa* sensu strict.

It is possible then concludes that the monophyly of the genus *Orinocosa* is demonstrated but the relationships between its species is yet to be clarified. *Trochosa* would be tentatively the closest genus to *Orinocosa* and more species should be added in upcoming analysis to elucidate more precisely the phylogenetic relationships between this and other genera.

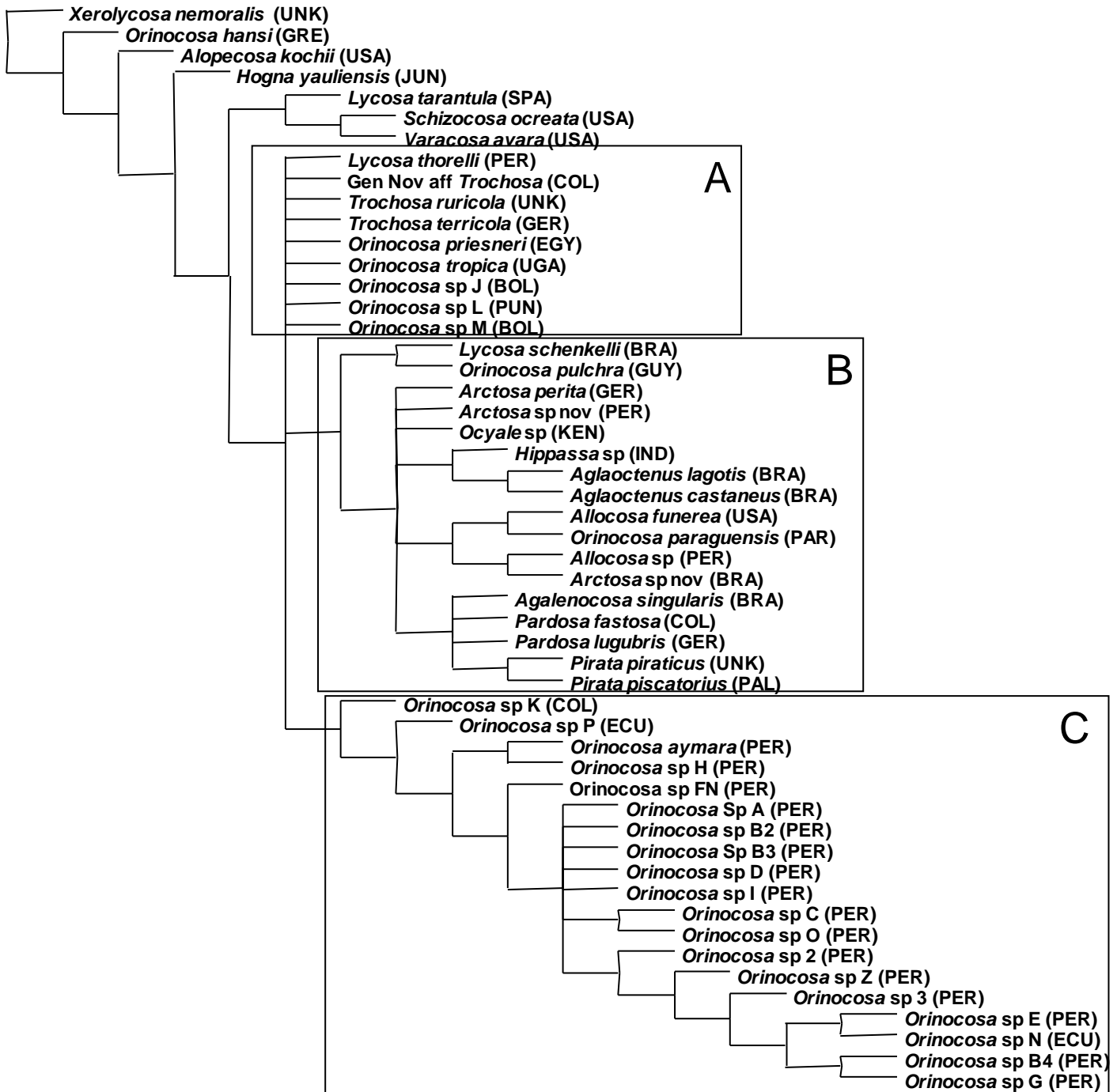
Extract characters from *Orinocosa securifer* were not possible because it was not possible to access an item on loan. In addition to the copy to be a young guy, this species was transferred from *Porrmosa* and placed in *Orinocosa* by Santos & Brescovit (2001) based on highly variable characters as three pairs ventral spines on tibia I. This character is visible in other genera as *Trochosa* and *Hogna* too. Therefore, it is appropriate to consider this species as insertae sedis by the lack of genitalic characters sufficiently developed to distinguish as *Orinocosa* and because the later taxonomic transfers cannot be based only in non genitalic characters.

*Orinocosa hansii* do not belong to *Orinocosa* for not possessing Hood and because the triangular format of the median and transversal septum resembling the *Arctosa*. They also shared the first row of eyes straight and the absence of the clypeal condyle with the basal taxa in the tree.

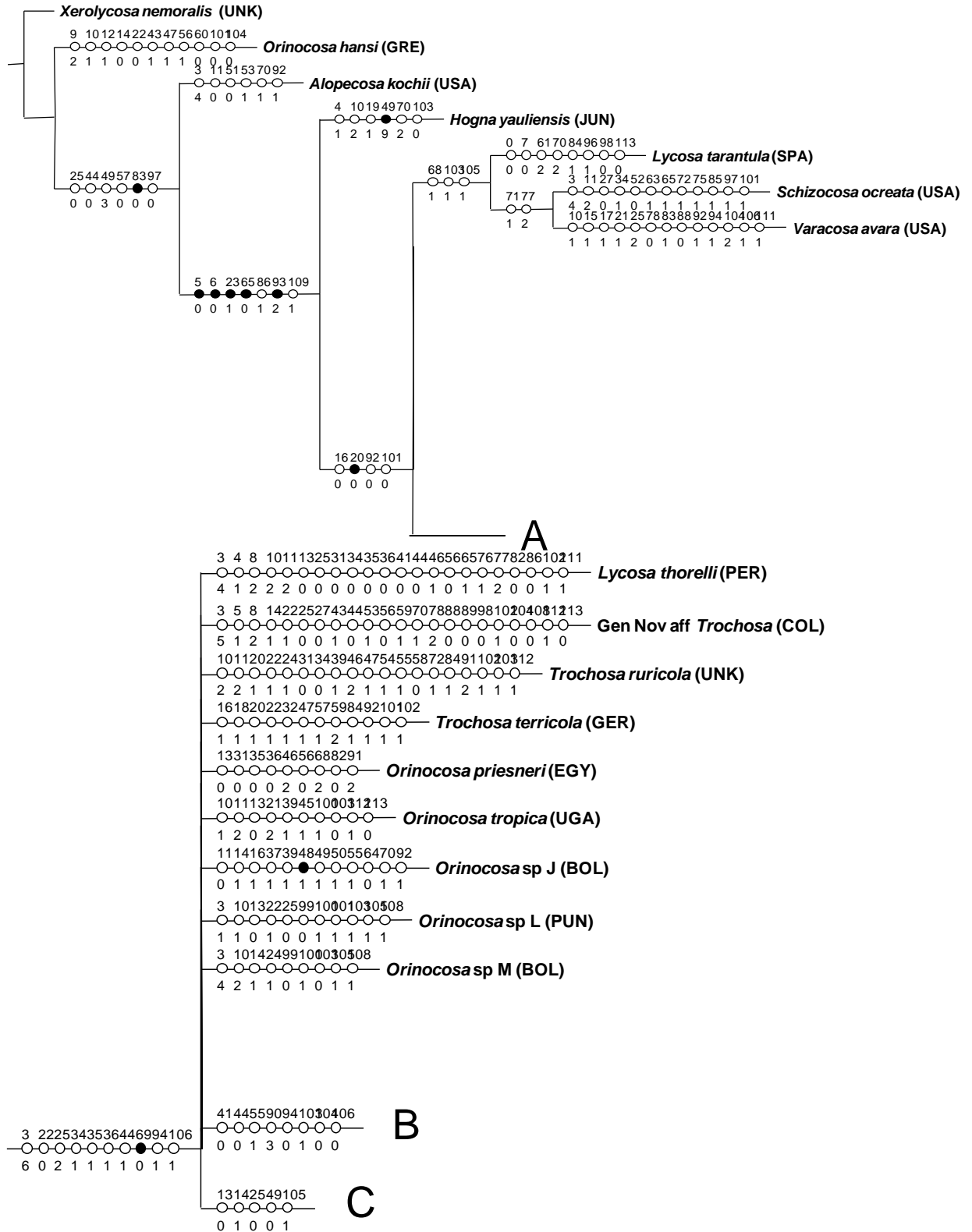
Characters shared among *Orinocosa pulchra* and *Lycosa schenkelli* are related on curled setae that occur on entirely legs and body. Even when *Pirata piscatorius* had similar setae patterns that occurred in the leg I and II and were disposed from the tibia to the tarsi, this species were not related to the clade *O. pulchra* + *L. schenkelli*. The combination of these and other characters present in these two taxa, suggest that this is a new genus which currently will be described. Therefore, the status of *L. schenkelli* and *O. pulchra* will be repositioned in a forthcoming taxonomic review.



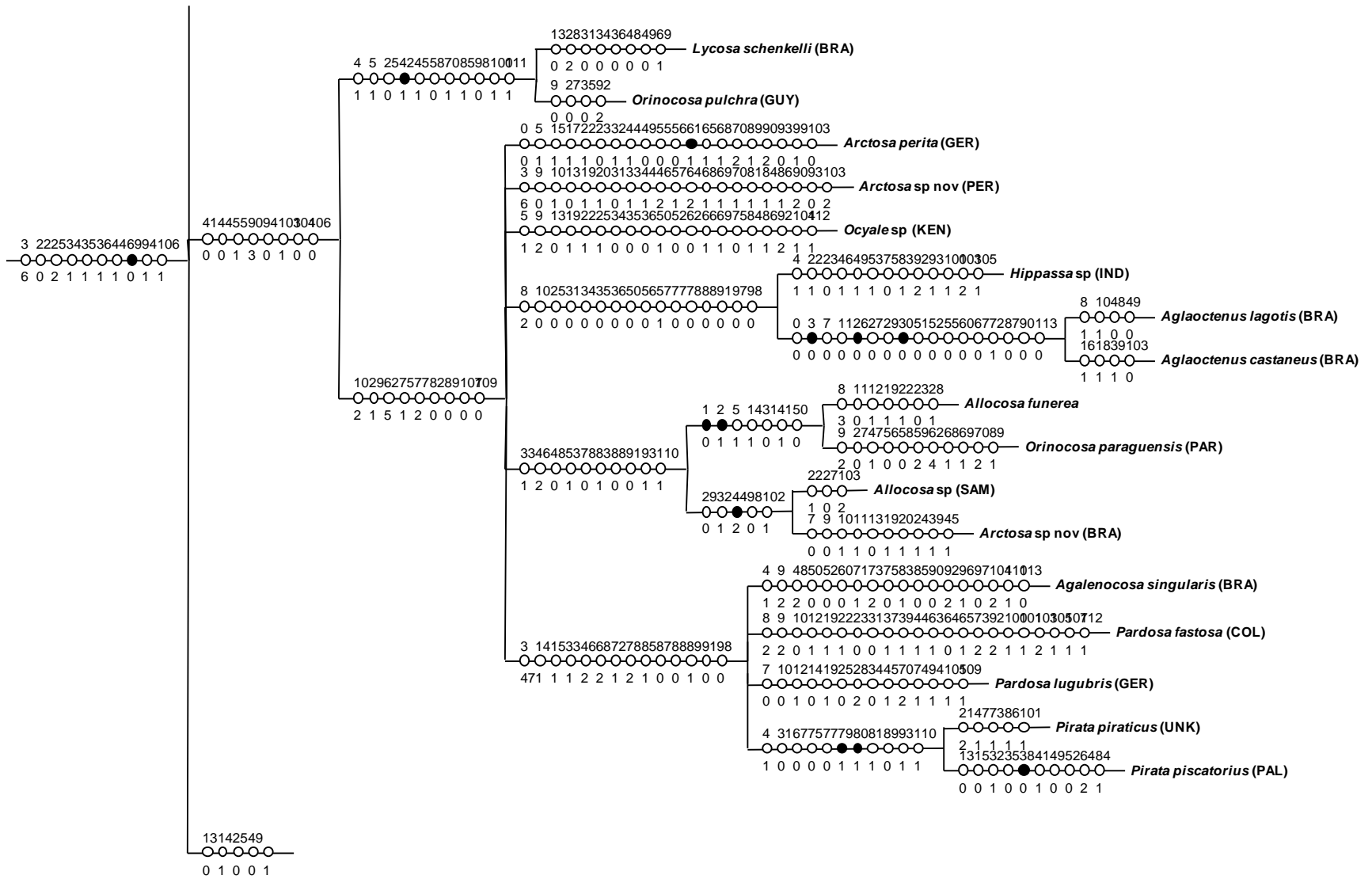
**Fig. 1** Strict consensus tree of the 5 most parsimonious trees resulting from the analysis of the matrix in the Table 1. The numbers above each node represents the Bremer Support value (L=884, Ri=40, Ci=18)



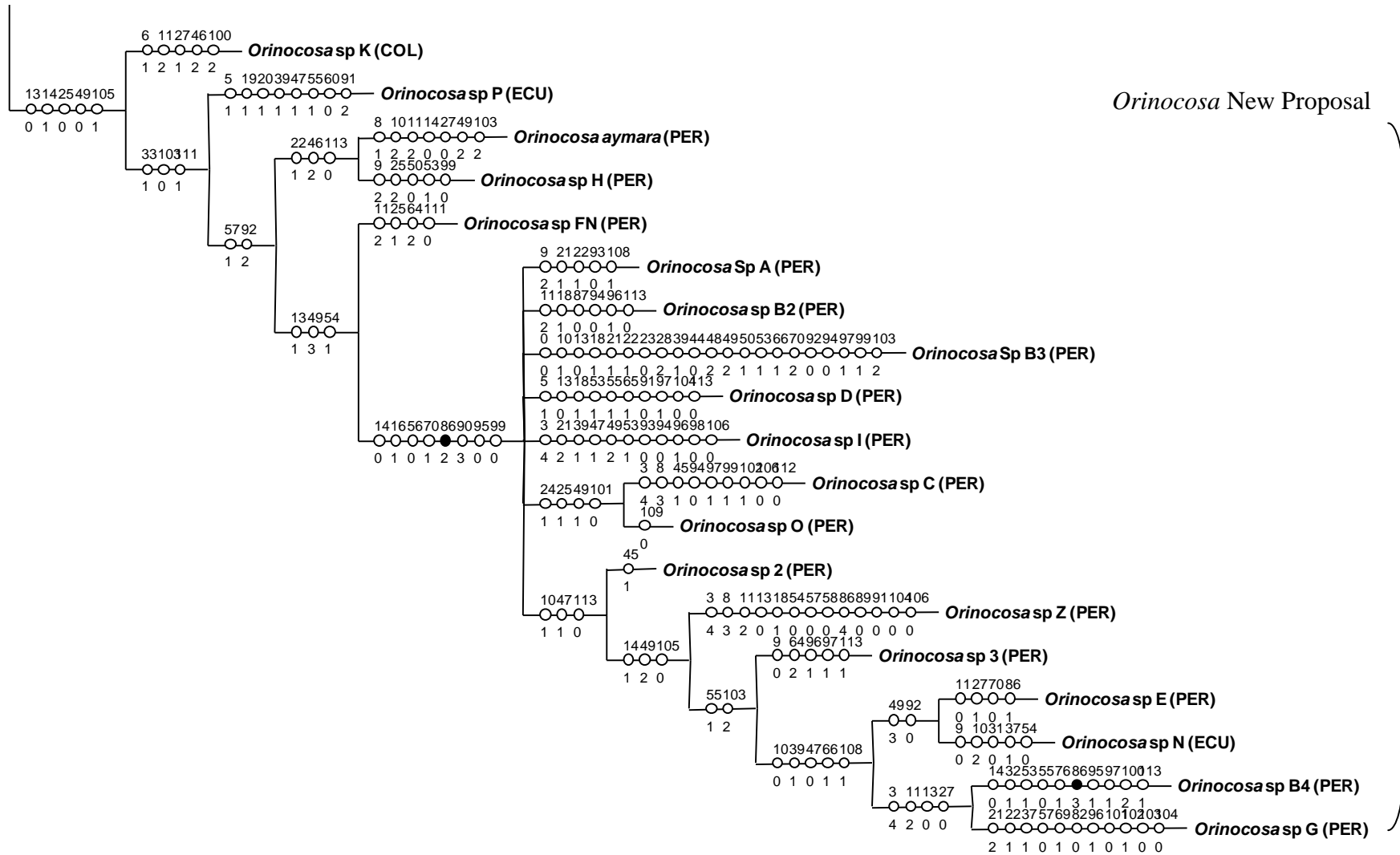
**Fig. 2** Strict consensus tree of the 5 most parsimonious trees resulting from the analysis of the matrix in the Table 1. (L=884, Ri=40, Ci=18). Squares show the groupings to be explained in detail. **BRA**, Brasil; **PER**, Peru; **GER**, Germany; **UNK**, United Kingdom; **COL**, Colombia; **PAL**, Palearctic; **IND**, India; **PAR**, Paraguay; **EGY**, Egypt; **USA**, United States of America; **GRE**, Greece; **KEN**, Kenya; **GUY**, Guyana; **PUN**, Puno (Peru); **BOL**, Bolivia; **UGA**, Uganda, **SPA**, Spain.



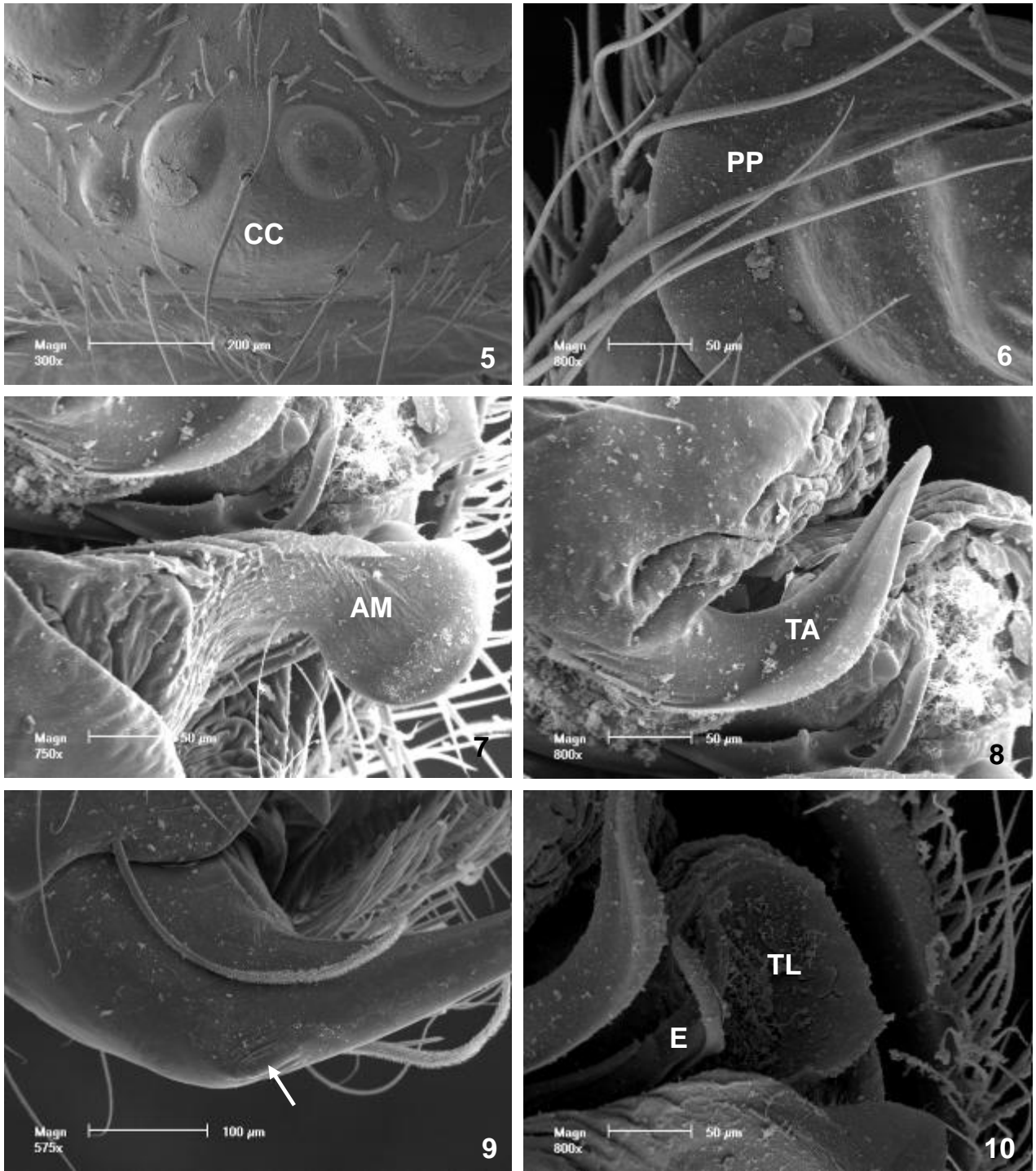
**Fig. 3** Sections of the strict consensus tree showing the outgroup phylogeny (L=884, Ri=40, Ci=18) resulting of the analysis of the data matrix of Table 1. Character number and states for each branch are indicated above and below circle marks, respectively. Filled and empty hash marks indicate non-homoplasious and homoplasious character state changes.



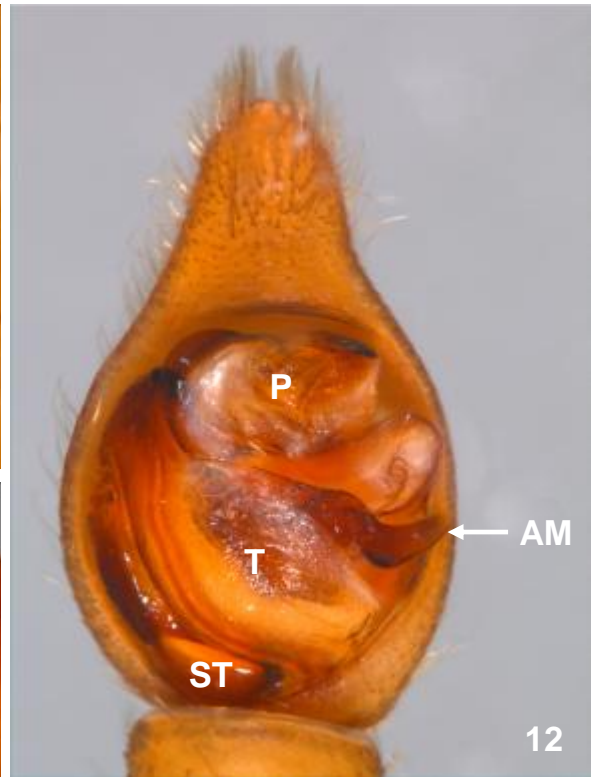
**Fig. 4A** Clade B of the strict consensus tree showing the outgroup phylogeny (L=884, Ri=40, Ci=18) resulting of the analysis of the data matrix of Table 2. Character number and states for each branch are indicated above and below circle marks, respectively. Filled and empty hash marks indicate non-homoplasious and homoplasious character state changes



**Fig. 4B** Extreme part of the strict consensus tree showing the internal phylogeny of *Orinocosa* (L=759, Ri=46, Ci=17) resulting of the analysis of the data matrix of Table 2 . Character number and states for each branch are indicated above and below circle marks, respectively. Filled and empty hash marks indicate non-homoplasious and homoplasious character state changes.

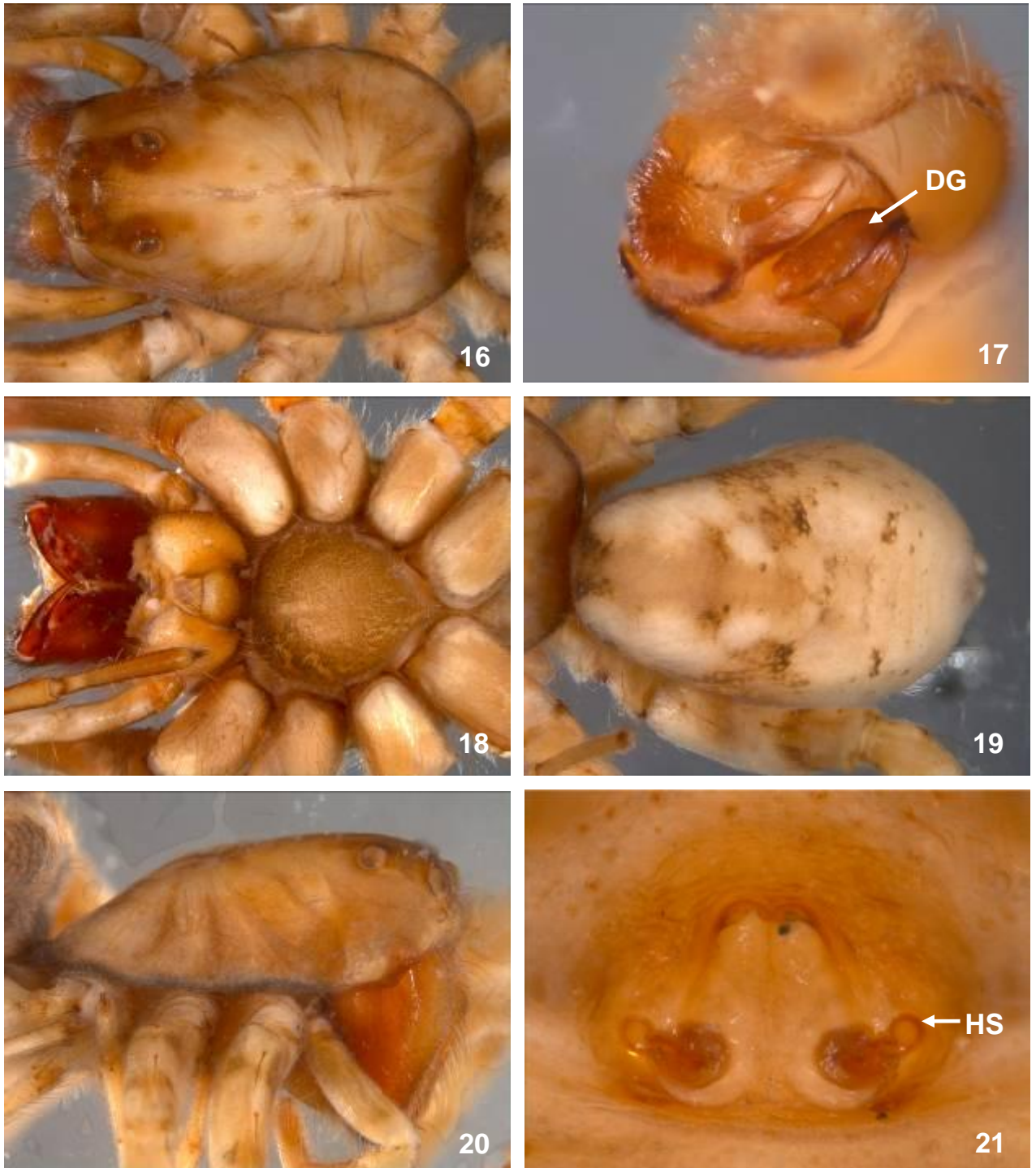


**Figs. 5-10.** *Orinocosa* sp E male. **5:** Clipeal condyle; **6:** Pars pendula; **7:** Median Apophysis; **8:** Terminal Apophysis; **9:** Tubercle in the fang of the male; **10:** Tegular lobe membranous and detail of the embolus. **CC,** Clipeal Condyle; **PP,** Pars Pendula; **MA,** Median Apophysis; **TA,** Terminal Apophysis; **TL,** Tegular Lobe, **E,** Embolus

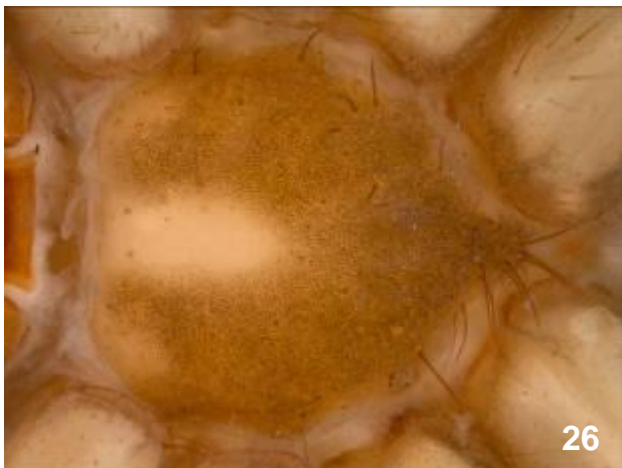


**Figs. 11-15.** *Trochosa terricola* Thorell, 1856. **11:** Female epyginum, ventral view; **12:** Male palpus, ventral view; **13:** Male chelicerae, ventral view; **14:** Carapace male, frontal view; **15:** Male palpus, prolateral view. **LS**, Longitudinal Septum; **TS**, Transversal Septum; **EA**, Epigynal Atrium; **P**, Plear Region; **AM**, Median Apophysis; **T**, Tegulum; **ST**, Subtegulum; **E**, Embolus





**Figs. 16-21.** *Arctosa perita* (Latreille, 1799), male and female. **16-19:** male; **20-21:** female. **16:** Carapace in dorsal view; **17:** Dorsal groove in the AM; **18:** Sternum, the base of the sternum present an acute angle shape between coxae IV; **19:** abdomen in dorsal view. **20:** Lateral view of the carapace showing the convex profile; **21:** Epyginum in ventral view. **DG,** Dorsal groove; **HS,** Head of Spermathecae.



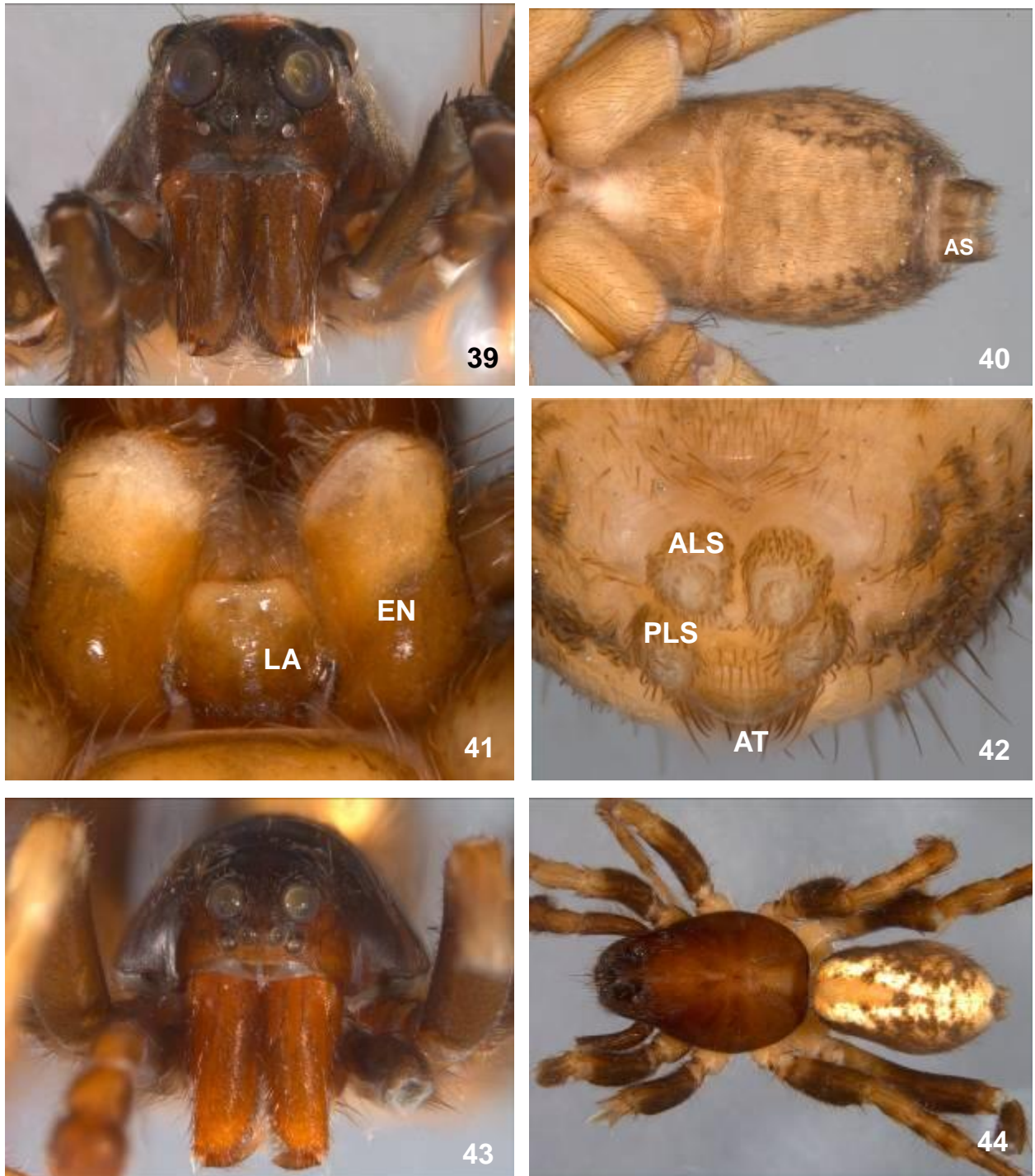
**Figs. 22-27.** *Orinocosa aymara* Chamberlin 1916, female, holotype; **22:** Carapace frontal view showing the procurved eyes; **23:** Cheliceral Teeth 3-3; **24.** Detail of the labium and endites; **25:** Ventral view of the three pairs of spines in the III leg showing the three pairs of ventral spines; **26:** Ventral view of the sternum, coloration pattern; **27:** Female spinnerets aspect.



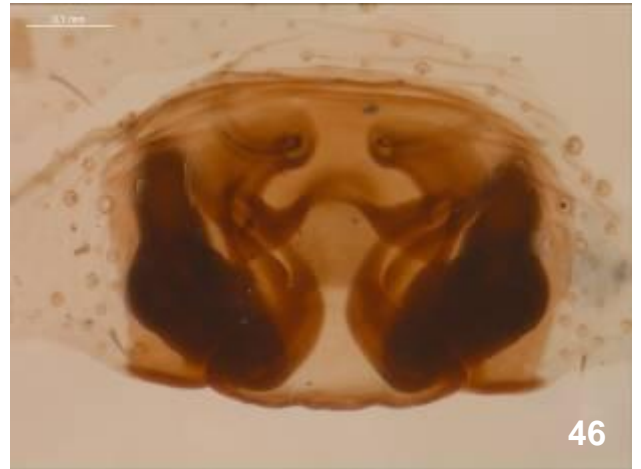
**Figs. 28-33.** *Orinocosa aymara* Chamberlin 1916, female, holotype; **28:** Annuli in the leg II and IV; **29:** Detail of the spine in distal position in the patella IV; **30:** Body in Ventral view; **31:** Body in dorsal view; **32:** Body in lateral view; **33:** Ventral view of the epigynum. **HS**, Head of Spermathecae; **H**, Hood; **HSm**, Mast of the Head of Spermathecae.



**Figs 34-38.** **34-35:** *Orinocosa* sp M . **34:** Female epigynum in ventral view showing the broad copulatory duct (CD); **35:** epigynum in dorsal view. **36:** *Orinocosa* sp K female, dorsal view of the carapace, detail of the median longitudinal band tapering posteriorly (MLB). **37-38:** *Orinocosa* sp J, male; **37,** palpus in ventral view, detail of (ST) and (MA) shape; **38,** Male palpus, retrolateral view, detail of the strong spine at the tip. **CD,** Copulatory Duct; **MLB,** Median Longitudinal band; **MA,** Median Apophysis; **ST,** Subtegulum.



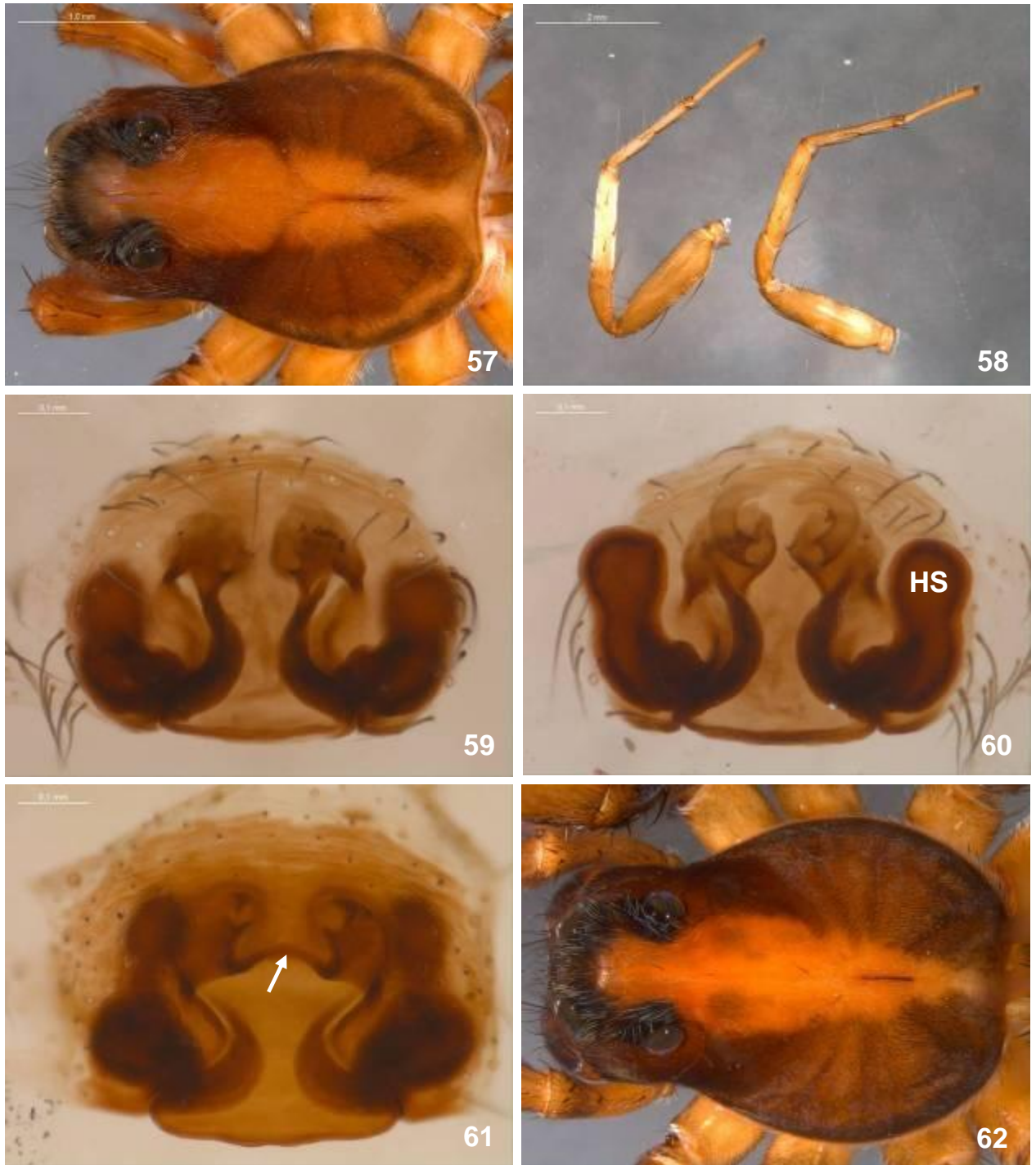
**Figs 39-44.** 39-40: *Orinocosa* sp N, male; **39**, frontal view of the cephalothorax, chelum entire; **40**, detail of the AS and ventral view of the abdomen. **41-44:** *Orinocosa paraguensis* (Gertsch & Wallace, 1937), male, holotype; **41**, detail of the parallel labium and endites; **42**, AS, PS and anal tubercle, ventral view; **43**, cephalothorax, frontal view, detail of the divided chelium; **44**, Body, dorsal view showing the glabrous carapace and the pattern of the abdomen. **AS**, Anterior Spinnerets; **LA**, Labium; **EN**, Endites; **PS**, Posterior Spinnerets; **AT**, Anal Tubercle.



**Figs 45-50.** 45-47: *Orinocosa* sp 2, female. 45, carapace, dorsal view, detail of submarginal stripes; 46, epigynum, ventral view, hood with a complete loop; 47, female, abdomen, lateral view showing the spinnerets. 48-49: *Orinocosa* sp 3. 48, female epigynum, ventral view, detail of the hood joined; 49. Male palpus, ventral view, pallear region sclerotized and ST notch straight. 50. *Orinocosa* sp A female, epigynum, dorsal view, detail of the broad copulatory duct.



**Figs 51-56.** **51-53:** *Orinocosa* sp B2. **51**, Female epigynum, ventral view, triangle shaped aspect; **52**, Male, right legs in lateral view showing the different coloration; **53**, male clarified palpus expanded showing the dorsal channel of the MA; **54-56:** *Orinocosa* sp B3. **54**, female epigynum, dorsal view showing the rounded HS; **55**, male palpus clarified, detail of the embolus\* passing through the dorsal channel of the MA; **56**, palpus male, ventral view, detail of the STA •. **HS**, Head of Spermathecae. **STA**, Subterminal Apophysis.

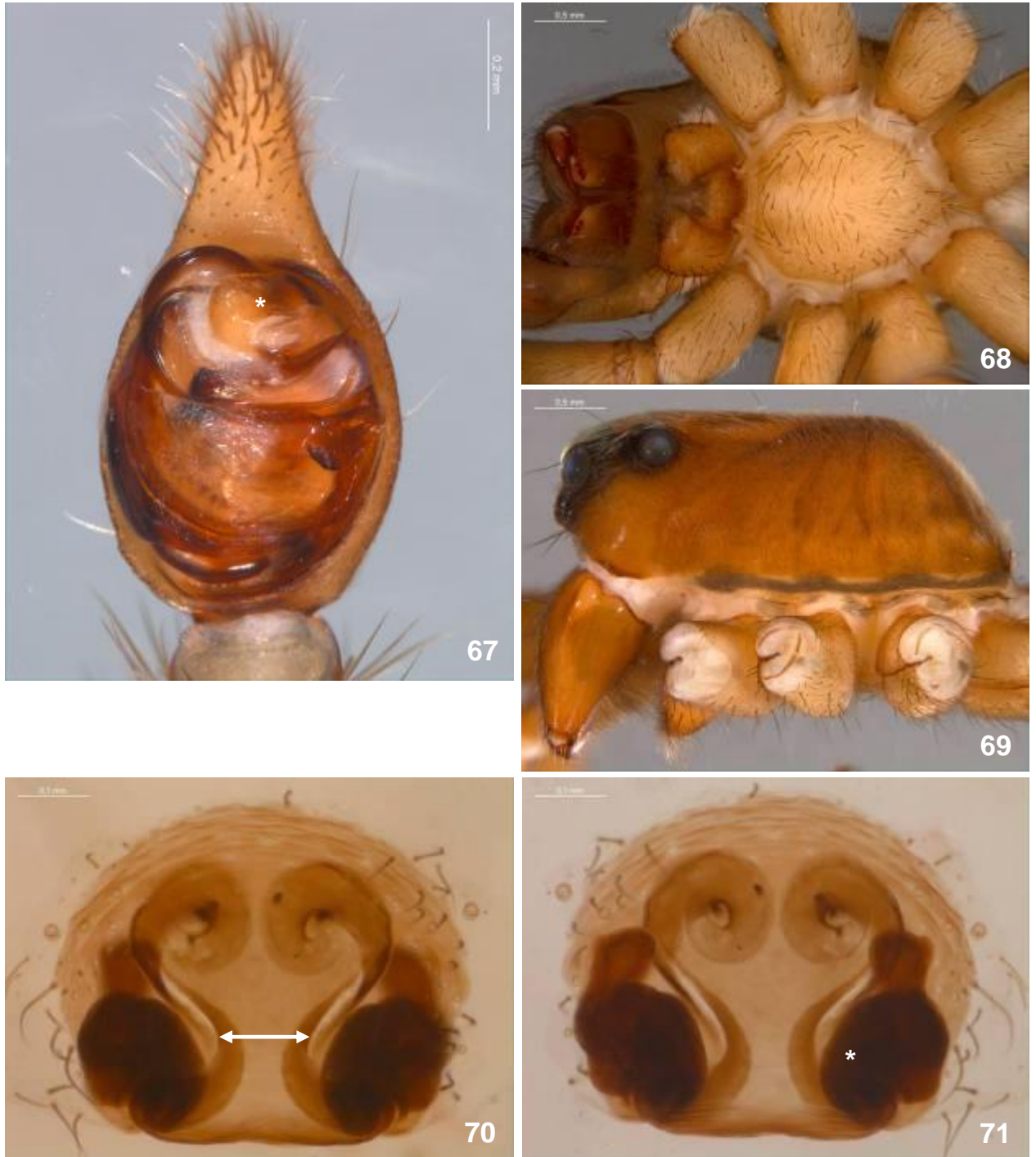


**Figs 57-62.** **57-58:** *Orinocosa* sp B4 female, and male respectively; **57**, female carapace, dorsal view. Detail of the submarginal stripes; **58**, male, right legs I and II in lateral view showing the difference in coloration. **59-60:** *Orinocosa* sp C, female; **59**, female epigynum, ventral view showing the narrow copulatory duct; **60**, female epigynum, dorsal view, **HS** bigger than most of the HS. **61-62:** *Orinocosa* sp D, female; **61**. Epigynum in ventral view, detail of the hood joined; **62**, Carapace, dorsal view. Detail of the two dots behind the ocular area. **HS**, Head of Spermathecae.

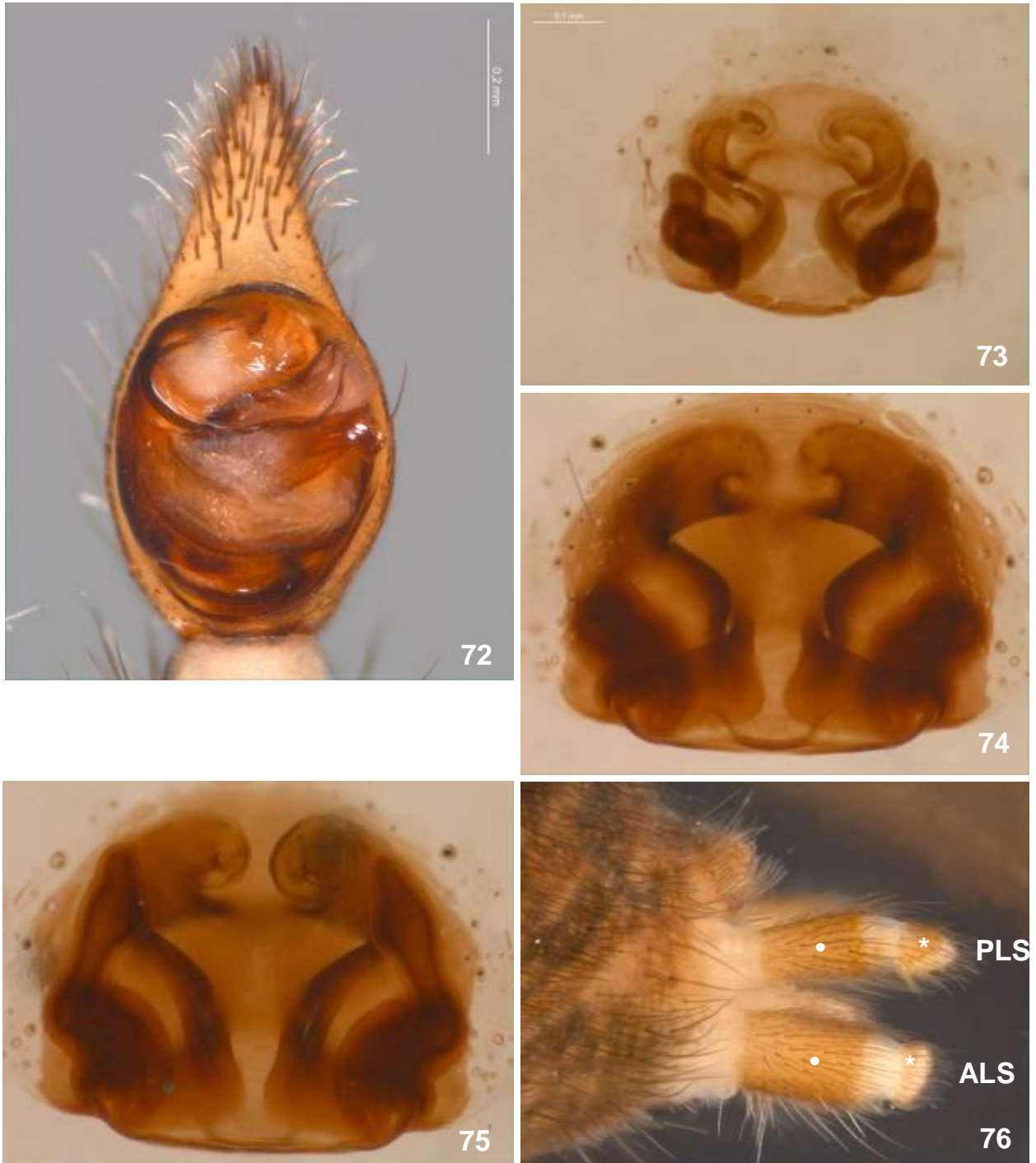




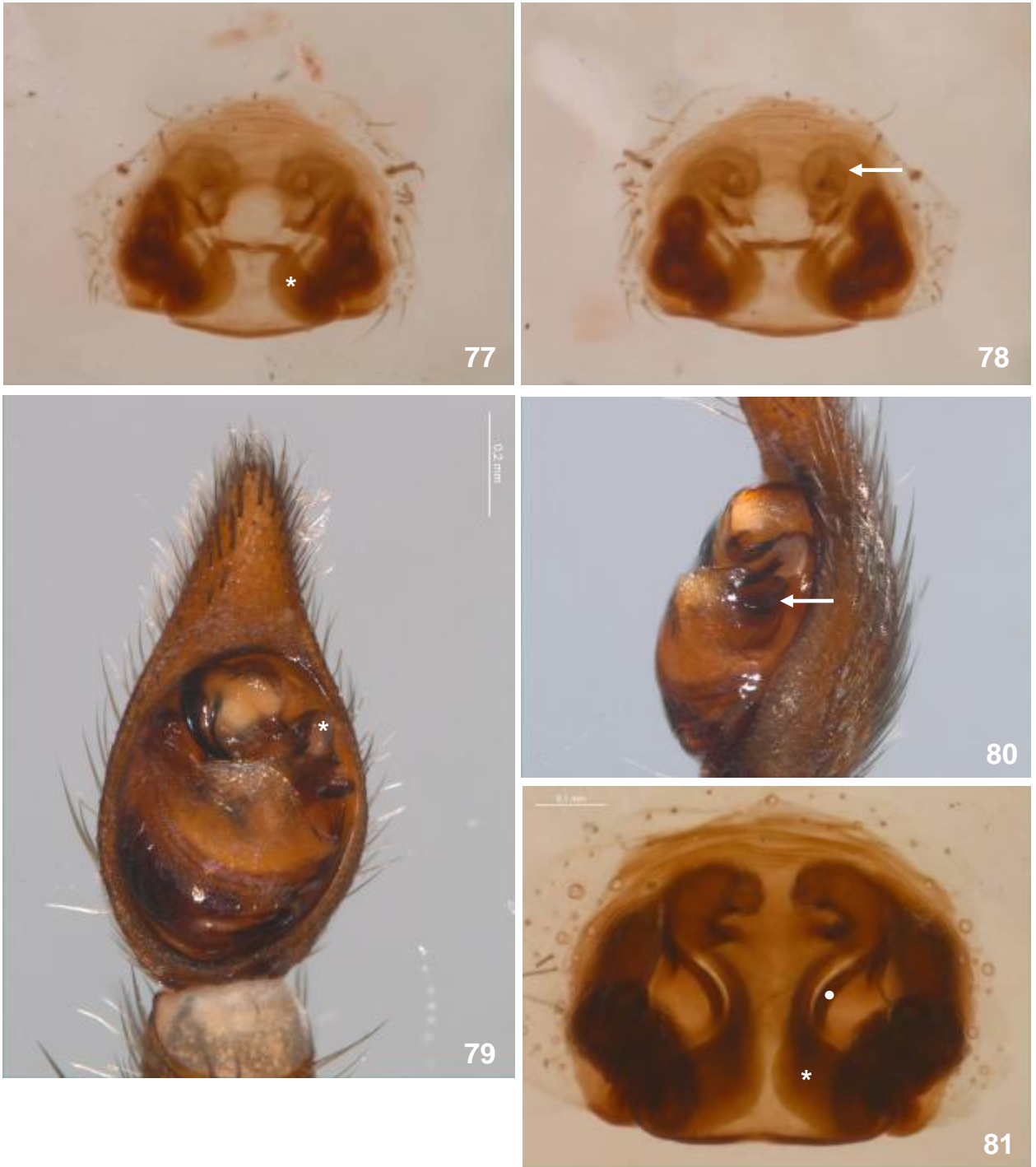
**Figs 63-66.** **63**, *Orinocosa* sp D male, showing the TA straight; **64-66**: *Orinocosa* sp E, male and female respectively; **64**, male palpus, ventral view showing the pars pendula\*; **65**, male pedipalpal femur, ventral view showing the distinctive setae; **66**, female epigynum, ventral view showing the lateral lobes sclerotized\*. **TA**, Terminal Apophysis.



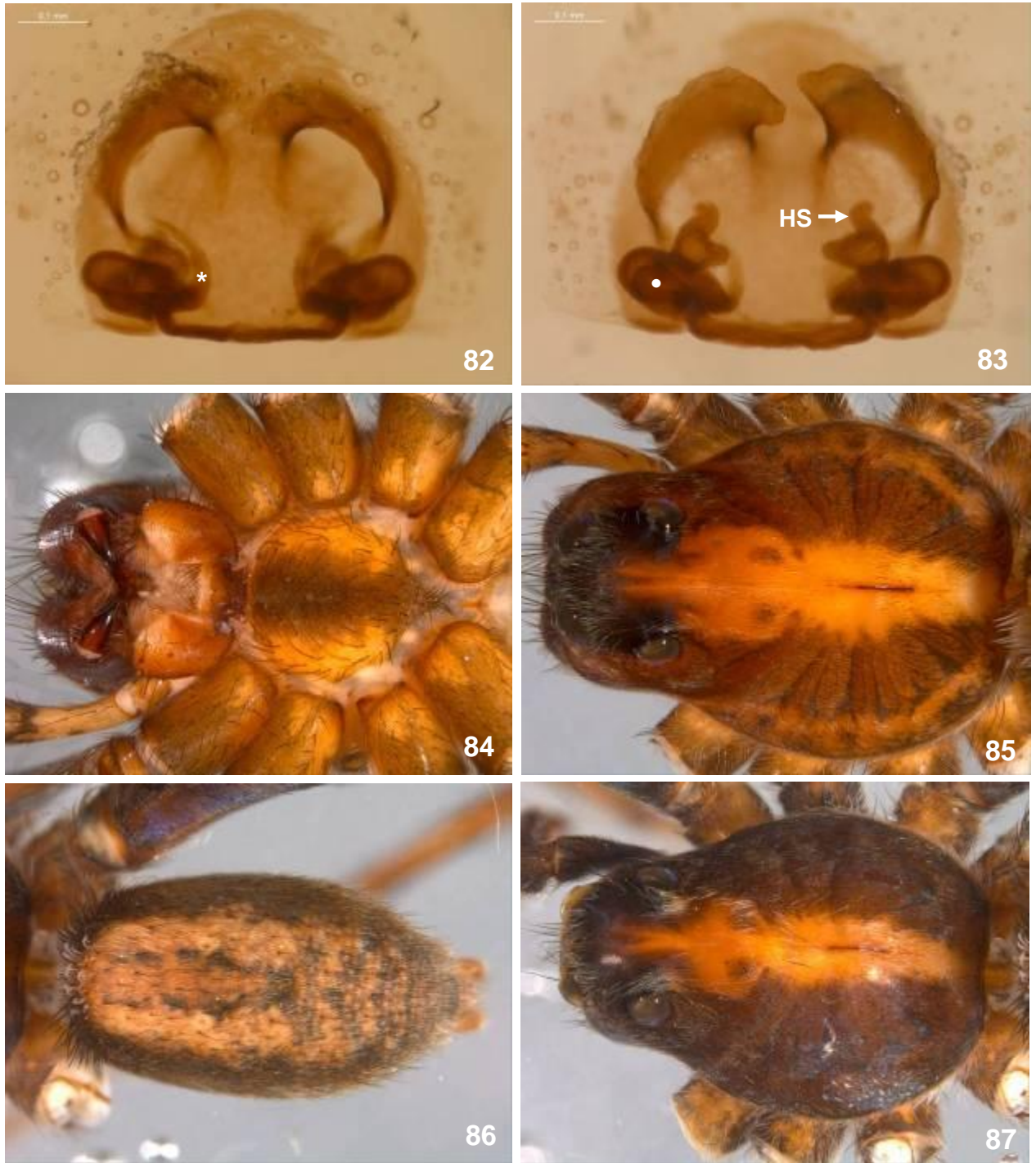
**Figs 67-71.** **67-69:** *Orinocosa* sp F, male. **67**, male palpus, ventral view showing the TA straight and the palpal region sclerotized; **68**, cephalothorax, ventral view showing the uniform coloration of sternum; **69**, cephalothorax, lateral view showing the developed cheliceral condyle. **70-71:** *Orinocosa* sp FN, female. **70**, epigynum, ventral view showing the narrowing in the LS; **71**, epigynum, dorsal view showing the lobed base of spermatheca\*.



**Figs 72-76.** **72-73:** *Orinocosa* sp G. **72**, male palpus, ventral view showing the palear region not totally sclerotized but occupying almost all the palear area; **73**, female epigynum, ventral view showing the triangular shape of the LS and TS. **74-76:** *Orinocosa* sp H, female. **74**, epigynum, ventral view showing the not joined hood; **75**, female epigynum, dorsal view. Detail of the bowling pin-shaped HS, **76**, ALS and PLS in lateral view showing the basal • and distal segments\*.ALS, Antero Lateral Spinneret; PLS,Postero Lateral Spinneret



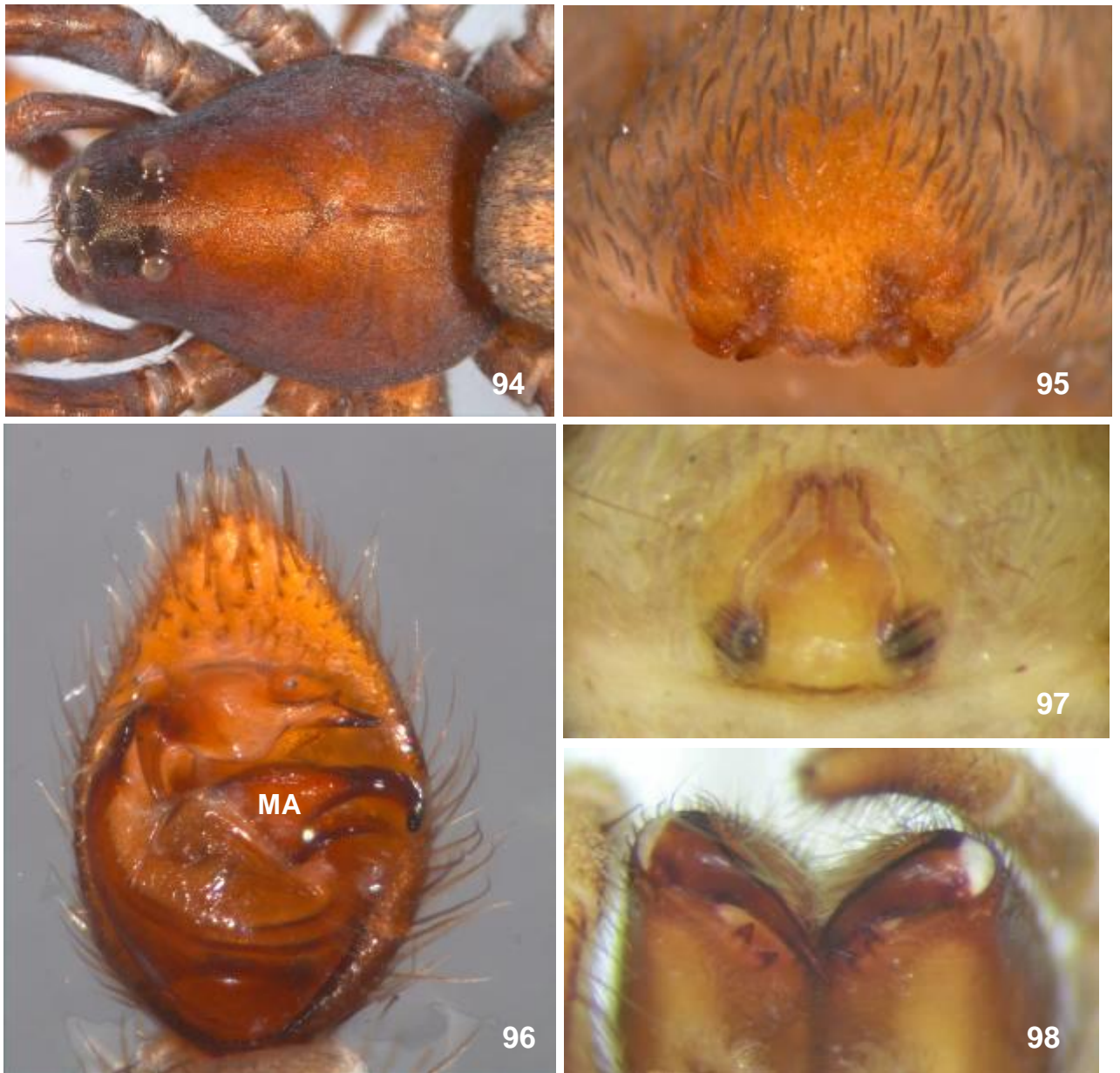
**Figs 77-81.** **77-78:** *Orinocosa* sp I, female. **77**, epigynum, ventral view showing the broad copulatory duct\*; **78**, female epigynum, dorsal view showing the hood completing one loop. **79-81:** *Orinocosa* sp Z, male and female. **79**, male palpus, ventral view showing the membranous retrolateral ridge of the tegular lobe\*; **80**, male palpus, prolateral view; detail of the rectangular distal extreme of the MA, **81**, female epigynum, ventral view showing the lateral lobes sclerotized• and the broad copulatory duct\*.



**Figs 82-87.** **82-85:** Gen Nov Aff *Trochosa*, female and male. **82**, epigynum, ventral view showing the narrow copulatory duct\* and oval atrium; **83**, female epigynum, dorsal view showing the hood not completing one loop and the anterior protuberance. • Secondary receptacle. **84**, Caparace, ventral view showing the different pattern; **85**, carapace, dorsal view showing the dots behind the ocular area. **86-87:** Gen Nov Aff *Trochosa*, male. **86**, abdomen, dorsal view showing the pattern; **87**, male carapace, dorsal view, showing the pattern of the **MLB**. **HS**, Head of Spermatheca.



**Figs 88-93.** **88:** *Orinocosa hansii*, female. **88**, carapace, ventral view showing the dark sternum; **89**, male leg III, prolateral view showing the setae with curled apex. **90:** *Orinocosa pulchra*, female, body, ventral view showing fusiform-shaped heart mark. **91-93:** *Orinocosa priesneri* Roewer, 1959 male, holotype. **91**, male palpus, ventral view showing straight ventral keel; **92**, male, body dorsal view., **93**, male carapace, frontal view. Detail of the same length ALE-PME-PME. **VK.** Ventral Keel.

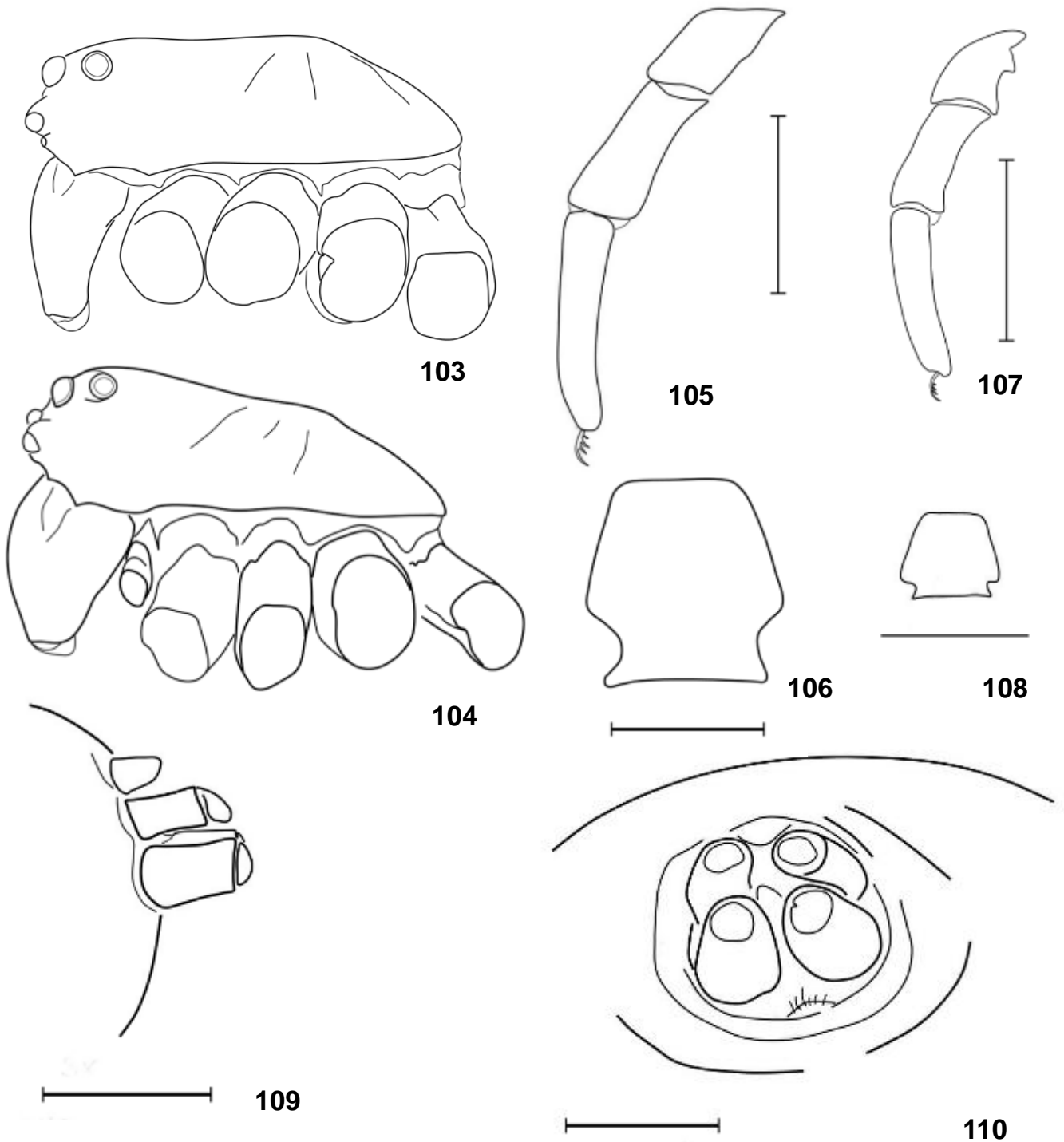


**Figs 94-98.** 94-95: *Allocosa funerea*, female. 94, carapace, dorsal view showing the no hairy aspect; 95, female epigynum, ventral view showing the plate shaped format; 96: *Allocosa funerea*, male palpus, ventral view showing the MA bifurcated. 97-98: *Orinocosa hansii*, holotype. 97, female epigynum, ventral view showing triangle shaped format; 98, female, retromarginal teeth ventral view showing the two teeth. MA, Median Apophysis

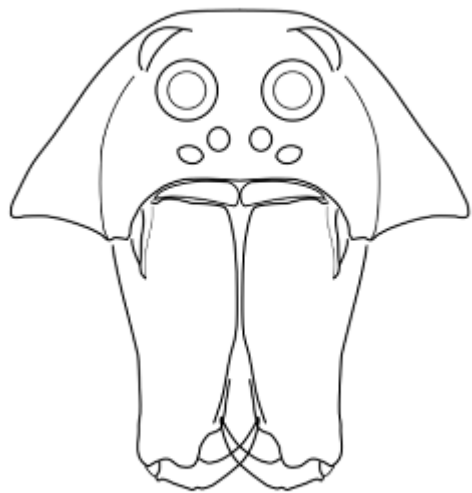


**Figs 99-100. 99-100:** Gen Nov aff *Trochosa*, male. **99**, pedipalpus, prolateral view showing the swollen tibia in its medial portion; **100**, male pedipalpus, dorsal view showing the stridulatory organ. **101:** *Arctosa perita* male palpus, ventral view showing the TA; **102:** *Pirata piscatorius*, male palpus, ventral view showing the absence of palea. **TA**, Terminal Apophysis





**Figs 103-110.** **103-104:** *Aglaoctenus lagotis*. **103**, male, cephalothorax lateral view, showing the trapezoidal format; **104**, female, cephalothorax lateral view, showing the wedge shaped format. **105-106:** *Alopecosa kochi*, female. **105**, female left palpus, retrolateral view showing the conical tibia; **106**, female labium, ventral view. **107:** *Trochosa terricola*, female right palpus showing the tubular tibia. **108:** *Pardosa lugubris*, female labium, ventral view. **109:** *Schizocosa ocreata*, female spinnerets, lateral view. **110.** *Trochosa terricola*, female spinnerets, ventral view showing the colulus. **105,107:** bar, 1mm; **106, 108-110:** bar, 0.5mm



1mm

111



112



113

**Figs 111-113.** **111-:** *Orinocosa paraguensis*, male, cephalothorax frontal view. **112:** *Orinocosa* sp 2, female epigynum dorsal view. **113:** *Orinocosa* sp 3, female epigynum, ventral view showing the excavation in the anterior part of the longitudinal septum. **111-112:** bar, 1mm. **113.** bar, 0.5mm

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## APPENDIX 1

### Material examined for the phylogenetic analysis

#### *Lycosidae*

*Orinocosa aymara* (Chamberlin, 1916). PERU: Cusco: (Santa Ana), 3000 ft., viii. 1911, 1♀ (MCZ 294), Holotype; Cusco: (Huadquina), 5000 ft., vi. 1911, 1♀ (MCZ 254), Paratype.

*Orinocosa hansii* (Strand, 1916): GREECE: Kreta, (Phurne), Roewer leg vi.1926, N°89/ Arachnid Roewer Collection-Lfd, 2♀ 2♂, (N° 2230), Holotype.

*Orinocosa paraguensis* (Gertsch & Wallace, 1937): PARAGUAY: Alto Parana, (Taquarapa), 1♂ (Fiebig Collection 3721), Holotype.

*Orinocosa priesneri* Roewer, 1959: EGYPT: (Djebel Bokas), iii. 1935, Prinsus leg., 1♂, N° 314/ (NHSM 6108), Holotype.

*Orinocosa pulchra* Caporiacco, 1947: GUYANA: Esequibo: (Webecari Mission), 3.iv.1936, 1♀ (MZUF 285), Syntype; (Windsor Forest), 4-7.viii.1936, 1♂ (MZUF 291); Cuyuni-Mazaruni: (Bartica), 8.vi.1936, 1♀, (MZUF289); Vreed en Hodge 3♀ 1♂, 25.vi.36 (MZUF); Potaro-Siparuni: (Tumatumari), 21.vii.1936, 1♂ 1♀ 1 juv, (MZUF 290), Paratype.

*Orinocosa tropica* Roewer, 1959: UGANDA, Ost-Afrika, (Ruwenzori National Park), N°769/ Arachnid Roewer Collection-Lfd, 1♀ (N° 11724), Holotype.

*Orinocosa* sp nov A: PERU. Loreto. Maynas, Napo, Rio Curaray, (Gasoducto Barrett), 1°51'42.46"S, 75°24'6.12"W, 176m, 24-25.ii.2008, W. Paredes leg., 1♀ (MUSM-ENT 505 046)

*Orinocosa* sp nov B2: PERU. Loreto: Maynas, (Rio Napo), 1°12'33.8"S/ 72°22'32"W, 190m, 2.i.2009, W. Yawarcani leg, 1♀ (MUSM-ENT 00505 055); Maynas, Rio Curaray, (Gasoducto Barrett), 1°51'42.45"S, 75°24'6.12"W, 176m, 24-25.ii.2008, W. Paredes leg., 1♂

*Orinocosa* sp nov B3: PERU. Loreto: Maynas, Rio Curaray, (Gasoducto Barrett), 1°42'49.69"S/

75°29'9.85"W, 274m, 25.ii.2008, W. Yawarcani leg (MUSM-ENT 00505 056) 1♀; Loreto: Maynas, Napo, Rio Curaray, (Gasoducto Barrett), 1°39'35.88"S, 75°25'48.85"W, 207m, 14.ii.2008, W. Yawarcani leg., 1♂ (MUSM-ENT 00505 044).

*Orinocosa* sp nov B4: PERU. Cusco. La Convención, Camisea, (Llactahuaman), 12°51'52.23"S, 73°30'53.68"W, 1778m, 24.vii.1998, S. Cordova et al., 1♀ (MUSM-ENT 00505 278); Cusco. La Convención, Camisea, (Llactahuaman), 12°51'26.75"S, 73°31'27.98"W, 1690m, 26.vii.1998, S. Cordova et al., 1♂ (MUSM-ENT 00505 282)

*Orinocosa* sp nov C: PERU. Cusco: La Convencion, (Echarate), 12°12'46.96"S/ 72°49'5.36"W, 445m, 22.iv.2010, C. Carranza & E. Razuri leg., 2♀. (MUSM-ENT 00501 444).

*Orinocosa* sp nov D: PERU: San Martin: Moyobamba, Soritor, (Caserio Paitoja), 6°21'12.49"S, 77°4'22.13"W 1584m, 3-4.xii.2008, C.Albujar leg., 4♂ (MUSM-ENT 00505 087); San Martin, Moyobamba, Soritor, (Caserio Paitoja). 6°21'14.74"S, 77°4'15.30"W 1646m, 30.viii.2008, C.Albujar leg., 1♀ (MUSM-ENT 00505 129).

*Orinocosa* sp nov E: PERU: Cusco, La Convencion, Camisea, (Cashiriari), 11°52'S, 72°39"W, 30.xi.1997, J. Duarez leg., 1♀ (MUSM-ENT 00505 186); Cusco, La Convencion, (Reserva Comunal Matsigenga), 12°10'20.98"S, 73°02'32.48"W, 581m, 15.viii.2007, A. Asenjo leg., 2♂ (MUSM-ENT 00505 117).

*Orinocosa* sp nov FN: PERU: Cusco, La Convención, Camisea, (Gasoducto TGP), 12°16'49.4"S, 73°01'5.8"W, 1425m, 24.viii.2009, W. Paredes & D. Concha leg., 1♂ (MUSM-ENT 00505 304); Cusco, La Convención, Camisea, (Gasoducto TGP), 12°16'50.4"S, 73°01'8.5"W, 1463m, 24.viii.2009, W. Paredes & D. Concha leg., 1♀ (MUSM-ENT 00505 178).

*Orinocosa* sp F1: PERU: Cusco, La Convención, Camisea, Llactahuaman, 12°52'18.90"S, 73°30'5.43"W, 1175m, 26.vii.1998, S. Cordova et al leg. 2 ♂ (MUSM-ENT 00505 189); La Convención, Reseva Comunal Matsiguenga, 12°13'33.8"S, 73°02'06.09"W, 1297m, 16.iv.2007, A, Asenjo leg. 1 ♀ (MUSM-ENT 00505 292).

*Orinocosa* sp nov G: PERU. Madre de Dios: Zona Reservada Tambopata, (Trocha de Bambu), Quebrada, 12°50'S, 69°17'W, 290m, 22.vii.1987, D. Silva D. leg., 1♂ (MUSM-ENT 00505 240); Madre de Dios. Zona Reservada Tambopata, (Trocha de Bambu, Quebrada), 12°50'S, 69°17'W, 290m, 22.vii.1987, D. Silva D. leg., 1♂ 1♀.

*Orinocosa* sp nov H: PERU. Madre de Dios: Rio Tambopata, Rio Los Amigos, CICRA Biological Station, (2do Mirador), 12°33'S, 70°05'W. 281m, 17.x.2005, W. Paredes leg., 1♀

*Orinocosa* sp nov I: PERU. Pasco: Huancabamba, NW de Iscozacín, (Quebrada Chispa), 10°10'S, 75°1.5' W 345m, 3.xi.1986, D. Silva D. leg., 1♀ (MUSM-ENT 00505 303).

*Orinocosa* sp nov L. PERU: Puno: (Zona Reservada Tambopata-Candamo), 13°21'46''S, 69°33'65''S, 24.viii.1992, I. Bohorquez leg, 1♀ (MUSM-ENT 505 151)

*Orinocosa* sp nov K. COLOMBIA: Meta: Puerto López, Inspección Policial Remolinos, (Cafam Llamas, ca). 4°05'N/ 72°57'W, 17.x.2002, 270m, J.J. Jimenez & D. Cuad leg. 2♀.

*Orinocosa* sp nov J. BOLIVIA: La Paz: próximo de Coroico, (Rio Huarinilla), 31.vii.1993, A. D. Brescovit leg., 1♂ (MCN-FZB 23794).

*Orinocosa* sp nov M. BOLIVIA: La Paz: Nor Yungas, (Cascata del Leon), 17.vii.1993, A.D. Brescovit leg., 1♀ (MCN-FZB 23725).

*Orinocosa* sp nov N. ECUADOR: 10. Morona Santiago, Near Macas, (Parque Ecológico Indio Alex), S 02.19075°, W 078.8288°, 1196m, 24.Mar.2011, A. Chagas, A. Giupponi & A. Kury leg., 1♂ (MNRJ 06505).

*Orinocosa* sp nov. O. PERU: Ucayali: Sepahua, Rio Urubamba, (Quebrada Panguana), ca. 11°2'32''S, 72°33'54W ca. 369m, 01.viii.2001, 1♀ (MUSM-ENT 00500 875).

*Orinocosa* sp nov P: ECUADOR: Napo, (Estacion Biologica Jatun-Sacha), 1°3'57.6"S/ 77°37'0.2"W. A. J. Santos leg. 1.xii.2009 1♂, 1♀ (UFMG 9120). Napo, (Estacion Biologica Jatun-Sacha), 1°3'57.6"S/ 77°37'0.2"W. A. J. Santos leg. 1.xii.2009, 2♂ (UFMG 9121)

*Orinocosa* sp nov Z: PERU. Junin: Chanchamayo, Santuario Nacional Pampa Hermosa, (El Chorruto), 10°59'48.9"W, 72°25'35.3"S, 1593m, 1.vi.2011, D. Silva et al. leg., 1♂ (MUSM-ENT no number); Chanchamayo, Santuario Nacional Pampa Hermosa, (El Chorruto), 10°59'48.9"W, 72°25'35.3"S, 1593m, 1.vi.2011, D. Silva et al. Leg., 2♀

*Orinocosa* sp nov 2: PERU. San Martin: Tarapoto, (Cerro Azul), 6°27'17.6"S, 76°19'44.6"W 842m, 26.ii.2005, W. Paredes leg., 1♀ (MUSM-ENT 00505 210).

*Orinocosa* sp nov 3: PERU: Junin: Rio Tambo, (Mashira), 11°25'20.71"S, 73°27'15.91"W, 608m, 30.xi.2010 J. Grados leg., 1♂ (MUSM-ENT 00505 158); Rio Tambo, (Mashira), 11°25'20.71"S, 73°27'15.91"W, 608m, 30.xi.2010 J. Grados leg., 1♀ (from MUSM-ENT 00505 158). Cusco: La Convención, Gasoducto Camisea, 11°42'16.2"S, 72°54'45"W 460m, iv-v. 1998, S. Cordova et al leg, (MUSM-ENT 00505 267) 1♀.

## **Outgrup taxa**

### ***Lycosidae***

*Aglaoctenus lagotis* (Holmberg, 1876): BRAZIL: Goias:, Minaçu, (Usina Hidroeletrica Serra da Mesa) 18-30.xi.1996, 1♀, (MCN FZB 28049). Parana: (Telêmaco Borba), 13.x.1986, 1♂, (MCN FZB 20555).

*Aglaoctenus castaneus* (Mello - Leitão, 1942): BRAZIL: Para: Fortaleza, (Ilha do Mel), 18. ix.1988, 1♂, (MCN-FZB 20608); Para, Fortaleza, Ilha do Mel, 09.vii.1989, 1♀, (MCN-FZB 20609)

*Agalenocosa singularis* Mello-Leitão, 1944: BRAZIL: Rio Grande do Sul: (Torres), 2010, 2♀, 1♂. R. Ramos leg, (MCTP 32589)

*Xerolycosa nemoralis* (Westring, 1861): UNITED KINGDOM: Ipswich: Heathlands Hollesley, (Suffolk), 12.vi.1961, 1♂, 1♀.

*Pirata piraticus* (Clerck, 1757): UNITED KINGDOM: Dibden Bottom, (New Forest), 5.vi.1955, J.A.L.C.

*Pirata piscatorius* (Clerck, 1757): No data nor locality of collecting, 1♂, 1♀(N°330) (MZUSP 10.910)

*Pardosa fastosa*: COLOMBIA: Boyaca, (Via Santa Rosa a Duitama), 10.iv.2002, 2400m. O. Cambita leg 3♂, 4♀, (ICN-Ar 1884)

*Pardosa lugubris* (Walckenaer, 1802): GERMANY: no locality nor data of collecting, (N° 328), 1♂, 2♀, (MZUSP 10.908)

*Lycosa schenkelli* Mello-Leitão, 1939: BRAZIL: Rio Grande do Sul: Cambará do Sul, Parque Nacional Aparados da Serra, 28°41'9.63"S, 50°9'57.06"W, 8.xi.2011, 2♂, 1♀, (UFMG 8602)

*Lycosa thorelli*: (Keyserling, 1877): PERU: Cajamarca, Lonya Grande, (Rio Marañón), iv.2010, 4♂ 2♀ (MUSM-ENT 0504 130).

*Lycosa tarantula* (Linnaeus, 1758): SPAIN: Madrid, (IBSP 41 030), 1♂; Madrid, (IBSP 41 028), 1♀.

*Alopecosa kochi* (Keyserling, 1877): UNITED STATES: California: El Dorado Co., Blodget Experimental Forest, 14.4K, Georgetown, N38°54,625' W120°39.707', 1300m, 16-18.ix.2011, 6♂ 16♀.

*Hippassa* sp: INDIA: Tamilnadu: (Rajapalayam), 150m, 28.iii.1962, 1♀, 1 juv, (CASENT 9043789). Tamilnadu: (Coimbatore), 430m, 8.iii.1962, 1♀ 1♂ 1 juv, (CASENT 9043788).



*Schizocosa ocreata* (Hentz, 1844): UNITED STATES: Missouri: DryFork, Rolla, 26.vi.19562, 1♂, 2♀, (CASENT 9047067).

*Arctosa perita* (Latreille, 1799): GERMANY: No data and no locality of collecting, (N°325), 1♀, 1♂, (MZUSP 10.913).

*Arctosa* sp nov.: PERU. Pantanos de Villa Lima, Chorrillos, (Totorales). 12°12' 22.0''S/ 76°59'19.5''W, ±24m, 12.xi.2006. W. Paredes & C. Ruiz leg., 1♀ 1♂ (MUSM-ENT 00500107).

*Arctosa* sp nov M: BRASIL: Minas Gerais, Jaboticabas, Minas Gerais, (Parque Nacional da Serra do Cipó), 19°37'S 43°21'W, 27.vii.2002, E.S.S. Alvarez leg, 1♀ (UFMG 6319)

*Ocyale* sp: KENYA: Rift Valley Province: Lodwar, (Along Turwell River), 35°35.7'E 3°7.0'N, 10-12.vi.1999, 1♂ 1♀, (CASENT 9043996).

*Hogna yauliensis*: (Strand, 1908): PERU: Junin: Yauli, Right side of Yauli river, Cerro Jerusalen, 11°39'41.4''S, 76°04'39.3''W, 4111m, 23.viii.2005, 1♂ 2♀, (MUSM-ENT 0500 301)

Gen Nov Aff *Trochosa*: COLOMBIA: Cauca: Guapi, Parque Nacional Isla Gorgona, vii.2003, 5m, 1♂, (ICN-Ar 2580); Meta: Finca Santa Ana, 4°17'25"N/ 75°27'16"W, 300m, viii-xii.2002, 2♀ (ICN-Ar no number).

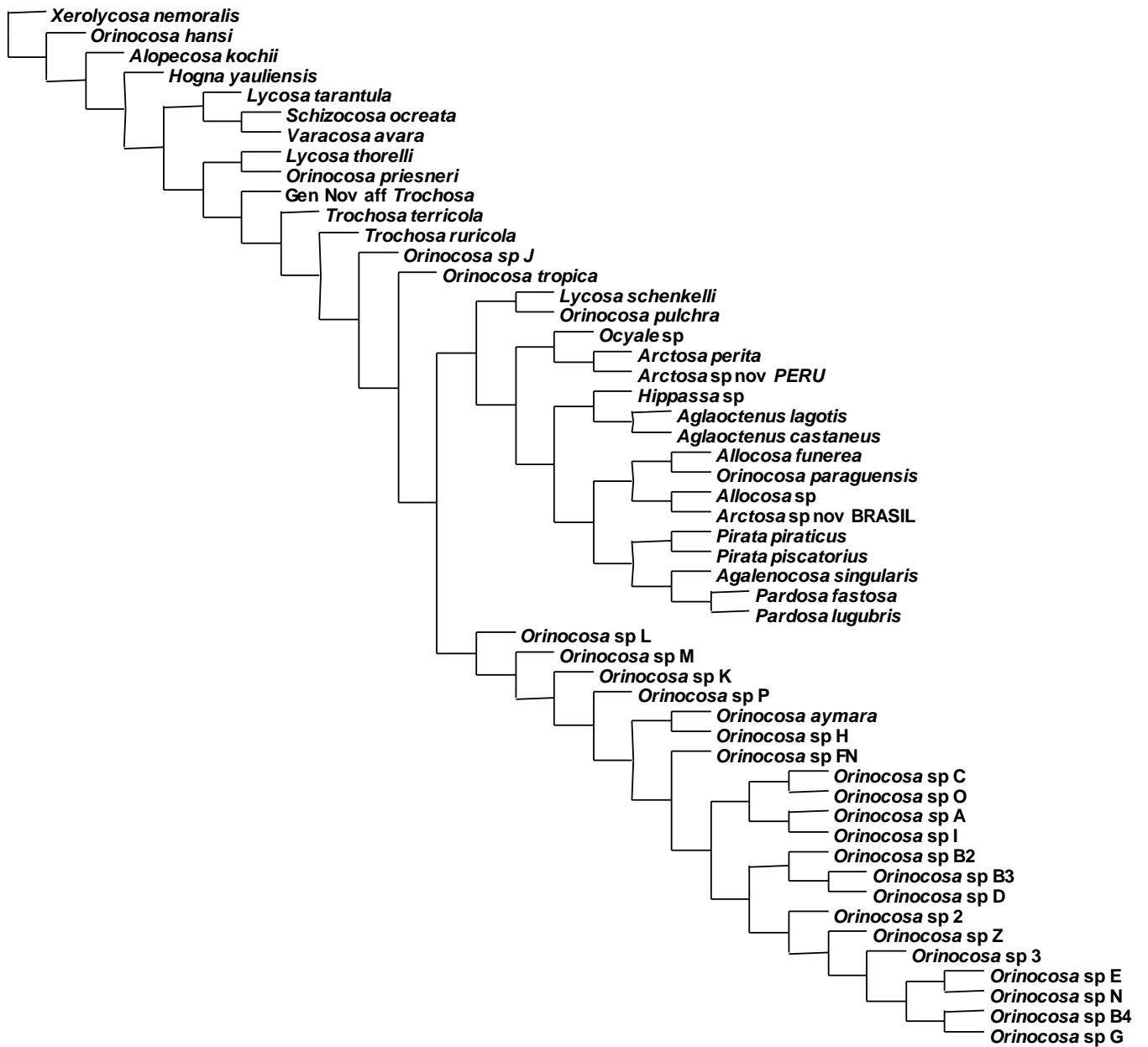
*Trochosa ruricola* (De Geer, 1778): UNITED KINGDOM: Hampshire: 7.iv.1960, 1♂, J.A.L.C. (N° 3002). GERMANY: no data nor locality of collecting, 1♂ 1♀ 2 juv. (MZUSP 10.904).

*Trochosa terricola* (Thorell, 1856): GERMANY: No data and no locality of collecting, (N°316), 3♀, 3♂, (MZUSP 10.902)

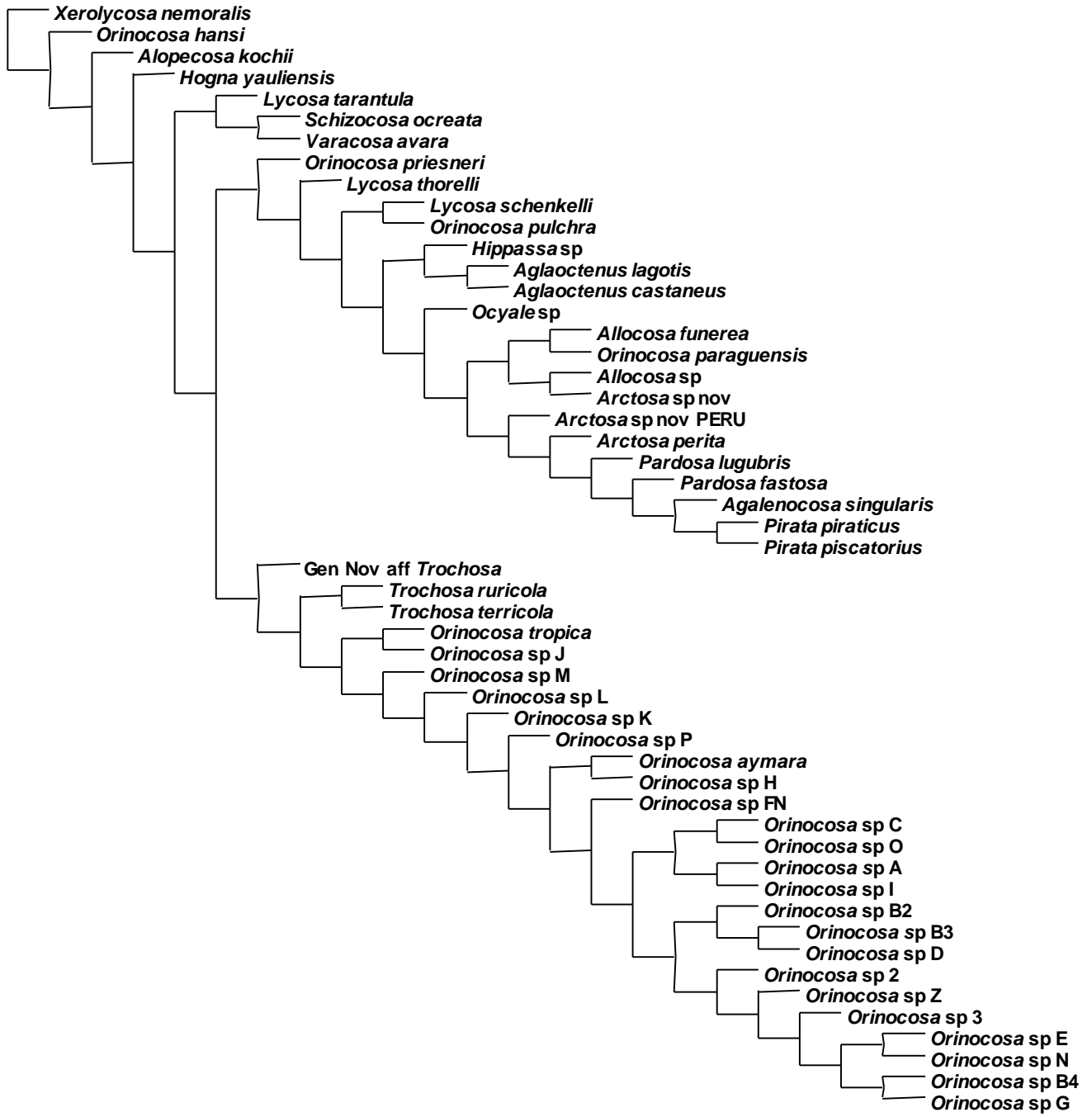
*Varacosa avara* (Keyserling, 1877): USA: CL-390 Aub. Wash, Co. Cove, 23.Feb.1963, Hexline leg, 1♂ 1♀ (CASENT 9047076)

*Allocosa funerea* (Hentz, 1844): USA: Missouri, Rolla, Sept 1951 H. Exline leg., 1♀ (CASENT 9047043). Missouri, Rolla, Sept 1951 H. Exline leg., 1♂ (CASENT 9047042)

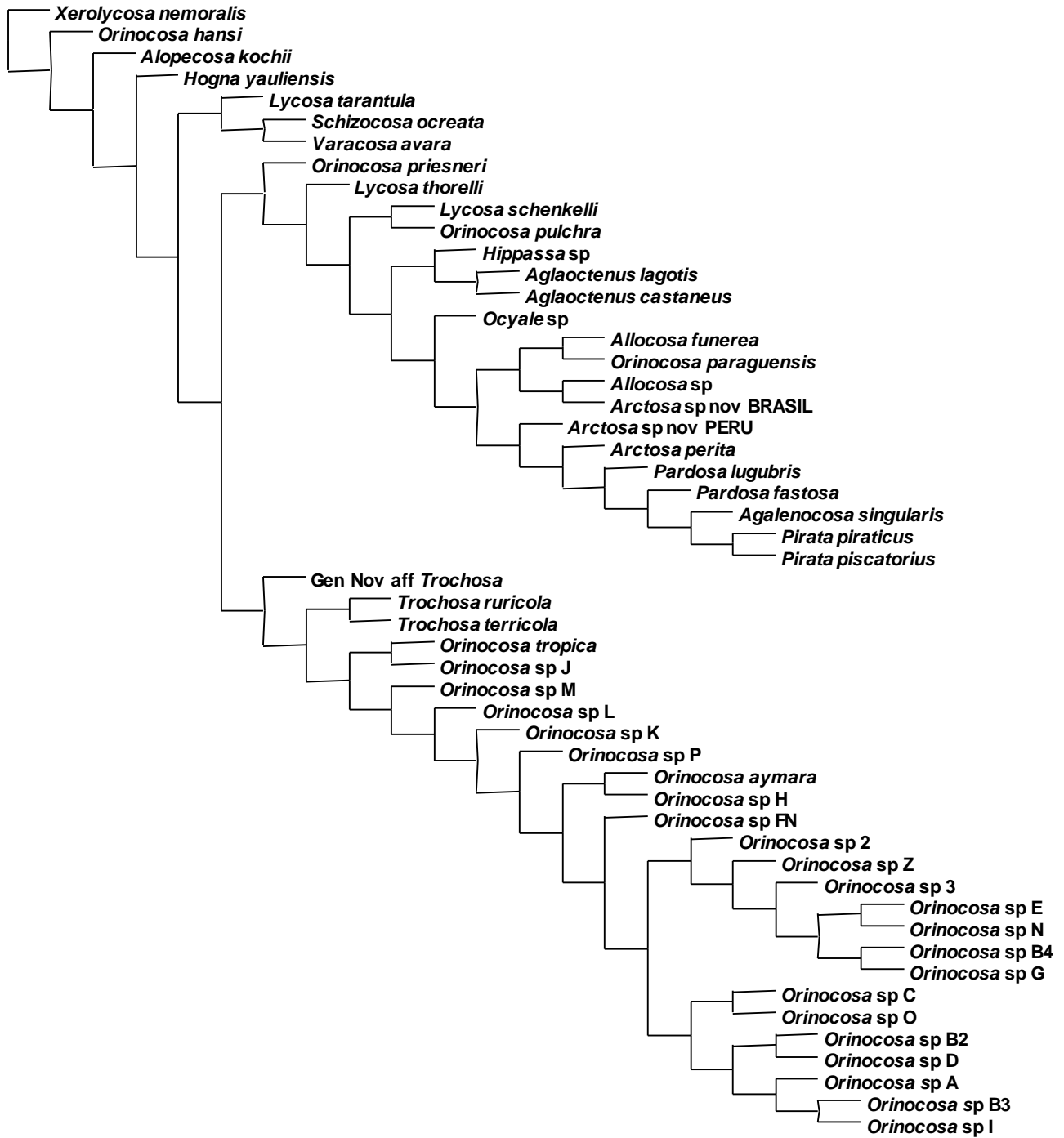
*Allocosa* sp.: PERU: San Martin, Moyobamba (Yuracyacu), 5°57'0.91"S, 77°14'1.34"W, 828m, 10.ix.2008, W. Paredes & C. Albuja leg., 1♂ 1♀ (MUSM-ENT 00500 360).



APPENDIX 2: Parsimonius tree number 1



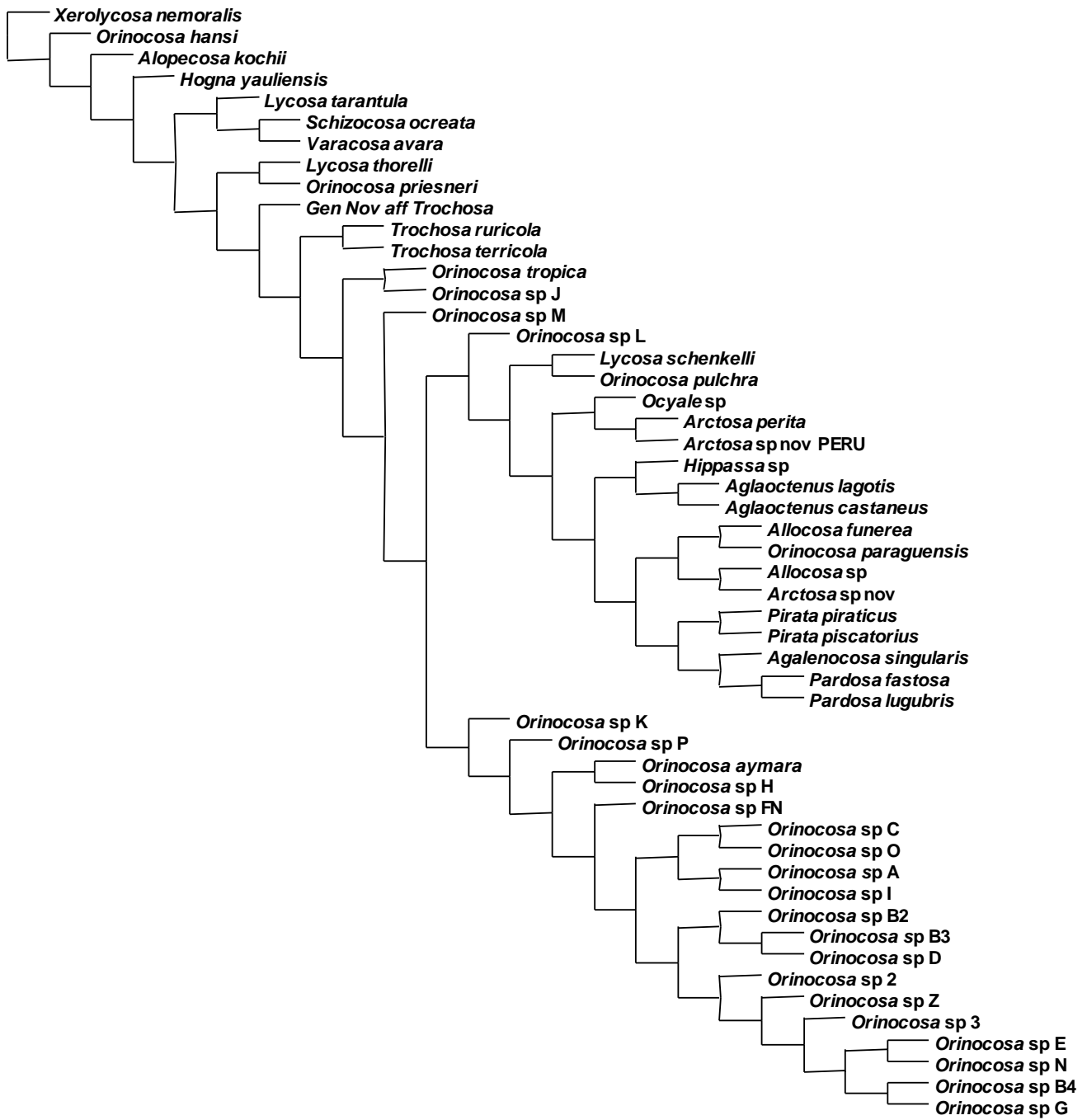
APPENDIX 3: Parsimonius tree number 2



APPENDIX 4: Parsimonius tree number 3



APPENDIX 5: Parsimonius tree number 4



APPENDIX 6: Parsimonius tree number 5