UNIVERSIDADE FEDERAL
DO RIO GRANDE DO SUL

INSTITUTO DE BIOCIÊNCIAS

PROGRAMA DE PÓS-GRADUAÇÃO EM BIOLOGIA ANIMAL

DISSERTAÇÃO DE MESTRADO

ANÁLISE COMPARATIVA DA FAUNA DE ARANHAS DE SOLO EM ÁREAS DE CAMPO COM E SEM PASTEJO NO PAMPA GAÚCHO

Autor: Guilherme Oyarzabal da Silva

Orientador: Dr. Ricardo Ott

Linha de Pesquisa: Biodiversidade

Porto Alegre

Fevereiro/2017

UFRGS
UNIVERSIDADE FEDERAL
DO RIO GRANDE DO SUL

Guilherme Oyarzabal da Silva

ANÁLISE COMPARATIVA DA FAUNA DE ARANHAS DE SOLO EM ÁREAS DE CAMPO COM E SEM PASTEJO NO PAMPA GAÚCHO

Dissertação apresentada ao Programa de Pós-Graduação em Biologia Animal, da Universidade Federal do rio Grande do Sul como requisito para obtenção do grau de Mestre em Biologia Animal.

Aprovada em 17 fevereiro de 2017.

Dr: Ricardo Ott – Orientador

Dr: Adalberto José dos Santos – Universidade Federal de Minas Gerais

Dra: Ana Paula Ott – Universidade Federal do Rio Grande do Sul

Dra: Simone Mundstock Jahnke – Universidade Federal do Rio Grande do Sul

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

Reitor: Rui Vicente Oppermann

Vice-Reitora: Jane Fraga Tutikian

INSTITUTO DE BIOCIÊNCIAS

Diretor: João Ito Bergonci

Vice-Diretora: Lavinia Schüler Faccini

Silva, Guilherme Oyarzabal

Análise comparativa da fauna de aranhas de solo em áreas de campo com e sem pastejo no Pampa Gaúcho. Guilherme Oyarzabal da Silva. – Porto Alegre: IBIO/UFRGS, 2017, [151 pp.].

Dissertação (Mestrado). – Universidade Federal do Rio Grande do Sul. Instituto de Biociências, Programa de Pós-Graduação em Biologia Animal. Porto Alegre, RS - BR, 2017.

Orientador: Ricardo Ott

Universidade Federal do Rio Grande do Sul – **Instituto de Biociências**; Campus do Vale Av. Bento Gonçalves, 9500 - Porto Alegre - RS - Brasil CEP: 91501-970
Fone: +55 51 3308-7676
Fax: +55 51 3308-7675
E-mail: biociencias@ufrgs.br

DEDICATÓRIA

Aos que acreditam que educação e conhecimento podem salvar esse mundo

Aos que acreditam numa ciência sem barreiras e fronteiras

Aos que tem senso crítico e empatia

Aos que se atrevem e ousam

Aos que não cansam de tentar

"You think you're any different from me, or your friends, or this tree? If you listen hard enough, you can hear every living thing breathing together. You can feel everything growing. We're all living together, even if most folks don't act like it. We all have the same root, and we are all branches of the same tree".

-Huu. Avatar, The Last Airbender.

AGRADECIMENTOS

Espero não cometer nenhuma injustiça ao nomear quem preciso agradecer por terem participado, de alguma forma, na construção deste trabalho e de minha jornada até aqui.

Obrigado mãe, Angelita e pai, Salvador, por terem me dado vida e seus exemplos. A tanta coisa pra agradecer que nem sei por onde começar. Vou simplificar: Amo vocês.

Obrigado minha mana, Mariucha. Sem você, eu não seria metade do homem que sou hoje. Sem você, eu não seria professor. Sem você, eu não acreditaria na educação. Mesmo longe, vou te amar pra sempre!

Obrigado, vó Zoel e vô Vitor. Por trabalharem tanto para me dar a educação que tenho hoje. Não estaria aqui se não fossem vocês.

Obrigado aos meus amigos mais próximos, aqueles que já constroem amizades de 10-15-20 anos. Clarissa Dreon, Claudia Gomes, Débora Aguiar, Fernando Cardoso, Germano Rosa, Letícia Nieto, Paula Ramos, Thomas Gandini, em ordem alfabética pra não colocar ninguém na frente! Mesmo longe e vivendo essa vida adulta louca, ainda sinto que somos aqueles colegas de escola. Nossa amizade não se explica só se sente.

Obrigado Lana Resende. Pelo colo, cafés da manhã, abraços apertados, puxões de orelha, maquinas do sacode. Pelo sorriso sem compromisso, pela risada sincera, pelo olho brilhando, pelo cafuné. Por me dar esperança e estender a mão quando caio. O chão não combina com a gente.

Obrigado ao meu orientador de anos, Ricardo Ott. Pelas conversas que começavam sobre aranhas e terminavam em política. Pelos devaneios sobre se existe aleatoriedade nesse universo. Pelos ensinamentos, sobre ecologia, sobre aranhas, sobre pesquisa, sobre ciência.

Obrigado a minhas colegas de laboratório. Edna Velhino, pelo turotia inicial na aracnologia, por tirar aquelas duvidas mais bestas. Patrícia Rodrigues, pelas conversas no almoço sobre ciência, vida e carreira. Kimberly Marta, pelas loucuras sobre aranhas e a indignação com o mundo lá fora.

Obrigado Equipe Alfa, Danielle Franco, Joana Tomazelli e Lana Resende. Pelas conversas profundas sobre biologia, sobre a vida, sobre nossos projetos. Por me apresentarem organismos completamente diferentes dos meus. Ainda quero aprender muito com vocês.

Obrigado aos meus professores, mestres e doutores da escola, do colégio, da universidade. O conhecimento de vocês me impulsionou até aqui.

Obrigado ao Programa de Pós-Graduação em Biologia Animal da Universidade Federal do Rio Grande do Sul (UFRGS), a Fundação Zoobotânica do Rio Grande do Sul (FZB) e ao Museu de Ciências Naturias do Rio Grande do Sul (MCN) pelas estruturas físicas e pessoais. Suas lutas são justas.

Obrigado Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) pela concessão da bolsa de mestrado.

Obrigado a todxs! Vocês fazem parte desta conquista.

SUMÁRIO

RESUMO

O Pampa é um bioma do tipo savana exclusivo da região Neotropical, situado na porção sul da América do Sul, cobrindo a Argentina, o Uruguai e o Brasil. O clima é quente temperado e úmido, com temperaturas anuais que variam de 0° C no inverno e mais de 24° C no verão. Os grandes distúrbios no Pampa se iniciaram a cerca de 300 anos com a chegada da colonização Europeia na região e o advento da agricultura, silvicultura, manejo sem controle pelo fogo e a criação de gado, leiteiro e de corte. Apesar de contribuir para a falta de heterogeneidade vegetal e perda na diversidade de fauna, a pecuária ainda é extensivamente indicada como manejo sustentável do Pampa. Com pesquisas e trabalhos por vezes mais focados no aumento da produtividade do rebanho que na manutenção da biodiversidade, a conservação do Pampa vem sendo negligenciada. O monitoramento de diferentes metodologias de pastejo, tradicional, em mosaico e exclusão total do gado, se faz necessário para um maior entendimento de como a diversidade de plantas e animais se comportam nestes sistemas. Para isso, são necessários bons modelos ecológicos para testes de hipóteses e diferentes manejos, o que sustenta a utilização de aranhas para estes estudos. Aranhas são rápidas colonizadoras, ótimas dispersoras, predadoras generalistas, além de estarem estritamente relacionadas à estrutura vegetal. Suscetíveis a impactos bióticos e abióticos, aranhas são ótimas medidoras de qualidade ambiental e, sendo de fácil amostragem, podem ser envolvidas em estudos sobre diversidade de espécies e indivíduos. Para tanto, este estudo foi realizado na APA do Ibirapuitã, na Campanha do Rio Grande do Sul, Brasil. Seis parcelas, de um hectare cada, foram distribuídas em pares em três fazendas. Cada par é constituído de uma parcela com pastejo, demarcadas apenas por estacas, onde o gado tem livre acesso, e uma parcela sem pastejo, cercadas desde Agosto de 2012 onde o pastejo do gado foi excluído por completo. A principal expectativa principal é que a abundancia, riqueza, biomassa e composição de aranhas serão diferentes quando áreas com e sem pastejo são comparadas forem comparados. As amostragens foram realizadas com o uso de armadilhas de queda do tipo "*Pitfall traps*" nas primaveras de 2011, 2012 e 2013, e sazonalmente no outono (maio), inverno (setembro) e primavera (novembro) de 2015 e verão (fevereiro) de 2016 para a captura de aranhas de hábito epígeo. Para análises estatísticas, Testes T, ANOVA e ANOSIM foram realizadas. Linyphiidae e Lycosidae foram as famílias mais abundantes e ricas em todas as coletas realizadas. Os resultados obtidos em 2011, 2012 e 2013 não demonstraram diferença significativa na fauna de aranhas, abundância e riqueza quando áreas com e sem pastejo foram comparadas. Contudo, os resultados apresentaram valores maiores nas áreas com pastejo quando comparando com áreas sem pastejo. Em 2015/2016 a abundância e a riqueza de aranhas também não foram significativamente diferentes nos dados coletados, contudo, os valores brutos também apresentaram maiores abundância e riqueza em áreas com pastejo do que nas sem pastejo. Analisando-se as estações como um todo, juntando áreas com e sem pastejo, o verão foi a estação com mais riqueza geral. Contudo, analisando as áreas com e sem pastejo separadamente, o inverno foi a estação mais rica e abundante em cada uma destas áreas. Apesar dos resultados anteriores, as espécies mais abundantes demonstraram diferença significativa em suas abundancias em cada estação do ano quando áreas com e sem pastejo foram comparados. A biomassa das aranhas não foi significativamente diferente para todos os anos entre áreas com e sem pastejo, com valores maiores em áreas com pastejo. Entretanto, espécies mais abundantes demonstraram diferenças significativas em sua biomassa sazonalmente nos anos de 2015 e 2016, com valores maiores em áreas com pastejo. Áreas com e sem pastejo ainda se mantém similares mesmo após quase quatro anos de exclusão do gado em termos de abundância total de aranhas. Apenas aranhas mais abundantes demonstram diferença entre áreas com e sem pastejo em termos de abundância e biomassa.

Palavras-Chave – Neotropical; Aracnídeos; Diversidade; Biomassa; Campo

ABSTRACT

Pampa is a savanna-like biome, exclusively of Neotropical region, lying in southern part o South America, covering Argentina, Uruguay and Brazil. The climate is hot temperate and humid, with annual temperatures ranging of 0° C in winter and higher than 24° C in summer. The increase of disturbance at Pampa began around 300 years after Europian colonization and the advent of agriculture, silviculture, uncontrolled fire management and creation of dairy and beef cattle. Even livestock causing loss of vegetal heterogeneity and fauna diversity, it is a widely recommended methodology for sustainable management of Pampa. With studies more focused in forage properties and beef production than diversity maintenance, the Pampa conservation has been neglected. Monitoring different livestock methodologies are necessary to improve knowledge of how diversity of plants and animals change during this impact. Thus, using great ecological models, like spiders, are necessary to test hypotheses and different managements. Spiders are quick settlers, great dispersers, generalist predators and are much correlated with vegetal structure. Susceptible to biotic and abiotic impacts, spiders are great environmental quality meters, being easy to sample and to measure abundance, diversity and richness. This study was conduct at Ibirapuitã River Environmental Federal Protection Area "Área de Proteção Ambiental – APA do Rio Ibirapuitã" in Rio Grande do Sul state, Brazil. Six plots, of one hectare each, were distributed in pars in three farms. Each pair is constituted of a closed plot, a fenced plots since August 2012, with total exclusion of cattle graze; and a opened plot with only poles in the corners to demarcate the place, and cattle have free access for graze. Our main expectative is that abundance, richness, biomass and composition of arenofauna will be different when grazed and ungrazed areas were compared. Ground dwelling spiders were sampled with Pitfall traps in springs of 2011, 2012 and 2013, and seasonally in autumn (May), winter (September) and spring (November) 2015 and summer (February) 2016. Statistical analyses were performed using Stundents' Test, ANOVA and ANOSIM. Linyphiidae and Lycosidae were the most abundant and richer families. Results of 2011, 2012 and 2013 were no significant different in spider abundance and richness when grazed and ungrazed plots were compared. However, raw data suggest higher values of abundance in grazed areas than ungrazed ones. In 2015/2016 samples, spider abundance and richness were not significant different between grazed and ungrazed areas. Raw data suggest that grazed areas abundance and richness was higher than in ungrazed though.

Although summer was the richer season in general, winter was the richer season separately in grazed and ungrazed areas. Despite the previous results, abundance of the most abundant species were significant different between grazed and ungrazed areas in general and in each season. Spider biomass was not significant different in any year when grazed and ungrazed areas were compared. However, biomass of most abundant species were significant different seasonally and in each season in 2015/2016. Grazed and ungrazed areas are still very similar even after almost four years of cattle exclusion in terms of spider abundance and biomass. Only most abundant species demonstrate a significant difference between grazed and ungrazed areas in terms of abundance and biomass, with higher values in grazed plots.

Keywords – Neotropical; Arachnids; Diversity; Biomass; Grassland

LISTA DE FIGURAS E TABELAS

INTRODUÇÃO GERAL

O Pampa

O Pampa é um bioma Neotropical do tipo savana, onde a paisagem é dominada por extensas pastagens e prados, com a predominância de gramíneas formando vastos campos, e além desses, matas ciliares, de encosta e capões de mato (Overbeck et al. 2007; Beheling et al. 2009; Boldrini 2009). A denominação bioma (bio = vida; oma = proliferação) refere-se a locais que reúnem diferentes ecossistemas em uma unidade geográfica contínua, sendo o termo ratificado ao Pampa apenas em 2004, pelo Ministério do Meio Ambiente brasileiro (Suertegaray & Silva 2009). Como bioma, o Pampa é a reunião de formações únicas relacionadas a ecossistemas e paisagens, que articula conceitos também geográficos, com particularidades próprias em termos de tráfego de energia e matéria (IBGE 2004).

O Bioma Pampa é exclusivo da porção meridional da América do Sul e cobre uma área com cerca de 75.000 km^2 (Vélez et al. 2009) em partes da Argentina, todo o território do Uruguai e o extremo sul do Brasil (Fig. 1). É formado por vastas planícies e coxilhas e sua altitude máxima não ultrapassa os 200 m (Suertegaray & Silva 2009). O Rio Grande do Sul é o único estado com ocorrência do Pampa, no Brasil, cobrindo cerca de 63% do território do mesmo e apenas cerca de 2,07 % do território brasileiro (Suertegaray & Silva 2009).

O Pampa situa-se na Zona Temperada Sul, com quatro estações bem caracterizadas (Suertegaray & Silva 2009), e tem, segundo a classificação de Köppen-Geiger, um clima do tipo “Cfa”, temperado, úmido e com verões quentes (Kottek et al. 2006). As temperaturas mínimas no inverno chegam até 0°C e variam de 22°C a mais de 24°C nos meses de verão (Nimer 1977; Suertegaray 1998). A precipitação anual varia de 1.250 e 1.500 mm sem estações seca (Cordeiro & Soares 1977).

Os impactos

A presença humana na região se inicia-se por volta de 13.000-10.000 (A.P.) no início do Pleistoceno, com culturas pré-colombianas que colonizaram a região (Consens 2009; Cruz & Guadagnin 2010). O clima nesta época era mais frio e seco, com o nível do mar mais baixo do que o de hoje (Carvalho 2003). Os campos eram dominados por animais da megafauna como mastodontes, tatus e preguiças gigantes (Scherer & da Rosa 2003; Alberdi & Prado, 2008) além da vegetação predominante de poaceae e ervas como Cyperaceae e Asteraceae (Behling et al. 2005). A megafauna era responsável pelo controle da sucessão dos campos para floresta, transformando a paisagem em mosaicos com diferentes intensidades de pisoteio e pastoreio, que por conseqüência, também diminuía a probabilidade de incêndios espontâneos (Cruz & Guadagnin 2010).

Os primeiros habitantes humanos do Pampa ocupavam e caçavam em lugares abertos (Cruz & Guadagnin 2010). Essas comunidades provavelmente não dominavam o polimento de rochas, mas já se utilizavam do fogo, inclusive para caçadas (Carvalho 2003; Suertegaray & Silva, 2009). O fogo em caçadas funcionava para direcionar os animais para locais mais propícios para o abate, reduzindo o gasto de energia e aumentando a eficiência, além de manter o campo baixo e propiciar um melhor avistamento de ameaças (Behling et al. 2009, Overbeck et al. 2009). A extinção da megafauna, por volta de 8.000 (A.P.), e o aumento da incidência de partículas carbonizadas, registrado em testemunhos em turfeiras, por volta de 10.000 (A.P.), convergem para uma provável responsabilidade humana nestas atividades (Behling et al. 2005; Cruz & Guadagnin 2010).

É muito difícil relacionar com certeza quais foram os fatores que extinguiram a megafauna e quais os que mantiveram o Pampa predominantemente como um Bioma campestre. Há evidencias para mudanças climáticas (Burney & Flannery 2005), e como já citadas, atividades humanas, principalmente a ação de queimadas controladas (Cruz & Guadagnin 2010). Entretanto, não se sabe ao certo como o Pampa era antes de mais de 300 anos atrás. A partir dessa data a perturbação humana aumentou dramaticamente com a chegada da colonização Européia e, principalmente, após a introdução de gado, manejo sem controle do fogo, seguindo-se da agricultura e mais recentemente a silvicultura (Suertegaray & Silva 2009; Podgaiski et al. 2014; Ferrando et al. 2016).

A conservação e a pecuária

A conservação do Pampa vem sendo negligenciada (Overbeck et al. 2013), e a transformação dos campos para fins agro-econômicos tem mudado suas características originais, causando grandes perdas em biodiversidade, devido à falta de regulação e manejo apropriado (Andrade et al. 2015; Winck et al 2016). Apesar de, por exemplo, pastejo intenso de gado diminuir a diversidade de habitats, animais e plantas (Van Klink et al. 2013, 2015; Niba & Yekwayo 2016), esta atividade é amplamente recomendada para a conservação de campos e pastagens (Dennis et al. 2015; Evans et al. 2015; Polchaninova et al. 2015; Gómez 2016). Alguns autores afirmam que o fogo também é indicado para a manutenção do Pampa, apesar de afetar diretamente a fauna relacionada ao solo, diminuir as taxas de decomposição e detritivoria e alterar propriedades do solo, como absorção de água (Laterra et al. 2003; Vogelmann et al. 2012; Podgaiski et al. 2014). Apesar do impacto gerado, estudos indicam que a recuperação da fauna, depois do fogo, é rápida e que a vegetação já estaria adaptada a esse distúrbio, o que incentivaria o uso do método (Fidelis et al. 2010; Podgaiski et al. 2013; Ferrando et al. 2016). Ademais, pastejo e fogo teriam funções e efeitos semelhantes no Pampa, como reduzir a competição entre gramíneas, reduzir o avanço da floresta sobre o campo e promover a renovação dos nutrientes no solo (Bogino et al. 2015; Bernardi et al. 2016).

Focando em pecuária, a maior parte dos estudos ressalta o aumento da produtividade, na qualidade da carne e no melhoramento do forrageamento do gado (Pinto et al. 2008; Kamali et al. 2014; Pelegrini et al. 2016; Ruviaro et al. 2016). Esses estudos ignoram aspectos importantes como o dano causado às espécies nativas e ao solo, devido ao pisoteio e herbivoria excessivos (Soares et al. 2011; Bella et al. 2014; Gantchoffet al. 2014; Bella et al. 2015; Van Klink et al. 2015). Áreas com sobre-pastejo são conhecidas por disporem de plantas com baixa qualidade forrageira, e perdas na biodiversidade (Pallarés et al., 2005; Nabinger et al. 2009; Evans et al. 2015), o que poderia ser evitado com o uso de carga mais indicada para a área de campo.

A Pecuária em Mosaico propõe uma alternativa para o uso moderado do campo, onde gado seria movido de área em área evitando o pastejo excessivo (Diaz et al., 2007; Nabinger et al. 2009). Esta metodologia tende a aumentar a heterogeneidade do campo, favorecendo a maior complexidade de fauna e flora (Andrade et al. 2015; Bolaños 2015; Dassou et al. 2015; Hertzog et al. 2016; Modernel 2016). Outra metodologia, mais complexa, seria realizar uma auto-recuperação periódica do ambiente, no qual se excluiria e cessaria todo impacto e manejo ocorrido, deixando o Pampa retornar a sua forma “original” através de a sua própria resiliência (Andrade et al. 2015).

Métodos e modelos de estudo no Pampa

Muitos estudos no Pampa focam na diversidade e abundancia da fauna de vertebrados (Bertaco & Azevedo 2013; Bencke 2016; Entiauspe-Neto et al. 2016; Espinosa et al. 2016; Jardim et al. 2016), da flora (Poggio et al. 2013; Oliveira et al. 2015; Oliveira 2016) e de microorganismos (Lupatini et al. 2013; Vargas et al. 2015; D’Acunto et al. 2016). Cada táxon possui suas próprias metodologias de coleta e avaliação e, por vezes, os trabalhos relacionam seus resultados com impactos gerados por atividade humana.

Outro método de estudo pouco convencional é a análise da biomassa de seres vivos por área (Bornebusch 1930; Edwards 1966), uma metodologia pouco utilizada para estudos no Pampa. O estudo da biomassa é um importante conceito ecológico aplicado para diferentes organismos (Hooper 1996; Kirchman 2001; Borer et al. 2012) e que analisa tamanho populacional, taxas decrescimento, quantidade de energia no sistema e reciclagem de nutrientes (Ganihar 1997). Geralmente, plantas são os modelos mais utilizados, devido à facilidade da pesagem de material fresco e seco; mensura-se a biomassa aérea (galhos, arbustos e plantas lenhosas) e/ou biomassa do solo (raízes, gramíneas) (Pinto et al. 2008; Fidelis et al. 2009; Risio et al. 2014; Guimaraes et al. 2015). Todavia, medir a biomassa de organismos pequenos, como invertebrados, consome muito tempo, geralmente destrói o material e é, por vezes, impreciso (Work et al. 2002; Motobayashi et al. 2006; Indicatti et al. 2008). Desta forma, apesar das diferentes morfologias corpóreas em invertebrados, regressões de massa-comprimento tem se provado ótimos métodos para mensurar biomassa (Brady & Noske 2006; Höfer & Ott 2009; Wardhaugh 2013).

A comunidade de invertebrados é amplamente utilizada na avaliação de áreas campestres. Para coleta destes invertebrados, as metodologias divergem na captura da fauna mais ligada ao extrato arbóreo/aéreo (Pereira et al. 2015; Rodrigues et al. 2014; Carvalho et al. 2015) ou ao solo (Cortelezzi et al. 2015; Frasson et al. 2015). Um método comumente utilizado para captura da fauna de solo são as armadilhas do tipo "*Pitfall Traps*" (Siqueira et al. 2016; Winck et al. 2016). Tratam-se de um recipientes coletores (copos ou potes), preenchidos com um líquido conservante e mortífero (Formol 2% ou Álcool), deixados ao nível do solo para a captura indireta dos organismos (Paschetta et al. 2013). Por vezes, podem-se utilizar iscas para a atração dos invertebrados (Silva et al. 2012; Garcia et al. 2016). A captura feita por essas armadilhas está muito relacionada à atividade e a densidade das espécies, sendo que as menos ativas costumam ser menos capturadas (Topping & Sunderland 1992; Patrick & Hansen, 2013), o que pode causar, por vezes, resultados não conclusivos em relação a diversidade (Gotelli & Colwell 2001; Bedano & Domínguez 2016). Entretanto, a metodologia é muito utilizada na captura de invertebrados como, por exemplo, as aranhas onde se captura grande riqueza e abundancia de espécies (Curtis 1980; Ferreti et al. 2011; Rodrigues et al. 2014; Pompozzi et al. 2014; Polchaninova et al. 2015).

Aranhas como modelos

Aranhas (Araneae) são o segundo grupo mais rico de Arachnida, contando, atualmente, com mais de 46 mil espécies descritas em 113 famílias (World Spider Catalog 2016). Ocupam quase a totalidade dos ambientes terrestres, não sendo encontradas apenas na Antártida (Foelix 2011). Os aracnídeos, como predadores do topo de cadeia da fauna de invertebrados, têm grande capacidade de resposta a fatores e perturbações bióticas e abióticas (Podgaiski et al. 2013; Herrmann et al. 2015; Lin et al. 2016; Niba & Yekwayo 2016; Peterson et al. 2016).

Aranhas são ótimas dispersoras e colonizadoras (Bishop & Riechert 1990; Rodrigues et al. 2009; Lin et al. 2016); são predadoras vorazes, consumindo altas taxas de biomassa (Nyfeller 2000; Ott 2016), em diferentes níveis tróficos (Dennis et al., 2015; Rodriguez-Artigas et al. 2016). Consomem até mesmo outras aranhas (Wise, 2006) sem afetar plantas hospedeiras (Fritz et al.2011; Norma-Rashid et al. 2014); sendo que espécies construtoras de teias estão muito relacionadas a estrutura vegetal disponível, apresentando grandes diferenças na composição das assembléias, por exemplo, entre a araneofauna arbórea e a que vive sobre o solo (Uetz 1999; Baldissera, 2004; Rodrigues et al. 2009; Andrade et al. 2015; Nogueira & Pinto-da-Rocha, 2016);

Todos estes aspectos fazem deste grup grandes modelos experimentais em ecologia (Coddington & Levi 1991).

Aranhas já foram amplamente estudas em diversos biomas. Contudo, estudos em diferentes campos e pastagens envolvendo riqueza, composição, abundância e resiliência destes organismos, sob diferentes impactos e manejos, ainda se fazem necessários (McDonald 2007; Haddad et al. 2015; Horváth et al. 2015). Aranhas são conhecidas por reocuparem rapidamente ambientes impactados pelo fogo (Podgaiski et al. 2013) e agroecosisstemas (Rodrigues et al. 2009; Lee et al. 2014; Baba & Tanaka 2016). Todavia, estas nunca foram utilizadas como modelos em resiliência no Pampa, desta forma, suas capacidades ecológicas e esta brecha no conhecimento, as tornam grandes candidatas para este estudo.

A dissertação

Esta dissertação está apresentada em três capítulos em formatos de artigos. Todos os trabalhos foram realizados na APA do Ibirapuitã (Fig.1), localizada na região da Campanha gaúcha, abrangendo os municípios de Alegrete, Quaraí, Rosário do Sul e Sant'Ana do Livramento.

Três fazendas foram selecionadas para o experimento. Em cada uma das fazendas, um par de hectares (100 m x 100 m) foi selecionado em 2011 sendo um denominados como áreas com pastejo e sem pastejo. As áreas com pastejo são parcelas com livre acesso para o pastejo do gado, com apenas estacas demarcando os vértices do perímetro de um hectare. As áreas sem pastejo são parcelas de mesmos tamanhos cercados e com total exclusão de gado e consequentemente sem pastejo. O cercamento efetivo das áeras e exclusão do gado ocorreram em apenas em agosto de 2012. A vegetação dominante nas áreas, à época do fechamento e ainda encontrada atualmente nas áreas pastejadas era de gramíneas baixas intercaladas com capim caninha

(*Andropogon lateralis* Nees). Ao longo do período de fechamento (43 meses ao final desta dissertação) foi ocorrendo uma modificação na morfologia da vegetação entre áreas com e sem pastejo, claramente visível conparando-se ambos os lados da cerca (Fig. 2). Atualmente as áreas sem pastejo possuem uma vegetação compostas por gramíneas altas e arbustos (*Baccharis* spp.) que chegam a ultrapassar 1,7 m de altura no caso de plantas *Baccharis dracunculifolia* DC (Fig. 3). Nas áreas com pastejo a vegetação é basicamente composta de gramíneas rasteiras não ultrapassa os 15 cm de altura à excessão da toiceiras de capim caninha (Fig. 4). Durante nossa pesquisa consideramos sempre estas áreas sem pastejo como sendo o mesmo estado ambiental de quando a pesquisa foi iniciada em 2011.

O primeiro artigo proposto é intitulado: "Short-term spider community monitoring after cattle removal in grazed grassland". Este artigo compreende os levantamentos ocorridos nas primaveras de 2011, 2012 e 2013 na APA do Ibirapuitã. Aborda aspectos da diversidade como riqueza, composição e abundância das famílias e espécies da assembleia de aranhas ativas junto ao solo nas áreas pastejadas e nas áreas sem pastejo. As amostragens ocorreram em três momentos distintos, a primeira antes do cercamento (2011) e em dois momentos ao longo dos primeiros meses após o cercamento e exclusão do pastejo, aos 03 meses (2012) e aos 15 meses (2013).

O segundo artigo proposto é intitulado: "Grazing affects ground spider (Arachnida: Araneae) biomass and body size at Pampa biome?". Este artigo compreende os levantamentos ocorridos nas primaveras de 2011, 2012 e 2013 e os levantamentos sazonais no outono (Maio), inverno (Setembro), primavera (Novembro) de 2015 e verão (Fevereiro) de 2016 na APA do Ibirapuitã. Aborda a diferenciação da biomassa total de aranhas, das espécies mais abundantes e dos machos mais abundantes entre áreas com e sem pastejo após três anos de exclusão.

O terceiro artigo proposto é intitulado: “Seasonal spider diversity and species phenology in grazed and ungrazed areas in Southern America Grasslands”.Este artigo compreende levantamentos sazonais no outono (Maio), inverno (Setembro), primavera (Novembro) de 2015 e verão (Fevereiro) de 2016, na APA do Ibirapuitã. Aborda aspectos da diversidade como riqueza, composição e abundância sazonais de aranhas entre 30 meses e 39 meses após exclusão do pastejo comparada com áreas ainda com pastejo de gado.

O primeiro artigo aqui proposto é apresentado na formatação da revista Iheringia Série Zoologia. Outrostextos, tabelas, figuras, referências e literaturas citadas são apresentadas na formatação da revista Journal of Arachnology e

OBJETIVOS

Objetivo geral

Avaliar a variação da assembléia de aranhas em áreas com e sem pastejo na APA do Ibirapuitã, inserida no Bioma Pampa, no sul do Brasil ao longo de 43 meses.

Objetivos específicos

1. Realizar uma análise comparativa da araneofauna entre áreas com pastejo e sem pastejo, avaliando riqueza e abundância relativa temporal e sazonal.
2. Testar diferenças na Biomassa de aranhas em áreas com a sem pastejo.
3. Apresentar listas de famílias, espécies e morfo-espécies de aranhas ocorrentes no bioma Pampa.

RESULTADOS GERAIS

Dados gerais

- Foram coletados um no total de 3.243 aranhas (1.437 machos, 500 fêmeas e 1.306 jovens). Destas, 1.315 foram coletas nas primaveras de 2011, 2012 e 2013 (576 machos, 199 fêmeas e 540 jovens) e 1.928 sazonalmente em 2015 e 2016 (861 machos, 301 fêmeas e 766 jovens).

- Um total de 1.784 indivíduos foi coletado em áreas com pastejo (Primaveras, 685; Sazonalmente 1.099) e 1.459 indivíduos em áreas sem pastejo (Primaveras 630; Sazonalmente 829).

- Um total de 117 espécies foi identificado, 44 nominalmente, 53 classificadas em nível de gênero e 20 em nível de morfoespécie. A riqueza entre áreas com pastjo e áreas sem pastejo foi aproximada. Foram registradas 95 espécies nas aeras com pastejo e e 91 nas áreas sem pastejo.

- Destas espécies, 22 foram exclusivas das áreas sem pastejo, 26 exclusivas das áreas com pastejo e 69 foram compartilhadas entre ambas as metodologias. Para as áreas com pastejo, 39 espécies foram singletons e 11 doubletons. Nas áreas sem pastejo, 32 singletons e 14 doubletons foram registrados.

Das primaveras (2011, 2012, 2013)

- Teste T baseado em apenas aranhas adultas revelou diferença não significativa entre áreas com e sem pastejo em 2012/2013 (p=0.4782), em apenas 2012 com três meses de cercamento (p=0.2807) e em apenas 2013 com 15 meses de cercamento (p=0.8465). O mesmo Teste T baseado apenas nas espécies mais abundantes revelou diferença não significativa entre áreas com e sem pastejo nos mesmos parâmetros, 2012/2013 (p=0.5744), apenas 2012 (p=0.2086) e apenas 2013 (p=0.7550).

- Apesar da disposição das armadilhas nos coletas de 2013, ANOSIM revelou diferença não significativa entre os grupos de pitfall quando adultos (Morisita: R= -0.0298 p= 0.7978; Bray-Curtis: R= -0.0073 p= 0.5322; Jaccard: R= -0.0210 p= 0.7046) e espécies mais abundantes (Morisita: R= -0.0379 p= 0.8833; Bray-Curtis: R= -0.0400 p= 0.8508; Jaccard: R= -0.0361 p= 0.8694) foram testadas.

Da biomassa

- A biomassa média de aranhas nas áreas com pastejo, foi superior a medida nas áreas com pastejo. Entretanto, Teste T revelou diferença não significativa entre entre áreas com e sem pastejo quando as Primaveras (2012, 2013 e 2015) foram testadas (todas as aranhas p=0.6447; machos mais abundantes p=0.91096). Teste T revelou diferença significativa entre áreas com e sem pastejo, com valores maiores nas áreas com pastejo, sazonalmente (2015/2016) quando todas as aranhas foram testadas (p=0.013882). Entretanto, machos mais abundantes ainda revelaram diferença não significativa (p=0.87517).

- Usando a biomassa das espécies mais abundantes sazonais (2015/2016), Teste T revelou diferença significativa entre áreas com e sem pastejo, com valores maiores nas áreas com pastejo para *Agyneta* sp. 1 (p = 0.0101), *Neohania* sp. 1 (p = 3.4204E-06), *Erigone* sp. 1 (p = 5.751E-11), *Tutaibo* sp. 1 (p = 0.0038). *Glenognatha lacteovittata* (p = 3.7013E-07) teve valores maiores nas áreas sem pastejo. A biomassas de *Neohania* sp. 2 (p = 0.4971), *Agyneta* sp. 2 (p = 0.0928), *Guaraniella mahnerti* (p = 0.8514) não foram significativamente diferentes.

- Teste T baseado nas médias do comprimento da carapaça dos machos mais abundantes revelou diferença não significativa entre áreas com e sem pastejo com todos os dados, excluindo 2011 (p = 0.9369), apenas nas primaveras, excluindo 2011 (p = 0.9609) e sazonalmente (p = 0.9867).

Da sazonalidade (2015/2016)

- Teste T performado comparando áreas com e sem pastejo, utilizando a abundância das espécies mais abundantes, revelou diferença significativa para todas elas (p = 0.0070) e individualmente, *Agyneta* sp. 1 (p = 0.0009), *Neohania* sp. 1 (p = 2.0799E-07), *Erigone* sp. 1 (p = 1.9777E-07), *Neohania* sp. 2 (p = 0.0252) e *Agyneta* sp. 2 (p = 0.0168), com valores maiores nas áreas com pastejo.
- O inverno foi a estação com mais abundancia de indivíduos adultos (198 nas áreas com pastejo; 154 áreas sem pastejo), seguido da primavera (215; 112), outono (182; 112) e verão (143; 63). As curvas de fenologia das espécies mais abundantes não demonstram uma estação de preferência, contudo, demonstram maior atividade destas espécies nas áreas scom pastejo.
- As curvas de fenologia demonstraram maior atividade das aranhas nos nas áreas com do que nas áreas sem pastejo.

LITERATURA CITADA

Alberdi, M. & J. Prado. 2008. Presencia de Stegomastodon (Gomphotheriidae, Proboscidea) en el Pleistoceno Superior de La zona costera de Santa Clara Del Mar (Argentina). Estudios Geológicos, 64(2)175-185. doi: 10.3989/egeol.08642.044

Andrade, B.O., C. Kock, I.I. Boldrini, E. Vélez-Martin, H. Hasenack, J.M. Hermann et al. 2015. Grassland degradation and restoration: a conceptual framework of stages and thresholds illustrated by southern Brazilian grasslands. Natureza & Conservação, 0:10. doi: 10.1016/j.ncon.2015.08.002.

Baba, Y.G. & K. Tanaka. 2016. Factors affecting abundance and species composition ofgeneralistpreda tors (Tetragnathaspiders)in agricultural ditches adjacent to rice paddy fields. Biological Control, 32 p. doi: http://dx.doi.org/10.1016/j.biocontrol.2016.09.004.

Baldissera, R.; Ganade, G.; Fontoura, S. B. 2004. Web spider community response along an edge between pasture and Araucaria forest. Biological Conservation, 118:403–409.

Bedano, J. C. & A. Domínguez. 2016. Large-Scale agricultural management and soil meso- and macrofauna conservation in the argentine pampas. Sustainability, 8(653):1-25. doi:10.3390/su8070653.

Behling, H., V.D. Pillar, S.G. Bauermann. 2005. Late Quaternary grassland (Campos), gallery forest, fire and climate dynamics, studied by pollen, charcoal and multivariate analysis of the São Francisco de Assis core in western Rio Grande do Sul (southern Brazil). Review of Palaeobotany and Palynology, 133:235-248.

Beheling, H., V. Jeske-Pieruschka, L. Schüler, V.P.Pillar. 2009. Dinâmica dos campos no sul do Brasil durante o quaternário tardio, Pp. 13-25. *In* Pillar, V.P., S.C.

Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Bella, C.E.D., E. Jacobo, R.A. Golluscio, A.M. Rodriguez. 2014. Effects of cattle grazing on soil salinity and vegetation composition along an elevation gradient in a temperate coastal salt marsh of Sambotombón Bay (Argentina). Wet lands Ecology and Management, 22:1-13.

Bella, C.E.D., A.M. Rodriguez, E. Jacobo, R.A. Golluscio, M.A. Taboada. 2015. Impact of cattle grazing on temperate coastal salt marsh soils. Soil Use and Management, 31:299-307.

Bencke, G.A. 2016. Aves; Pp. 48-51. *In* Moura, L.A., L. Chomenko, M.A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul.

Bernardi, R.E., M. Holmgren, M. Arim, M. Scheffer. 2016. Why are forests so scarce in subtropical South America? The shaping roles of climate, fire and livestock. Forest Ecology and Management, 363:212–217.

Bertaco, V.A. & M.A. Azevedo. 2013. Fishes from rio Ibirapuitã basin, Environmental Protection Area of Ibirapuitã, Pampa Biome. Check List, 9(5):966–972.

Bishop, L. & Riechert, S. E. 1990. Spider colonization of Agroecosystems: Mode and Source. Entomological Society of America, 19:1738-1745.

Bogino, S., S.C. Roa-Giménez, A.T. Velasco-Sastre, M.L. Cangiano, L. Risio-Allione, V. Rozas. 2015. Synergetic effects of fire, climate, and management history on Prosopis caldenia recruitment in the Argentinean pampas. Journal of Arid Environments, 117:59-66.

Bolaños, V.A., M.C. Vecchio, R.A. Golluscio. 2015. Dormición y tipo de suelo como determinantes de La germinación y establecimento de *Chloris berroi* em La Pampa Deprimida. Ecologia Austral, 25:75-80.

Boldrini, I.I. A flora dos campos do Rio Grande do Sul. 2009. Pp.63-77. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Borer, E.T., E.W. Seabloom, D. Tilman. 2012. Plant diversity controls arthropod biomass and temporal stability. Ecology Letters, 15:1457-1464.

Bornebusch, C.H. 1930. The Fauna of Forest Soil. Nielsen and Lydiche, Copenhagen.

Brady, C.J. & R.A. Noske. 2006. Generalised regression provide good estimates of insect and spider biomass in the monsoonal tropics of Australia. Australian Journal of Entomology 45:187-191.

Burney, D.A. & Flannery, T.F. 2005. Fifty millennia of catastrophic extinctions after human contact. Trends in Ecology and Evolution, 20(7):395-401.

Carvalho, F.L. 2003. A Pré-História Sergipana. Aracaju: Universidade Federal de Sergipe.

Carvalho, A.P.S., G. Piovesan, A.B.B. Morais. 2015. Butterflies (Lepidoptera: Papilionoidea) of grassland areas in the Pampa biome, southern Brazil. Check List 11(5):1-6. doi: http://dx.doi.org/10.15560/11.5.1772

Coddington, J.A. & Levi, H.W. 1991. Systematics and evolution of spiders (Araneae). Annual Review of Ecology and Systematics, 22:565-592.

Consens, M. 2009. *Prehistoria del Uruguay: realidad y fantasía*. Montevideo, Del Sur Ediciones.

Cordeiro, C.A. & L.C. Soares. 1977. A erosão nos solos da região sudoeste do Rio Grande do Sul. Revista Brasileira de Geografia, 39:82-150.

Cortelezzi, A., C. Ocón, M.V.L. van Oosterom, R. Cepeda, A.R. Capítulo. 2015. Nutrient enrichment effect on macroinvertebrates in a lowland stream of Argentina. Iheringia, Série Zoologia, 105(2):228-234.

Cruz, R.C., D.L. Guadagnin. 2010. Uma pequena história ambiental do pampa: proposta de uma abordagem baseada na relação entre perturbação e mudança. *In* A sustentabilidade da Região da Campanha-RS: práticas e teorias a respeito das relações entre ambiente, sociedade, cultura e políticas públicas, Pp. 155-179. *In* Costa, B.C., J.H. Quoos, M.E.G. Dickel. Universidade Federal de Santa Maria, Programa de Pós-Graduação em Geografia e Geociências, Departamento de Geociências.

Curtis, D.J. 1980. Pitfalls in spider community studies (Arachnida, Araneae). The Journal of Arachnology, 8:(2)271-280.

Dassou, A.G.,S. Dépigny, E. Canard, F. Vinatier, D. Carval,P. Tixier. 2015. Contrasting effects of plant diversity across arthropod trophic group in plantain-based agroecosystems. Basic and Applied Ecology, 17:11-20.

D’Acunto, L., M. Smmartin, C.M. Ghersa. 2016. Uncultivated margins are source of soil microbial diversity in an agricultural landscape. Agriculture, Ecosystems and Environment, 220:1–7

Dennis, P., J. Skartveit, A. Kunaver, D.I. McCracken. 2015. The response of spider (Araneae) assemblages to structural heterogeneity and prey abundance in sub-montane vegetation modified by conservation grazing. Global Ecology and Conservation, 3:715–728.

Diaz, S., S. Lavorel, S. McIntyre, V. Falczuk, F. Casanoves, D.G. Milchunas et al. 2007.Plant trait responses to grazing – a globalsynthesis. Global Change Biology 13:313–341.

Edwards, C.A. 1966. Relationships between weights, volumes and numbers of soil animals. Colloquium on Dynamics of Soil Sommunities, 93:5–10.

Espinosa, C.C., D. GalianO, B B. Kubiak, J.R. Marinho.2016. Medium- and large-sized mammals in a steppic savanna area of the Brazilian Pampa: survey and conservation issues of a poorly known fauna. Brazialin Journal of Biology, 76:(1)73-79.

Evans, D.M., N. Villar, N.A. Littlewood, R.J. Pakeman, S.A. Evans, P. Dennis et al. 2015.The cascading impacts of livestock grazing in upland ecosystems: a 10-year experiment. Ecosphere, 6(3):1-15.

Entiauspe-Neto, O.M., T.D. Perleberg, M.A. Freitas. 2016. Herpetofauna from an urban Pampa fragment in southern Brazil: composition, structure and conservation. Check List 12(5):1-15. doi: http://dx.doi.org/10.15560/12.5.1964

Ferrando, C.P., L.R. Podgaiski,M.K. Costa, M.D.S. Mendonça Jr. 2016. Taxonomic and Functional Resilience of Grasshoppers (Orthoptera, Caelifera) to Fire in South Brazilian Grasslands. Neotropical Entomology, 45(4):374-381. doi: 10.1007/s13744-016-0380-3.

Ferretti, N., G. Pompozzi, S. Copperi, F. Pérez-Miles, A. González. 2011. Mygalomorph spider community of a natural reserve in a hilly system in central Argentina. Journal of Insect Science, 12(31): 1-16.

Fidelis, A., B. Appezzato-da-Glória, J. Pfadenhauer. 2009. A importância da biomassa e das estruturas subterrâneas nos Campos Sulinos, Pp. 88-100. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Fidelis, A., S.C. Müller, D.V. Pillar, J. Pfadenhauer. 2010. Population biology and regeneration of forbs and shrubs after fire in Brazilian Campos grasslands. Plant Ecology, 211:107–117.

Foelix, R.F. 2011.Biology of Spiders. 3. ed. Oxford: Oxford University Press.

Frasson, J.M.F., J.L.O. Rosado, S.G. Elias, B. Harter-Marques. 2015. Litter Decomposition of Two Pioneer Tree Species and Associated Soil Fauna in Areas Reclaimed after Surface Coal Mining in Southern Brazil. Revista Brasileira de Ciências de Solo, 40:1-13.

Fritz, L.L., E.A. Heinrichs, V. Machado, T.F. Andreis, M. Pandolfo, S.M. Salles, J.V. Oliveira, L.M. Fiuza. 2011. Diversity and abundance of arthropods in subtropical rice growing areas in the Brazilian south. Biodiversity and Conservation 20(10):2211-2224.

Ganihar, S.R. 1997. Biomass estimates of terrestrial arthropods based on body length. Journal of Biosciences, 22:219-224.

Gantchoff, M.G.,J. L. Belant, D.A. Masson. 2014. Land use affects mammal community composition in a multiple-use protected area, East-Central Argentina. Revista Latinoamericana de Conservación, 1:7-13.

Garcia, L.E., R.M. Moraes, É.E.S. Vianna. 2016. Levantamento de besouros copro-necrófagos (Coleoptera: Scarabaeidae: Scarabaeinae) do Bioma Pampa Evaluation of dung beetles (Coleoptera: Scarabaeidae: Scarabaeinae) in the Pampa Biome. Revista de Ciências Agroveterinárias, 15(2)144-154. doi: 10.5965/223811711522016144

Gómez, J.E. J. Lohmiller, A. Joern. Importance of vegetation structure to the assembly of an aerial web-building spider community in North American open grassland.

The Journal of Arachnology, 44(1):28-35. doi: http://dx.doi.org/10.1636/P14-58.1.

Green, A.J. 2001. Mass/Length Residuals: Measures of body condition or generators of spurious results? Ecology, 82(5):1473-1483.

Gotelli, N.J. & R.K. Colwell. 2001. Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. Ecology Letters, 4:379–391.

Guimaraes, C.C., M.V. Schumacher, R. Witshoreck, H.P. Souza, J.C. Santo. 2015. Biomassa e nutrientes em povoamento de eucalyptus dunnii maiden no Pampa Gaúcho. Revista Árvore, 39(5):873-882.

Haddad, C.R., S. H. Foord, R. Fourie, A.S. Dippenaar-Schoeman. 2015. Effects of fast-burning spring fire on the ground-dwelling spider assemblages (Arachnida: Araneae) in a central South Africa grassland habitat. African Zoology, 50(4): 281-292. doi: http://dx.doi.org/10.1080/15627020.2015.1088400.

Herrmann, J.D.,I. Opatovsky, Y. Lubin, T. Pluess, E. Gavish-Regev, M. H. Entling. 2015. Effects of non-native Eucalyptus plantations on epigeal spider communities in thenorthern Negev desert, Israel. The Journal of Aracnology, 43:101–106.

Hertzog, L.R.,S.T. Meyer, W.W. Weisser, A. Ebeling. 2016. Experimental manipulation of grassland plant diversity induces complex shifts in aboveground arthropod diversity. PLoS one, 11(2)1-16.doi: 10.1371/journals;pone.0148768.

Hooper, R.G. 1996. Arthropod biomass in winter and the age of longleaf pines. Forest Ecology and Management 82:115-131.

Horváth, R., T. Magura, C. Szinetár, B. Tóthemérész. 2009. Spiders are not less diverse in small and isolated grasslands, but less diverse in overgrazed grasslands: A field study (East Hungary, Nyérség). Agriculture, Ecosystems and Environment 130:16–22.

IBGE. Instituto Brasileiro de Geografia e Estatística. 2004. Produção Agrícola Municipal. Tabela 1612 - Área plantada, área colhida, quantidade produzida e valor da produção da lavoura temporária. Disponível em: http://www.sidra.ibge.gov.br/bda/. Acesso em: 06/12/2016.

Indicatti, R.P., S.M. Lucas, R. Ott, A.D. Brescovit. 2008. Litter dwelling mygalomorph spiders (Araneae: Microstigmatidae, Nemesiidae) from Araucaria forests in southern Brazil, with the description of five new species. RevistaBrasileira de Zoologia 25 (3):529-546.

Jardim, M.M.A., T.C. Trigo, J. Reck Jr., U.A. Souza, T. Michel, E. Pasa et al. 2016. Maníferos; Pp. 52-55. *In* Moura, L.A., L. Chomenko, M.A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul.

Kamali, F.P.,M.P.M. Meuwissen, A.G.J.M.O. Lansink. 2014. Evaluation of beef sustainability in conventional, organic, and mixed crop-beef supply chains. Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector, 1-11.

Kirchman, D. 2001. Measuring bacterial biomass production and growth rates from Leucine Incorporation in natural aquatic environments. Methodos in Microbiology, 30:227-237.

Kottek, M.; J. Griser,C. Beck,B. Rudolf,F. Rubel. 2006. World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift,15(3):259-263.

Krebs, C.J. & G.R. Singleton. 1993. Indices of Condition for Small Mammals. Australian Journal of Zoology, 41:317-23.

Laterra, P., O.R. Vignolio, M.P. Linares, A. Giaquinta, N. Maceira. 2003. Cumulative effects of fire on a tussock pampa grassland. Journal of Vegetation Science, 14: 43-54.

Lee, S.Y., S.T. Kim, J.K. Jung, J. Lee. 2014. A Comparison of Spider Communities in Bt and Non-Bt Rice Fields Environmental Entomology, 43(3):819-827. doi: http://dx.doi.org/10.1603/EN12259.

Lin, S., L. Vasseur, M., S. You. 2016. Seasonal Variability in Spider Assemblages in Traditional and Transgenic Rice Fields. Environmental Entomology, 0:1–10.doi: 10.1093/ee/nvw00.

Lupatini, M., A.K.A. Suleiman, R.J.S. Jacques, Z.I. Antoniolli, E.E. Kuramae, F.A.O. Camargo et al. 2013. Soil-Borne Bacterial Structure and Diversity Does Not Reflect Community Activity in Pampa Biome. PLoS ONE, 8(10):1-9. doi:10.1371/journal.pone.0076465.

McDonald, B. 2007. Effects of vegetation structure on foliage dwelling spider assemblages in native and non-native Oklahoma grasslands habitats. Proceedings of the Oklahoma Academy of Science, 87:85-88.

Modernel, P. W.A. Rossing, M. Corbeels, S. Dogliotti, V. Picasso, P. Tittonell. Land use change and ecosystem service provision in Pampas and Campos grasslands of southern South America. Environmental Reaserch Letters, 11:1-21. doi: 10.1088/1748-9326/11/11/113002.

Motobayashi, T., C. Ishijima, M. Takagi, M. Murakami, A. Taguchi, K. Hidake et al. 2006.Effects of tillage practices on spider assemblage in rice paddy fields. Applied Entomology and Zoology, 41(2):371-381.

Nabinger, C., E.T. Ferreira, A.K. Freitas, P.C.F. Carvalho, D.M. Sant'Anna. 2009. Produção animal com base no campo nativo: aplicações de resultados de pesquisa, Pp. 175–198. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Niba, A.S. &I. Yekwayo. 2016. Epiganic invertebrate community structure in two subtropical nature reserves, Eastern Cape, South Africa: Implications for conservation management. ArachnologischeMitteilungen, Arachnology Letters, 52: 7-15.

Nimer, E. 1977. Clima. *In* IBGE - Geografia do Brasil, Região Sul. SERGRAF-IBGE, Rio de Janeiro, 35-79pp.

Nogueira, A.A. & R. Pinto-da-Rocha. 2016. The effects of habitat size and quality on the orb-weaving spider guild (Arachnida: Araneae) in an Atlantic Forest fragmented landscape. The Journal of Arachnology, 44:36–45.

Norma-Rashid, Y., W.M.A.W. Zainudin, M.N. Dzulhelmi, N. Masduki. 2014. Spiders as Potential Ecofriendly Predators Against Pests, Pp. 245-254. *In* Sahayaraj, K. Basic and Applied Aspects of Biopesticides.

Nyfeller, M. 2000. Ecological impact of spiders predation: a critical assessment of Britowe's and Tunbull's estimates. Bulletin of the British Arachnological Society, 11:367-373.

Oliveira, M.L.A.A., M. Grings, F.S. Richter, A.R. Backes. 2015. Composição, estrutura e fatores edáficos condicionantes da distribuição das espécies do componente arbóreo em floresta ribeirinha do rio Ibirapuitã, Bioma Pampa. Iheringia, 70(2):245 – 263.

Oliveira, M.L.A.A. 2016. Flora e vegetação. Pp. 44-45. *In* Moura L.A., L. Chomenko, M.A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul.

Ott, R. 2016. Invertebrados terrestres – Aranhas; Pp. 46-47. *In* Moura, L.A., L. Chomenko, M.A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul.

Overbeck, G.E., S.C. Müller, A. Fidelis, J. Pfadenhauer, V.D. Pillar, C.C. Blancoet al., 2007. Brazil's neglected biome: the SouthBrazilian Campos. Perspectives in Plant Ecology, Evolution and Systematics, 9:101–116.

Overbeck, G.E., S. C. Müller, A. Fidelis, J. Pfadenhauer, V.P. Pillar, C.C. Blanco et al. 2009. Os Campos Sulinos: um bioma negligenciado; pp. Pp. 26-41. *In*: Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Overbeck, G.E., J. Hermann, B.O. Andrade, I.I. Boldrini, K. Kiehl, A. Kirmer et al., 2013. Restoration ecology in Brazil – time to step out of the forest. Natureza & Conservação, 11, 92–95.

Pallarés, O.R.,E.J. Berretta, G.E. Maraschin.2005. The South American campos ecosystem, Pp. 171-219. *In* Suttie, J., S.G. Reynolds, C. Batello. Grasslands of the World. FAO, Rome.

Paschetta, M., V. La Morgia, D. Masante, M. Negro, A. Rolando, M. Isaia. 2012. Grazing history influences biodiversity: a case study on ground-dwelling arachnids (Arachnida: Araneae, Opiliones) in the Natural Park of Alpi Marittime (NW Italy). Journal of Insect Conservation, 17:339–356.

Patrick, B., A. Hansen. 2013. Comparing ramp and pitfall traps for capturing wandering spiders. The Journal of Arachnology, 41:404-406.

Pelegrini, C.B., R.B. Medeiros, S.B. Carlotto, R.P.A. Garcia, C.V. Lisboa, G. Bruning. 2016. Valor nutritivo de uma pastagem nativa dominada por *Eragrotis plana* Nees e sua relação com o perfil metabólico de vacas primíparas suplementadas da gestação ao pós-parto. Ciência Animal Brasileira, 17(20):154-163.

Pereira, A.G, R.B. Silva, M.M. Dias, A.M. Penteado-Dias. 2015. Study on the Hymenoptera parasitoid associated with Lepidoptera larvae in reforestation and agrosilvopastoral systems at Fazenda Canchim (Embrapa Pecuária Sudeste) São Carlos, SP, Brazil. Brazilian Journal of Biology, 75(4):783-789.

Peterson, J. A., J.J. Obrycki, J.D. Hardwood. 2016. Spiders from multiple functional guilds are exposedto Bt-endotoxins in transgenic corn fields via preyand pollen consumption. Biocontrol Science and Technology, 26(9):1230–1248.

Pinto, C.E.; J.A.S. Fontoura Jr, A. Frizzo, T.M.S. Freitas, C. Nabinger, P.C.F. Carvalho. 2008. Produções primária e secundária de uma pastagem natural da Depressão Central do RS submetida a diversas ofertas de fitomassa aérea total. Revista Brasileira de Zootecnia, 37:1737–1741.

Podgaiski L.R., F. Joner, S. Lavorel,M. Moretti,S. Ibanez, M.S. Mendonça Jr et al. 2013. Spider trait assembly patterns and resilience under fire-induced vegetation change in south Brazilian Grasslands. PLoS ONE 8(3):1-11. doi:10.1371/journal.pone.0060207.

Podgaisk, L.R., C.S. GoldaS, C.P.R. Ferrando, F.S. Silveira, F. Joner, G.E. Overbeck et al. 2014. Burning effects on detritivory and litter decay in *Campos* grasslands. Austral Ecology, 39:686–695.

Poggio, S.L., E.J. Chanetonb, C.M. Ghersab. 2013. The arable plant diversity of intensively managed farmland: Effects of field position and crop type at local and landscape scales. Agriculture, Ecosystems and Environment, 166:55– 64.

Polchaninova, N., G. Savchenko, A. Drogvalenko, V. Ronkin, D. Shabanov. 2016. The impact of cattle grazing on cursorial spiders (Aranei) and true bugs (Heteroptera) in steppe gullies of northeastern Ukraine. Agriculture, Ecosystems & Environment, 234:65-71.

Pompozzi, G., S. Copperi, L. Schwerdt, N. Ferretti. 2014. On the ecology of the cursorial spider *Odo bruchi* (Araneae: Zoridae) in a grassland natural reserve from central Argentina. Revista de Biología Tropical, 62(1):87-93.

Risio, L., C. Herrero, S.M. Bogino, F. Bravo. 2014. Aboveground and belowground biomass allocation in native Prosopis caldenia Burkart secondaries woodlands in the semi-arid Argentinean pampas. Biomass and Bioenergy, 66:249-260.

Rodrigues, E.N.L., M.S. Mendonça Jr, R. Ott. 2009. Spider diversity in a rice agroecosystem and adjacent areas in southern Brazil.Revista Colombiana de Entomología, 35:78-86.

Rodrigues, E.N.L., M.S. Mendonça Jr, L.E. Costa-Schimidt. 2014. Spider diversity responds strongly to edge effects but weakly to vegetation structure in riparian forests of Southern Brazil. Arthropod-PlantInteractions, 8:123–133. doi: 10.1007/s11829-014-9294-3.

Rodriguez-Artigas, S.M., R. Ballester, J.A. Corronca. 2016. Factors that influence the beta-diversity of spider communities in northwestern Argentinean Grasslands. PeerJ 4:e1946. doi: 10.7717/peerj.1946.

Ruviaro, C.F., J.S. Costa, T.J. Florindo, W. Rodrigues, G.I.B. Medeiros, P.S. Vasconcelos. 2016. Economic and environmental feasibility of beef production in different feed management systems in the Pampa biomes, southern Brazil. Ecological Indicators, 60:930-939.

Schulte-Hostedde, A.I., B. Zinner, J.S. Millar, G. Hickling. 2005. Restitution of mass-size residuals: Validating body condition indices. Ecology, 86(1):155-163.

Sherer, C.S. & A.A.S. da Ross. 2003. Um Eqüídeo Fóssil do Pleistoceno de Alegrete, RS, Brasil. Pesquisas em Geociências, 30(2)33-38.

Silva, P.G., L.D. Audino, J.M. Nogueira, L.P. Moraes, F.Z. Vaz-de-Mello. Escarabeíneos (Coleoptera: Scarabaeidae: Scarabaeinae) de uma área de campo nativo no bioma Pampa, Rio Grande do Sul, Brasil. Biota Neotropica, 12(3):246-253.

Siqueira, G.M., Ê.F.F. Silva, M.M. Moreira, G.A.A. Santos, R.A. Silva. 2016. Diversity of soil macrofauna under sugarcane monoculture and two different natural vegetation types African Journal of Agricultural Research, 11(30):2669-2677.

Soares, A.B., P.C.F. Carvalho, C. Nabinger, J.P.P. Trindade, J.K. Trindade, J.C. Mezzalira. 2011. Dinâmica da composição botânica numapastagem natural sob efeito de diferentes ofertas de forragem.Ciência Rural, 41:1459–1465.

Suertegaray, D.M.A. 1998. Deserto Grande do Sul: Controvérsia. Editora da Universidade/UFRGS, 2 ed., Porto Alegre.

Suertegaray, D.M.A & L.A.P. Silva. 2009. Tchê Pampa: histórias da natureza gaúcha, Pp. 42-59. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Topping, C.J. & K.D. Sunderland. 1992. Limitations to the use of pitfall traps in ecological studies exemplified by a study of spiders in a field of winter wheat. Journal of Applied Ecology, 29:485-491.

Uetz, G.W., J. Halaj, A.B. Cady. 1999. Guild structure of spiders in major crops. The Journal of Arachnology, 27:270–280.

Van Klink, R., C. Rickert, R. Vermeulen, O. Vorst, M.F. WallisDeVries, J.P. Bakker. 2013. Grazed vegetation mosaics do not maximize arthropod diversity: evidence from salt marshes. Biological Conservation, 164:150–157.

Van Klink, R., F. van der Plas, C.G.E. van Noordwijk, M.F. WallisDeVries, H. Olffi. 2015. Effects of large herbivores on grassland arthropod diversity. Biological Reviews 90:347–366. doi: 10.1111/brv.12113

Van Valkenburgh, B. 1990. Skeletal and dental predictors of body mass in carnivores, Pp. 181-203. *In* Damuth, J.; B.J. MacFadden. Body size in mammalian paleobiology: Estimation and biological implications. Cambridge University Press.

Vargas, R.S., R. Bataiolli, P.B. Costa, B. Lisboa, L.M.P. Passaglia, A.Beneduzi et al. 2015. Microbial quality of soil from the Pampa biome in response to different grazing pressures Genetics and Molecular Biology, 38(2):205-212.

Vélez, E.; L. Chomenko, W. Schaffer, M. Madeira. 2009. Um panorama sobre as iniciativas de conservação dos Campos Sulinos, p. 356-379. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Vogelmann, E.S., J.M. Reichert, J. Prevedello, C.A.P. Barros, F.L.F. Quadros, J. Mataix-Solera. 2012. Soil hydro-physical changes in natural grassland of southern Brazil subjected to burning management. Soil & Tillage Research, 50:465–72.

Wardhaugh, C.W. 2013.Estimation of biomass from body length and width for tropical rainforest canopy invertebrates. Australian Journal of Entomology, 52:291-298.

Wise, D.H. 2006. Cannibalism, food limitation, intraspecific competition, and the regulation of spider populations. Annual Review of Entomology, 51:441–65. doi: 10.1146/annurev.ento.51.110104.150947.

Winck, B.R., E.L.S. Sá, V.M. Rigotti, M. Chauvat. Relationship between land-use types and functional diversity of epigeic Collembola in Southern Brazil. Applied Soil Ecology, 109:49–59.

Work, T.T., C.M. Buddle, L.M. Korinus, J.R. Spence. 2002. Pitfall trap size and capture of three taxa of Litter-Dwelling arthropods: Implications for biodiversity studies. Community and Ecosystem Ecology, 31(3):438-448.

World Spider Catalog. 2016. World Spider Catalog. Natural History Museum Bern. Disponível em: >http://www.wsc.nmbe.ch/<, version 17.5 Acesso em: 05.12.2016.

Zanetti, N.I. 2016. Records of epigeal spiders in Bahía Blanca in the temperate region of Argentina. Acta Zoológica Mexicana, 32(1):32-44.

MATERIAL SUPLEMENTAR

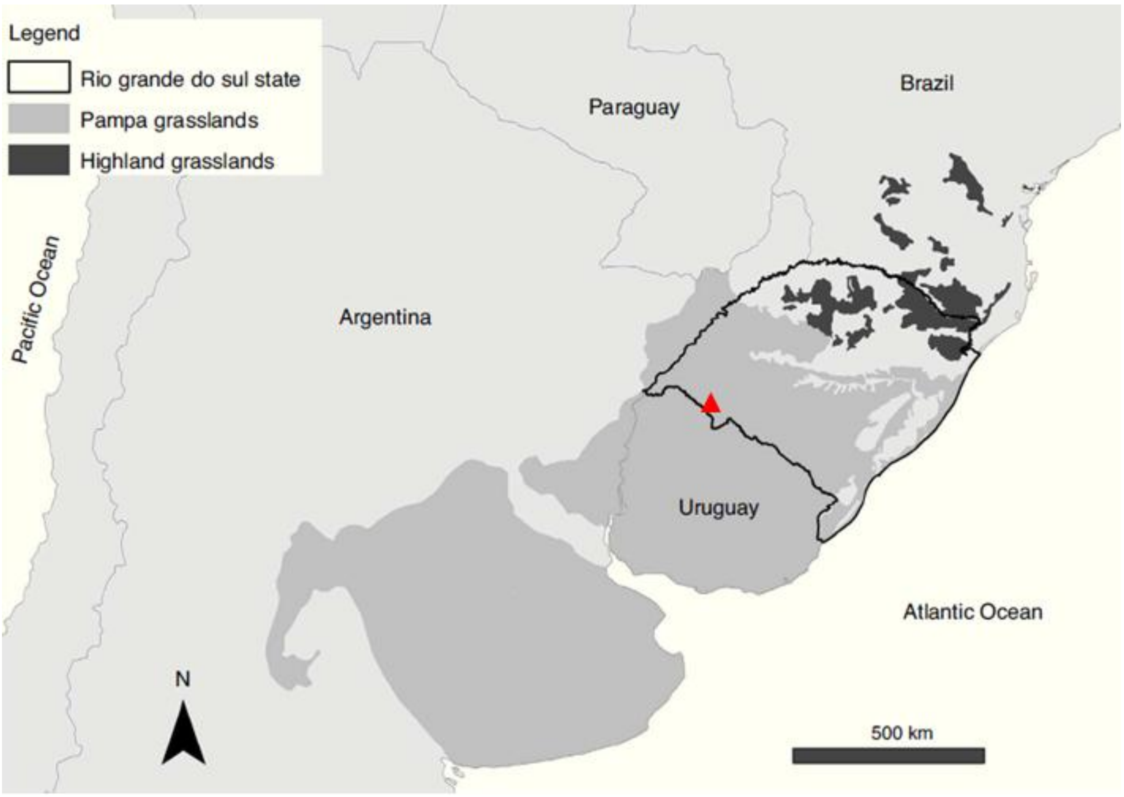

Figura 1 –Bioma Pampa no sul da América do Sul. Triângulo vermelho índica a APA do Ibirapuitã, local de amostragem para esta pesquisa. Imagem adaptada de de Andrade et al. (2015).

Figura 2 – Vegetação em aéras com e sem pastejo na APA do Ibirapuitã. À esquerda, áreas com pastejo e à direita áreas sem pastejo. Foto tirada em Maio de 2015.

Figura 3 – Vegetação em áreas sem pastejo na APA do Ibirapuitã. Foto tirada em Maio de 2015

Figura 4 – Vegetação em áreas com pastejo na APA do Ibirapuitã. Foto tirada em Maio de 2015

ARTIGO I

Short-Term spider community monitoring after cattle removal in grazed grassland

Submetido a Revista Iheringia: Série Zoologia

SHORT-TERM SPIDER COMMUNITY MONITORING AFTER CATTLE REMOVAL IN GRAZED GRASSLAND

Guilherme O. da Silva[1,2]*and Ricardo Ott[1]

[1]Fundação Zoobotânica do Rio Grande do Sul – FZB-RS. Rua: Dr Salvador França, CEP 90690-000, Porto Alegre, RS, Brazil.

[2]Universidade Federal do Rio Grande do Sul – UFRGS. Avenida Bento Gonçalves, 9500, CEP 91509-900, Porto Alegre, RS, Brazil.

ABSTRACT. At the Pampa Biome, grazing, like others disturbances, affects fauna, flora, creating heterogeneity in the environment. Little is known about how the diversity and richness of arthropods change during this impact. To improve the knowledge of how spider diversity is affected by grazing, experiments were realized at Pampa. The hypothesis is that abundance of spider will be different when comparing grazed and ungrazed areas. A paired block, with two areas of one hectare each, was established in three areas in APA do Ibirapuitã. One of these hectares was closed with fences, excluding the catle grazing, in August of 2012. Samplings were realized in November of 2011, 2012 and 2013 using Pitfall traps filled with formol 4% and disposed in an "X" format in each plot. For statistical analyses, T test, ANOSIM, ANOVA and Rarefaction were performed. A total of 1.315 spiders were captured, comprising 77 species and morphospecies of 21 families. The most abundant family was Lycosidae followed by Hahniidae, Linyphiidae and Theridiidae. Linyphiidae was the richest family with 14 species and morphospecies identified. All spiders, adults and juveniles, only adults in species and morphospecies, and most abundant species were used as models for statistics. These models revealed no significant difference between grazed and ungrazed areas after three and 15 months of cattle exclusion.

KEY WORDS: Neotropical; Pampa; Diversity; Arachnids;

RESUMO. **Monitoramento de curto prazo da comunidade de aranhas após a remoção do gado em campos pastejados.** No Pampa, o pastejo, como outros disturbios, afeta a fauna e flora, criando uma maior heterogeneidade no ambiente. Pouco se sabe como a diversidade e riqueza de artrópodes muda durante este impacto. Para aprimorar o conhecimento de como a diversidade de aranhas é afetada pelo pastejo, experimentos foram realizados no Pampa. A hipótese é que a abundancia de aranhas será diferente quando áreas pastejadas e sem pastejo são comparadas. Um bloco de duas parcelas, cada uma com um hectare, foi estabelecido em três fazendas na APA do Ibirapuitã. Um destes hectares foi fechado com cercas, excluindo o pastejo do gado, em agosto de 2012. As amostragens foram realizadas em novembro de 2011, 2012 e 2013 usando "*Pitfall traps*" preenchidas com formol 4% e disposta em formato de "X" em cada hectare. Foram utilizados para análise estatística, Teste T, ANOSIM, ANOVA e Rarefação. Um total de 1,315 aranhas foram amostradas, compreendendo 77 espécies e morfoespécies de 21 familias. A família mais abundante é Lycosidae, seguida de Hahniidae, Linyphiidae e Theridiidae. Linyphiidae é família mais rica, com 14 espécies e morfoespécies identificadas. A soma das abundancias de aranhas jovens e adultas, a abundancia de apenas aranhas adultas e a abundancia das espécies mais abundantes, foram utilizadas como modelos estatísticos. Estes modelos não revelaram diferença significativa entre áreas com e sem pastejo mesmo após três ou 15 meses de exclusão do gado.

PALAVRAS-CHAVE: Neotropical; Pampa; Diversidade; Aracnideos;

SHORT-TERM SPIDER COMMUNITY MONITORING AFTER CATTLE REMOVAL IN GRAZED GRASSLAND

Guilherme O. da Silva[1,2]*and Ricardo Ott[1]

[1]Fundação Zoobotânica do Rio Grande do Sul – FZB-RS. Rua: Dr Salvador França, CEP 90690-000, Porto Alegre, RS, Brazil.

[2]Universidade Federal do Rio Grande do Sul – UFRGS. Avenida Bento Gonçalves, 9500, CEP 91509-900, Porto Alegre, RS, Brazil.

ABSTRACT. At the Pampa Biome, grazing, like others disturbances, affects fauna, flora, creating heterogeneity in the environment. Little is known about how the diversity and richness of arthropods change during this impact. To improve the knowledge of how spider diversity is affected by grazing, experiments were realized at Pampa. The hypothesis is that abundance of spider will be different when comparing grazed and ungrazed areas. A paired block, with two areas of one hectare each, was established in three areas in APA do Ibirapuitã. One of these hectares was closed with fences, excluding the catle grazing, in August of 2012. Samplings were realized in November of 2011, 2012 and 2013 using Pitfall traps filled with formol 4% and disposed in an "X" format in each plot. For statistical analyses, T test, ANOSIM, ANOVA and Rarefaction were performed. A total of 1.315 spiders were captured, comprising 77 species and morphospecies of 21 families. The most abundant family was Lycosidae followed by Hahniidae, Linyphiidae and Theridiidae. Linyphiidae was the richest family with 14 species and morphospecies identified. All spiders, adults and juveniles, only adults in species and morphospecies, and most abundant species were used as models for statistics. These models revealed no significant difference between grazed and ungrazed areas after three and 15 months of cattle exclusion.

KEY WORDS: Neotropical; Pampa; Diversity; Arachnids;

RESUMO. **Monitoramento de curto prazo da comunidade de aranhas após a remoção do gado em campos pastejados.** No Pampa, o pastejo, como outros disturbios, afeta a fauna e flora, criando uma maior heterogeneidade no ambiente. Pouco se sabe como a diversidade e riqueza de artrópodes muda durante este impacto. Para aprimorar o conhecimento de como a diversidade de aranhas é afetada pelo pastejo, experimentos foram realizados no Pampa. A hipótese é que a abundancia de aranhas será diferente quando áreas pastejadas e sem pastejo são comparadas. Um bloco de duas parcelas, cada uma com um hectare, foi estabelecido em três fazendas na APA do Ibirapuitã. Um destes hectares foi fechado com cercas, excluindo o pastejo do gado, em agosto de 2012. As amostragens foram realizadas em novembro de 2011, 2012 e 2013 usando "*Pitfall traps*" preenchidas com formol 4% e disposta em formato de "X" em cada hectare. Foram utilizados para análise estatística, Teste T, ANOSIM, ANOVA e Rarefação. Um total de 1,315 aranhas foram amostradas, compreendendo 77 espécies e morfoespécies de 21 familias. A família mais abundante é Lycosidae, seguida de Hahniidae, Linyphiidae e Theridiidae. Linyphiidae é família mais rica, com 14 espécies e morfoespécies identificadas. A soma das abundancias de aranhas jovens e adultas, a abundancia de apenas aranhas adultas e a abundancia das espécies mais abundantes, foram utilizadas como modelos estatísticos. Estes modelos não revelaram diferença significativa entre áreas com e sem pastejo mesmo após três ou 15 meses de exclusão do gado.

PALAVRAS-CHAVE: Neotropical; Pampa; Diversidade; Aracnideos;

The Pampa is a Neotropical region biome localized in meridional South America, including south Brazil, Uruguay and part of Argentina, covering 750,000 km^2 (VÉLEZ *et al.*, 2009) (Fig. 1). It is composed originally of areas with grasslands and meadows areas (BEHELING *et al.*, 2009) and according to Köppen-Geiger classification, the climate is considered as "Cfa" (humid temperate with hot summers; KOTTEK *et al.*, 2006). In conformity to SUERTEGARAY & SILVA (2009) the Pampa is located in the Southern Temperate Zone with four well-characterized seasons and has a maximum altitude of 200 m.

The human presence in this region began around 10,000 (B.P.) with pre-columbian cultures (SUERTEGARAY & SILVA, 2009). In general it is not exactly know how the Pampa was before more than some 300 years ago, when disturbance increases dramatically after the European colonization due cattle introduction, uncontrolled fire management, farming and silvicultural activities (SUERTEGARAY & SILVA, 2009; RODRIGUES *et al.*, 2010; PODGAISKI *et al.*, 2014; FERRANDO *et al.*, 2016). Considering theses disturbances, many components of the biota, as also the invertebrate fauna, should be directly affected. However, these fauna and its level of endemism are poorly known for this region (LEWINSOHN, 2006), and the enhancement of studies on biodiversity and biogeography of insects, arachnids, crustaceans as for other invertebrates groups are still necessary (BENCKE, 2009).

Spiders are the second species richest group of Arachnida counting with more than 46,000 valid species distributed in 3,988 genera and 114 families (WORLD SPIDER CATALOG, 2016). The official number of spiders for Brazil is unknown but they could easily reach more than 4,000 species (BRESCOVIT, 1999; 2011). In terms of grasslands, richness and abundance of spider vary. For African grassland, Ammoxenidae, Lycosidae and Salticidae families seems to be the most abundant (HADDAD *et al.*, 2015;

JANSEN *et al.*, 2013; FOORD *et al.*, 2016) as Gnaphosidae, Salticidae and Thomisidae families were the richest (FOORD *et al.*, 2011; HADDAD *et al.*, 2015; FOORD & DIPPENAAR-SCHOEMAN, 2016) in most recent studies. For South American grasslands Linyphiidae, Lycosidae, Salticidae seems to be the most abundant and rich families (RODRIGUES *et al.*, 2010; POMPOZZI *et al.*, 2011; PODGAISKI *et al.*, 2013; CUNHA *et al.*, 2015; ZANETTI, 2016), however, spider diversity is still poorly known at Pampa.

Spider has their diversity dependent of many factors (FOELIX, 2011) like vegetal structure (BALDISSERA *et al.*, 2004; NOGUEIRA & PINTO-DA-ROCHA, 2016), capacity of dispersal and settlement (HORVÁTH *et al.*, 2009; RODRIGUES *et al.*, 2009; LIN *et al.*, 2016), prey availability and competitive exclusion (DENNIS *et al.*, 2015; RODRIGUEZ-ARTIGAS *et al.*, 2016). Moreover, spider are capable of consume high biomass (NYFELLER, 2000; OTT, 2016), are generalist predators in different trophic levels, even eating other spiders (WISE, 2006) and occupying nearly all terrestrial habitats (FOELIX, 2011), making up great ecological models (WISE, 1993; UNYAL, 2004). Their high recolonization capacity (PODGAISKI *et al.*, 2013), would make them a great model for testing the absence of cattle graze impact.

The objective of this work is to present a list of families, species or morphoespecies of ground dwelling spider of Pampa biome. Moreover, compare the areneofauna in areas with and without cattle graze after three and 15 months of total exclusion of this impact at Pampa. The hypothesis is that abundance, composition and richness of spider fauna will be different when comparing grazed and ungrazed areas. It is expected that abundance and richness of spider will be higher in ungrazed areas.

MATERIAL AND METHODS

Study Site

The experiments were carried out at Área de Proteção Ambiental – APA do Rio Ibirapuitã, located at Western Pampas Areas of Rio Grande do Sul state, Brazil. Six plots of one hectare each, located at three different farms in the municipality of Sant’Ana do Livramento and georeferenced at 30°28’50.57” S; 055º33’10.21” W (Estância do Açude; Farm 1), 30°28’54.97” S; 055º34’14.05” W (Fazenda Rincão dos Moraes ; Farm 2) and 30°25’54.78” S; 055°38’39.75” W (Fazenda Bela Vista; Farm 3) were selected for the sampling. In each farm a block of two plots, placed close to 200 m far from each other, were established, being one of them closed with fences in August of 2012, excluding totally the cattle grazing access; the second plot was defined only by poles placed at its corners and the cattle was allowed to graze in the area. Closed plots without grazing were defined here as ungrazed and cattle free grazing access plots were defined as grazed.

Data Collection

The plots were sampled using pitfall traps made by ordinary beer plastic cups of 500 ml (15 cm depth, 10 cm diameter) inserted into a 10 cm diameter PVC guide (Fig. 2; adapted from Uetz & Uzicker, 1976), exposed during seven days. Twelve traps were installed disposed in “X” format from corner to corner of each plot (72 in total). To measure possible border effects, the traps were separated in three different ptfall groups regarding the distance to the border (Edge, Middle and Center) of four traps. Traps were placed around 20 m apart from each other and at least 10 m from the fence or border line of each plot (Fig. 3). Sampling periods occur in three different years: 8 to 15 November 2011 (no fences), 8 to 16 November 2012 (3 months fences enclosure) and 26 November to 3 December 2013 (15 months fence enclosure), fulfilling 1512 trap days. Traps were filled around 1/3 of total volume with formol at 4% concentration with some drops of liquid soap to break superficial tension.

Data Analysis

Spiders collected at samples were sorted out manually and placed in vials containing 80% ethanol and examined using a stereo microscope. For determination in the lowest possible taxonomic level, dichotomous key were used for families (DIPPENAAR-SCHOEMANN & JOCQUÉ, 1997; BRESCOVIT *et al.*, 2002) and papers, available on-line at NMBE World Spider Catalog (WORLD SPIDER CATALOG 2016), for genera and species. Adult and juveniles were identified at family level and only adult were at morphospecies and species level. All adult spiders were deposited at the aracnological collection of Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul (MCN).

Most abundant species were defined by their dominance, as those making up ≥2% of the total of all individuals (adapted from SPILLER & SCHORNER, 1998; PETCHARAD *et al.*, 2016). For analysis, these species were separated in three ways: Most abundant species in general, with abundance of all individuals of 2011, 2012 and 2013; Most abundant species with abundance of all individuals of 2012 and 2013, for testing grazed and ungrazed plots differences; and Most abundant species after 15 months of enclosure, with only abundance of all individuals of 2013, for testing border effect.

For statistical analysis, Student's tests were performed to compare differences in abundance between grazed and ungrazed plots *using, as models, all spiders, only adults in species/morphospecies and the most abundant species. Three categories of tests were applied with these models: (i) Sum of 2012 and 2013 abundance; (ii) only 2012 abundance to test 3 months of enclosure in fenced areas; and (iii) only 2013 abundance to test 15 months of enclosure in fenced areas. Analysis of similarities (ANOSIM) was* *performed based in Morisita, Bray-Curtis and Jaccard measures. Abundance of 2013 families, all spiders, only adults in species/morphospecies and most abundant species were used as models to test difference between pitfall groups in* ungrazed plots. *Analysis of variance (ANOVA) was performed to test differences between pitfall groups in 2013 using medians of abundance of all spiders, only adults in species/morphospecies and most abundant species. Rarefaction curves were performed to plot spider richness in* ungrazed plots *trough the years, using ANOVA for testing significance. All statistical analyses were made using Past Program (Paleontological Statistics 3.13, HAMMER et al., 2001). The significance level utilized was p<0.05.*

RESULTS

A total of 1,315 spiders (775 adults, 576 males, 199 females; 540 juveniles) were sampled, 685 in grazed plots and 630 in ungrazed plots. A total of 26 families were identified considering juveniles and adults; 77 species and morphospecies of 21 families were identified, of these, 33 nominal species, 32 morphospecies at genera level and 12 morphospecies at only family level (Tab. I). The most abundant families were Lycosidae (433 individuals), Hahniidae (359), Linyphiidae (143), Theridiidae (94). Hahniidae followed by Lycosidae, Linyphiidae and Theridiidae were the most abundant families in ungrazed plots. Lycosidae followed by Hahniidae, Linyphiidae and Theridiidae were the most abundant families in grazed plots. Adults in grazed plots sum 360 individuals (271 males; 89 females) and in ungrazed plots sum 415 individuals (305 males; 110 females) (Tab. I).

Linyphiidae was the richest family (14 species and morphospecies), followed by Lycosidae (13), Gnaphosidae (9), Salticidae (8) and Theridiidae (8) (Tab. I). The families Amphinectidae, Anyphaenidae, Araneidae, Caponiidae, Ctenidae, Miturgidae, Nemesiidae, Oonopidae, Oxyopidae, Phrurolithidae, Tetragnathidae and Theraphosidae were represented by only one species or morphospecies (Tab. I). Only juveniles of Microstigmathidae, Philodromidae, Pholcidae, Sparassidae and Tengelidae were sampled. Anyphaenidae, Philodromidae, Pholcidae, Tetragnathidae and Trechalidae were exclusively found in ungrazed plots. Caponiidae, Microstigmathidae, Oxyopidae, Sparassidae and Tengelidae were exclusively found in grazed plots.

The most abundant species in general represent 34% of the total of spiders. They were *Neohania* sp. 1 (186 individuals), *Neohania* sp. 2 (155), *Guaraniella mahnerti* Baert, 1984 (45), *Agyneta* sp. 2 (35), *Schizocosa malitiosa* (Tullgren, 1905) (30). Twenty-six species are exclusively from ungrazed plots and 14 are exclusively from grazed plots. Twenty-seven species were singletons and 13 were doubletons.

A total of 918 spiders were sampled in 2012 and 2013. Of these, the most represent 33% of total and were, *Neohania* sp. 1 (104 individuals), *Neohania* sp. 2 (96), *G. mahnerti* (31), *S. malitiosa* (25), *Agyneta* sp. 2 (24) and *Birabenia* sp. 1 (21). A total of 459 spiders were sampled in only 2012. Of these, the most abundant species represent 31% of total and were *Neohania* sp. 2 (63), *Neohania* sp. 1 (33), *S. malitiosa* (22), *G. mahnerti* (19), *Agyneta* sp. 2 (8). A total of 459 spiders were sampled in only 2013. Of these, the most abundant species represent 39% of total spiders and were *Neohania* sp. 1 (71), *Neohania* sp. 2 (33), *Agyneta* sp. 2 (16), *Birabenia* sp. 1 (15), *Erigone* sp. 1 (12), *G. mahnerti* (12), *Semiopyla cataphracta* Simon, 1901 (11) and *Lycosa thorelli* (Keyserling, 1877) (10).

Students’ test revealed no significant difference between grazed and ungrazed plots regarding all spiders in 2012 and 2013 (p= 0.8047), only 2012 with three months of enclosure (p= 0.7888) and only 2013 with 15 months of enclosure (p= 0.8413). The test wasn´t significant different regarding only adults in species/morphospecies in 2012 and 2013 (p= 0.4782), only 2012 with three months of enclosure (p= 0.2807) and only

2013 with 15 months of enclosure (p= 0.8465). Also, most abundant species weren´t significant different in the same parameters 2012 and 2013 (p= 0.5744), only 2012 with three months of enclosure (p= 0.2086) and only 2013 with 15 months of enclosure (p= 0.7550).

Regarding the distance of the traps to the border of ungrazed plots, the Analysis of Similarity (ANOSIM) revealed no significant difference for families (Morisita: R= 0.0036 p= 0.4095; Bray-Curtis: R= 0.0060 p= 0.3943; Jaccard: R= 0.0064 p= 0.3923), all spiders (Morisita: R= -0.0519 p= 0.9174; Bray-Curtis: R= -0.0322 p= 0.7674; Jaccard: R= -0.0427 p= 0.8608), only adults in species/morphospecies (Morisita: R= -0.0298 p= 0.7978; Bray-Curtis: R= -0.0073 p= 0.5322; Jaccard: R= -0.0210 p= 0.7046) and most abundant species (Morisita: R= -0.0379 p= 0.8833; Bray-Curtis: R= -0.0400 p= 0.8508; Jaccard: R= -0.0361 p= 0.8694) between pitfall groups in 2013.

Also, Analysis of Variance (ANOVA), based in the means of spiders abundance, demonstrated no significant difference between pitfall groups in 2013 when all spiders (p= 0.6737), only adults in species/morphospecies (p= 0.7392) and most abundant species (p=0.7365) were used as models.

Regarding the rarefaction curves a higher richness was presented in T1 than in T3 and T2 (Fig. 4) trough years. However, ANOVA reveled no significant difference between ungrazed plots (p= 0.08305).

DISCUSSION

Comparing our species list with lists of spider species from Uruguay (CAPOCASALE, 1990) (144 listed species and morphospecies), *Argiope argentata* (Fabricius, 1775), *Caponina notabilis* (Mello-Leitão, 1939), *L. thorelli*, *Metaltella simoni* Keyserling, 1878, *S. malitiosa* and *Teminius insularis* (Lucas, 1857) are shared between both lists. For Brazil, São Paulo state has listed 875 species, sharing with our list eight species: *A. argentata*, *Camillina pulchra* (Keyserling, 1891) *Lycosa erythrognatha* Lucas, 1836, *L. thorelli*, *Oxyopes salticus* Hentz, 1845, *Parabatinga brevipes* (Keyserling, 1891), *S. cataphracta* and *T. insularis* (BRESCOVIT *et al.*, 2011). Rio Grande do Sul state has 808 listed species, sharing 19 species with our list: *A. argentata*, C. *notabilis*, *C. pulchra*, *Castianeira chrysura* Mello-Leitão, 1943, *Castianeira gaucha* Mello-Leitão, 1943, *Eilica obscura* (Keyserling, 1891), *Eilica trilineata* (Mello-Leitão, 1941) *Euryopis camis* Levi, 1963, *Euryopis spinifera* Mello-Leitão, 1944, *Glenognatha lacteovittata* (Mello-Leitão, 1944) *G. mahnerti*, *L. erythrognatha*, *L. thorelli*, *M. simoni*, *P. brevipes*, *Psilocymbium lineatum* (Millidge, 1991), *S. malitiosa*, *O. salticus* and *T. insularis* (BUCKUP *et al.*, 2010). *A. argentata*, *L. thorelli and T. insularis* were present in all lists, and can be considered species with very broad range distribution. Moreover, the low quantity of shared species indicates that composition of spider fauna can be very variable even comparing close regions.

Our data suggest that grazed and ungrazed areas are still very similar in terms of abundance and species composition of ground spiders, even 15 months after the removal of the cattle. However the findings presented here could be affected by at last two sample design negative effects as stressed below. First, considering the size of the ungrazed plots (just one hectare) added to the fact that our fenced areas are all surrounded by not-fenced areas, could cause a presumable edge effect over the entire ungrazed plots (MURCIA, 1995; RODRIGUES *et al.*, 2014). Second, the low quantity of traps, it size or total trapping days, in other words the low “sample effort”, could lead to a very low power outcome of statistical tests and therefore no significant difference was found (TOPPING & SUNDERLAND, 1992; BRENNAN *et al.*, 1999; WORK *et al.*, 2002). However, it is also very likely that in this case, ground spider fauna is not really being affected by grazing, at least in the first 15 months after enclosure and cattle removal.

The absence, due our methodology, of spiders most commonly found in aerial vegetation, like orb-web builders (*A. argentata* sampled are totally occasional), could be another factor that led us to no significant difference between grazed and ungrazed plots. As spiders' diversity seems to be much correlated to vegetal structure (CADENASSO & PICKETT, 2001; SOUZA, 2007; RODRIGUES *et al.*, 2010), in short time the ground spider fauna seems to be less affected by grazing disturbance. Experiments with fire, where the vegetation is completely removed (PODGAISKI *et al.*, 2013) demonstrate that web-builders take more time to occupy recent disturbed areas, due its need of tri-dimensional structures for establish a webs (HALAJ *et al.*, 1998; PFISTER *et al.*, 2015; NOGUEIRA & PINTO-DA-ROCHA, 2016). Therefore, aerial vegetation correlated spiders and web-builders, would be more sensitive and respond more strongly to absence of cattle grazing.

Spiders are usually considered as a useful group to monitory management studies, due to quickly occupancy of altered habitats (UETZ *et al.*, 1999) and its important role as predators (FOELIX, 2011; BECK *et al.*, 1997; RODRIGUES *et al.*, 2010; LAWS & JOERN, 2015). But ground spiders provide only piece of information (GIBSON *et al.*, 1992). It is very possible that spiders living in the vegetation and other invertebrates, such as beetles (GRANDCHAMP *et al.*, 2005; WOODCOK *et al.*, 2005), ants (RED & ANDERSEN, 2000; CALCATERRA *et al.*, 2010) and grasshoppers (HOLMES *et al.*, 1979; FERRANDO *et al.*, 2016) could respond quicker and intensively to grassland management. Moreover, correlating abundance of these arthropods, spiders and other invertebrates would allow a better overview of how the fauna change without grazing perturbation.

Acknowledgements. We thank the Federal University of Rio Grande do Sul, for providing us with fieldwork infrastructure. This work was supported also by Guilherme Oyarzabal da Silva Masters Scholarship from CAPES, Brazil (process1478689).

REFERENCES

ANDRADE, B. O.; KOCK, C.; BOLDRINI, I. I.; VÉLEZ-MARTIN, E.; HASENACK, H.; HERMANN, J. M.; KOLLMANN, J.; PILLAR, V. P.; OVERBECK, G. E. 2015. Grassland degradation and restoration: a conceptual framework of stages and thresholds illustrated by southern Brazilian grasslands. Natureza & Conservação, 0:10. doi: 10.1016/j.ncon.2015.08.002.

BALDISSERA, R.; GANADE, G.; FONTOURA, S. B. 2004. Web spider community response along an edge between pasture and Araucaria forest. Biological Conservation, 118:403–409.

BECK , L.; HÖFER H.; MARTIUS C.; RÖMBKE J.; VERHAAGH M. 1997. Bodenbiologie tropischer Regenwälder. Geogrephische Rundschau 49(1):24-31.

BEHELING, H.; JESKE-PIERUSCHKA V.; SCHÜLER L.; PILLAR, V. P. 2009. Dinâmica dos campos no sul do Brasil durante o Quaternário Tardio, p.13-25. In: PILLAR, V.P., MÜLLER S. C.; CASTILHOS Z. M. S.; JACQUES A. V. A. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA. 403p.

BENCKE G. A. 2009. Diversidade e conservação da fauna dos Campos do Sul do Brasil; pp.101-121, In: PILLAR, V.P., MÜLLER S. C.; CASTILHOS Z. M. S.; JACQUES A. V. A. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA. 403p.

BRENNAN, K. E. C.; MAJER, J. D.; REYGAERT, N. 1999. Determination of an optimal pitfall trap size for sampling spiders in a Western Australian Jarrah forest. Journal of Insect Conservation, 3:297–307.

BRESCOVIT, A. D.; OLIVEIRA U.; SANTOS A. J. 2011. Spiders (Araneae, Arachnida) from São Paulo State, Brazil: diversity, sampling efforts, and state-of-art. Biota Neotropica. 11(1a): 32.

BRESCOVIT, A. D.; RHEIMS C. A.; BONALDO A. B. 2002. Araneomorphae - Chave de identificação para famílias de aranhas brasileiras. Available at: <http://pt.scribd.com/doc/123853696/Chave-de-Familias-de-Aranhas>. Accessed on: 19 May 2016.

BRESCOVIT A. D. 1999. Araneae. pp. 47-56. *In* Biodiversidade do Estado de São Paulo, Brasil: síntese do conhecimento ao final do século XX. Vol5, Invertebrados Terrestres, (C.A. Joly & C.E.M. Bicudo, orgs.) FAPESP, São Paulo.

BUCKUP, E. H.; MARQUES M. A. L.; RODRIGUES E. N. L.; OTT R. 2010. Lista das espécies de aranhas (Arachnida, Araneae) do estado do Rio Grande do Sul, Brasil. Iheringia, SérieZoológica., Porto Alegre, 100(4):483-518.

CADENASSO, M. L. & PICKETT S. 2001. Effect of edge structure on the fluxof species into forest interiors. Conservation Biology 15(1):91–97.

CALCATERRA, L. A.; CABRERA, S. M.; CUEZZO, F.; PEREZ, I. J.; BRIANO, J. A. 2010 Habitat and grazing influence on terrestrial ants in subtropical grasslands and savannas of Argentina. Entomological Society of America, 103(4): 635-646. doi: 10.1603/AN09173

CAPOCASALE, R. M. 1990. An annotated checklist of Uruguayan spiders. Aracnología, 11:1-23.

CUNHA, J. A. S.; ANDRADE, E. B.; SILVA, P. R. R.; BARROS, R. F. B. 2015. Araneofauna (Arachnida, Araneae) in conventional and organic crops of watermelon (*Citrullus lanatus*) in northeastern Brazil. Revista Colombiana de Entomología, 41(1):68-75.

DENNIS, P.; YOUNG, M. R.; GORDON, I. J. 1998. Distribution and abundance of small insects and arachnids in relation of structural heterogeneity of grazed, indigenous grasslands. Ecological Entomology, 23:253-264.

DENNIS, P.; SKARTVEIT, J. KUNAVER, A.; MCCRACKEN, D. I. 2015. The response of spider (Araneae) assemblages to structural heterogeneity and prey abundance in sub-montane vegetation modified by conservation grazing. Global Ecology and Conservation, 3:715–728.

DIPPENAAR-SCHOEMAN, A. S. & JOCQUÉ R. 1997. African Spiders: An Indetification Manual. Plant Protection. Research institute Handbook, 391p.

FERRANDO, C. P. R.; PODGAISKI L. R.; COSTA M. K. M.; MENDONÇA JR M. D. S. 2016. Taxonomic and Functional Resilience of Grasshoppers (Orthoptera, Caelifera) to Fire in South Brazilian Grasslands. Neotropical Entomology, 1-8, doi: 10.1007/s13744-016-0380-3.

FOELIX, R. F. 2011. Biology of Spiders. 3. ed. Oxford: Oxford University Press. 423p.

FOORD, S. H.; DIPPENAAR-SCHOEMAN, A. S.; HADDAD, C. R.; LOTZ, L. N.; LYLE, R. 2011. The faunistic diversity of spiders (Arachnida: Araneae) of the Savanna Biome in South Africa. Transactions of the Royal Society of South Africa 66:170–201. doi: http://dx.doi.org/10.1080/0035919X.2011.639406

FOORD, S. H.; DIPPENAAR-SCHOEMAN, A. S.; JOCQUÉ, R.; HADDAD, C. R.; LYLE, R.; WEBB, P. 2016. South African National Survey of Arachnida: A checklist of the spiders (Arachnida, Araneae) of the Lekgalameetse Nature Reserve, Limpopo province, South Africa. Koedoe, 58(1):1405-1403.

FOORD, S. H. & DIPPENAAR-SCHOEMAN, A. S. 2016. The effect of elevation and time on mountain spider diversity: a view of two aspects in the Cederberg mountains of South Africa. Journal of Biogeography, p. 1-12. doi: 10.1111/jbi.12817

GIBSON, C. W. D.; HAMBLER C.; BROWN V. K. 1992. Changes in spider (Araneae) assemblages in relation to succession and grazing management. Journal of Applied Ecology, 29:132-142.

GRANDCHAMP, A. C.; BERGAMINI, A.; STOFER, S.; NIEMELA, J.; DUELLI, P.; SCHEIDEGGER, C. 2005. The influence of grassland management on ground beetles (Carabidae, Coleoptera) in Swiss montane meadows. Agriculture, Ecosystems and Environment 110:307–317.

HALAJ, J; ROSS, D. W.; MOLDENKEL, A. R. 1998. Habitat structure and prey availability as predictors of the abundance and community organization of spiders in Western Oregon forest canopies. The Journal of Arachnology, 26:203–220.

HADDAD, C. R.; FOORD, S. H.; FOURIE, R.; DIPPENAAR-SCHOEMAN, A. S. 2015. Effects of fast-burning spring fire on the ground-dwelling spider assemblages (Arachnida: Araneae) in a central South Africa grassland habitat. African Zoology, 50(4):281-292 doi: http://dx.doi.org/10.1080/15627020.2015.1088400.

HAMMER, Ø.; HARPER D. A. T.; RYAN P. D. 2001. PAST: Paleontological Statistics package for education and data analysis. Paleontologia Eletronica 4(1):1-9.

HOLMES, N. D.; SMITH, D. S.; JOHNSTON A. 1979. Effect of grazing by cattle on the abundance of grasshoppers on fescue grassland. Journal of range management 32(4):1-2.

JANSEN, R.; MAKAKA, L.; LITTLE, I. T.; DIPPENAAR-SCHOEMAN, A. S. 2013. Response of ground-dwelling spider assemblages (Arachnida, Araneae) to montane grassland management practices in South Africa. Journal of Insect Conservation, p. 1-50.

JOCQUÉ, R. & ALDERWEIRELDTH, M. 2005. Lycosidae: the grassland spiders. Acta zoologica bulgarica, 1:125-130.

KOTTEK M.; GRISER J.; BECK C.; RUDOLF B.; RUBEL F. 2006. World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift, v.15, p.259-263.

LAWS, A.N. & JOERN, A. 2015. Predator–prey interactions are context dependent in a grassland plant–grasshopper–wolf spider food chain. Environmental Entomology, 1–10. doi: 10.1093/ee/nvv033

LEWINSOHN, T. M. 2006. Avaliação do estado do conhecimento da biodiversidade brasileira. Brasília: MMA. Série Biodiversidade, 15p.

LIN, S.; VASSEUR, L. M.; YOU, S. 2016. Seasonal Variability in Spider Assemblages in Traditional and Transgenic Rice Fields. Environmental Entomology, 0:1–10.doi: 10.1093/ee/nvw00.

MURCIA, C. 1995. Edge effect in fragmented forests: implications for conservation. Trends Ecology Evolution 10:58–62.

NOGUEIRA, A. A.; PINTO-DA-ROCHA, R. 2016. The effects of habitat size and quality on the orb-weaving spider guild (Arachnida: Araneae) in an Atlantic Forest fragmented landscape. The Journal of Arachnology, 44:36–45.

NYFELLER, M. 2000. Ecological impact of spiders predation: a critical assessment of Britowe's and Tunbull's estimates. Bulletin of the British Arachnological Society, 11:367-373.

OTT, R. 2016. Invertebrados terrestres – Aranhas; p.46-47, In: Moura L.A., L. Chomenko, M. A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul. 110p.

PETCHARAD, B.; MIYASHITA T.; GALE, G. A.; SOTTHIBANDHU, S.; BUMRUNGSRI, S. 2016. Spatial patterns and environmental determinants of community composition of web-building spiders in understory across edges between rubber plantations and forests. The Journal of Arachnology 44:182–193.

PFISTER, S. C.; SCHÄFER, R. B.; SCHIRMEL, J.; ENTLING, M. H. 2015. Effects of hedgerows and riparian margins on aerial web-building spiders in cereal fields. The Journal of Arachnology 43:400–405.

PODGAISK, L. R.; GOLDAS, C. S.; FERRANDO, C. P. R.; SILVEIRA, F. S.; JONER, F., G.E. OVERBECK G. E.; MENDONÇA JR M. S.; PILLAR V. D. 2014. Burning effects on detritivory and litter decay in Campos grasslands. Austral Ecology, 39:686–695. doi: 10.1111/aec.12132.

PODGAISKI L. R.; JONER F.; LAVOREL S.; MORETTI M.; IBANEZ S.; MENDONÇA JR M. S.; PILLAR V. D. 2013. Spider trait assembly patterns and resilience under fire-induced vegetation change in south Brazilian Grasslands. PLoS ONE 8(3):1-11. doi:10.1371/journal.pone.0060207.

POMPOZZI, G. A.; TIZÓN, F. R.; PELAÉZ, D. V. 2011. Effects of different frequencies of fire on an epigeal spider community in Southern Caldenal, Argentina. Zoological Studies, 50(6):718-724.

RED, J. L. & ANDERSEN, A. N. 2000. The value of ants as early warning bioindicators: responses to pulsed cattle grazing at an Australian arid zone locality. Journal of Arid Environments, 45:231–251. doi:10.1006/jare.2000.0634.

RODRIGUES, E. N. L.; MENDONÇA JR. M. S.; OTT, R. 2009. Spider diversity in a rice agroecosystem and adjacent areas in southern Brazil. Revista Colombiana de Entomología, 35:78-86.

RODRIGUES, E. N. L.; ROSADO J. L. O.; LOECK A. E. 2010. Soil spiders in differing environments: *Eucalyptus* plantations and grasslands in the Pampa biome, southern Brazil. Revista Colombiana de Entomología, 36(2):277-284.

RODRIGUES, E. N. L.; MENDONÇA JR. M. S.; COSTA-SCHIMIDT L. E. 2014. Spider diversity responds strongly to edge effects but weakly to vegetation structure in riparian forests of Southern Brazil. Arthropod-Plant Interactions, 8:123–133. doi: 10.1007/s11829-014-9294-3.

RODRIGUEZ-ARTIGAS, S. M.; BALLESTER, R.; CORRONCA, J. A. 2016. Factors that influence the beta-diversity of spider communities in northwestern Argentinean Grasslands. PeerJ 4:19-46. doi: 10.7717/peerj.1946.

SOUZA, A. L. T. 2007. Influência da estrutura do habitat na abundância e diversidade de aranhas; p.25-44, In: GONZAGA, M. O., SANTOS, A. J., JAPYASSÚ, H. F.. Ecologia e comportamento de aranhas. Rio de Janeiro, Interciência Editora. 300p.

SUERTEGARAY, D. M. A & SILVA, L. A. P. 2009. Tchê Pampa: histórias da natureza gaúcha; p.42-59. In: PILLAR, V.P., MÜLLER S. C.; CASTILHOS Z. M. S.; JACQUES A. V. A. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA. 403p.

SPILLER, D.A. & SCHOENER, T.W. 1998. Lizard reduce spider species richness by excluding rare species. Ecology, 79:503-516.

TOPPING, C. J.; & SUNDERLAND, K. D. 1992. Limitations to the use of pitfall traps in ecological studies exemplified by a study of spiders in a field of winter wheat. Journal of Applied Ecology. 29:485-491.

UETZ, G. W. & UNZICKER J. D. 1976. Pitfall Trapping in Ecological Studies of Wandering Spiders. The Journal of Arachnology. 3:101-111.

UETZ, G. W.; HALAJ J.; CADY A. B. 1999. Guild structure of spiders in major crops. The Journal of Arachnology 27:270-280.

UNIYAL, V. P. 2004. Spiders as conservation monitoring tools. Building Pests and Mycology Laboratory, CBRI, Rookee, 102-108

VÉLEZ, E.; CHOMENKO, L.; SCHAFFER, W.; MADEIRA, M. 2009. Um panorama sobre as iniciativas de conservação dos Campos Sulinos, p.356-379. In: PILLAR, V.P., MÜLLER S. C.; CASTILHOS Z. M. S.; JACQUES A. V. A. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA. 403p.

WISE, D. H. 1993. Spiders in ecological webs. The Journal of Arachnology. 23:48-50.

WISE, D. H. 2006. Cannibalism, food limitation, intraspecific competition, and the regulation of spider populations. Annual Review of Entomology, 51:441–65. doi: 10.1146/annurev.ento.51.110104.150947.

WORK, T. T.; BUDDLE, C. M.; KORINUS, L. M.; SPENCE, J. R. 2002. Pitfall trap size and capture of three taxa of litter-dwelling arthropods: implications for biodiversity studies. Entomological Societyof America, 31(3):438-448. doi:0046-225X/02/0438Ð0448$02.00/0.

WOODCOCK, B. A.; PYWELL R. F.; ROY, D. B.; ROSE R. J.; BELL, D. 2005. Grazing management of calcareous grasslands and its implications for the conservation of beetle communities. Biological Conservation 125:193–202.

WORLD SPIDER CATALOG. 2016. World Spider Catalog. Natural History Museum Bern. Available at: >http://www.wsc.nmbe.ch/<, version 17.5 Accessed on: 10.11.2016.

ZANETTI, N. I. 2016. Records of epigeal spiders in Bahía Blanca in the temperate region of Argentina. Acta Zoológica Mexicana, 32(1):32-44.

SUPPLEMENTAL MATERIAL

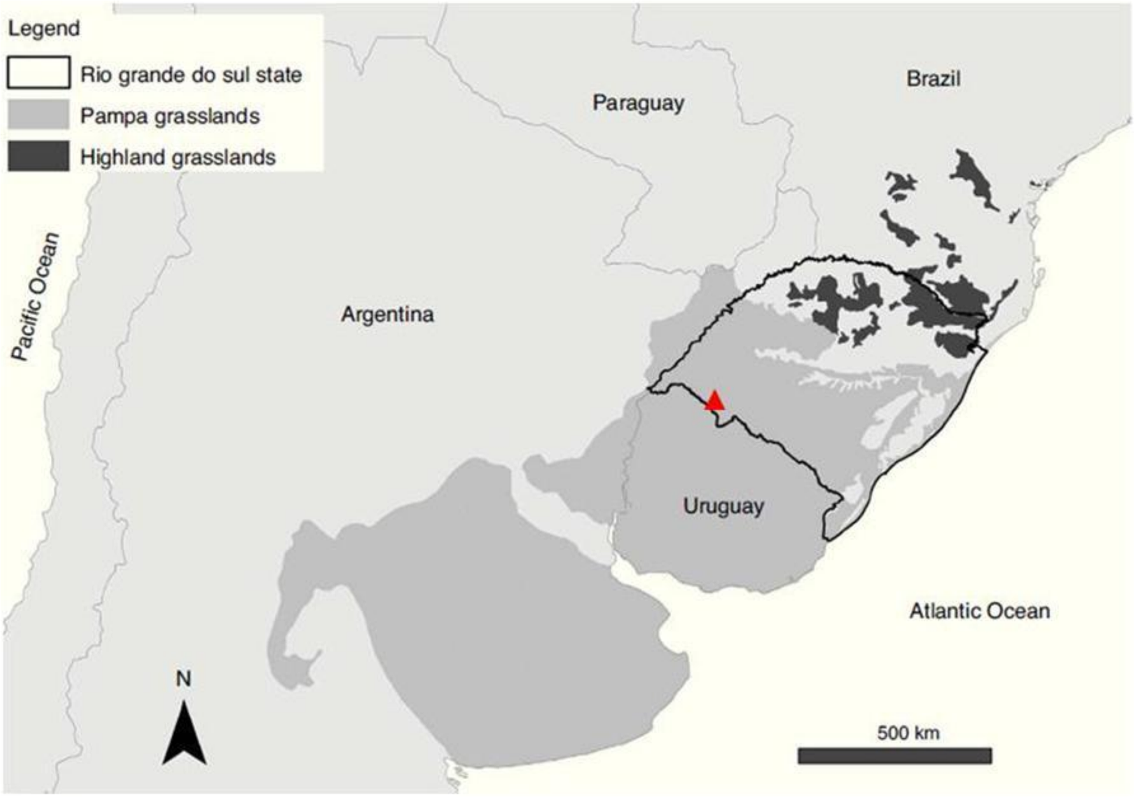

Figura 5 – Pampa Biome at Neotropical region. Red triangle indicates APA do Ibirapuitã's localization. Map adpted from Andrade et al. (2015).

Figura 6 – Pitfall traps used to collect ground spiders at APA do Ibirapuitã used in November of 2011, 2012 and 2013. A – Trap filled with formal 2%. B – Trap after one week of exposal with invertebrates captured.

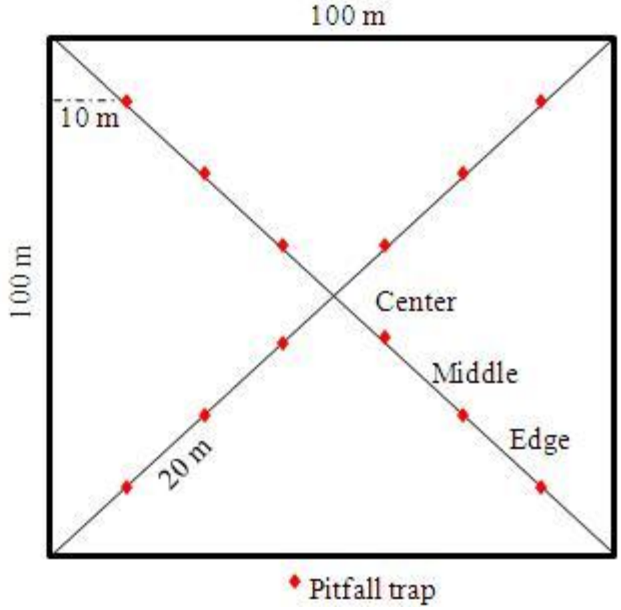

Figura 7 – Format used for exposal of pitfall traps in APA do Ibirapuitã during the campaign of 2011, 2012 and 2013. Red diamonds indicates the places of the traps. Traps were placed around 20 m from each other. Traps were least 10 m from the fence or border of each plot.

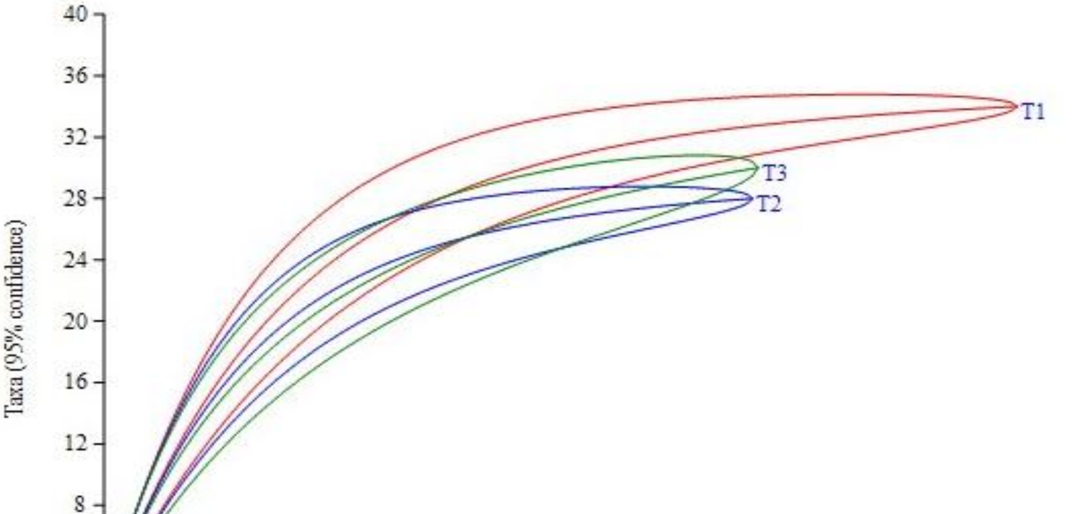

Figura 8 – Richness based rarefaction curves for spiders in ungrazed plots trough 2011, 2012 and 2013. Adjacent lines indicates 95% confidence intervals.

Tabela 1 – Total numbers of ground dweling spider individuals of families, species and morphospecies collected at APA do Ibirapuitã in November of 2011, 2012 and 2013. Juvenils identified only at family level and totals, indicated as: adult/juvenils.

	Grazed			**Ungrazed**			**Total**
Taxa	**Nov-2011**	**Nov-2012**	**Nov-2013**	**Nov-2011**	**Nov-2012**	**Nov-2013**	
Amphinectidae	3	8	0	1	2	2	**16/16**
Metaltella simoni Keyserling, 1878	3	4	1	1	2	5	**16**
Anyphaenidae	0	0	0	0	0	0	**2/0**
Arachosia sp.	0	0	0	0	1	1	**2**
Araneidae	0	0	3	1	4	7	**2/15**
Argiope argentata (Fabricius, 1775)	0	0	0	0	0	2	**2**
Caponiidae	1	0	0	0	0	0	**1/1**
Caponina notabilis (Mello-Leitão, 1939)	1	0	0	0	0	0	**1**
Corinnidae	3	1	0	1	8	1	**17/14**
Castianeira chrysura Mello-Leitão, 1943	0	1	0	0	1	0	**2**
Castianeira gaucha Mello-Leitão, 1943	0	1	0	0	0	0	**1**
Castianeira sp. 1	1	0	0	0	0	0	**1**
Castianeira sp. 2	2	1	0	2	6	0	**11**
Mazax sp.	0	0	0	0	2	0	**2**
Ctenidae	2	0	1	1	3	0	**1/7**
Parabatinga brevipes (Keyserling, 1891)	0	0	0	0	0	1	**1**
Gnaphosidae	0	2	0	2	4	2	**1/10**
Apopyllus sp.	0	0	0	0	2	0	**2**
Camillina galianoae Platnick & Murphy, 1987	1	0	0	0	1	3	**5**
Camillina pulchra (Keyserling, 1891)	0	3	0	0	1	0	**4**
Camillina sp.	1	1	0	1	0	0	**3**
Eilica obscura (Keyserling, 1891)	0	0	1	0	0	0	**1**
Eilica aff. *trilineata*	0	0	0	1	1	0	**2**
Eilica trilineata (Mello-Leitão, 1941)	0	1	0	0	0	0	**1**
Gen? sp.	1	1	0	0	1	0	**3**
Neodrassex ibirapuita Ott, 2013	0	0	0	0	0	1	**1**
Hahniidae	4	2	2	5	2	2	**342/17**
Intihuatana sp.	0	1	0	0	0	0	**1**
Neohania sp. 1	37	8	51	45	25	20	**186**
Neohania sp. 2	32	14	17	27	49	16	**155**
Linyphiidae	7	2	4	6	8	5	**111/32**
Agyneta sp. 1	0	0	0	0	1	2	**3**
Agyneta sp. 2	5	0	5	6	8	11	**35**
Erigone sp .1	9	2	9	1	1	3	**25**
Laminacauda sp. 1	0	0	1	0	0	0	**1**
Moyosi sp. 1	3	1	1	1	0	3	**9**
Neomaso sp. 2	2	1	2	1	1	4	**11**
Neomaso sp. 3	0	0	1	1	0	1	**3**

Pseudotyphistes sp. 2	0	0	1	0	0	0	**1**
Psilocymbium lineatum (Millidge, 1991)	1	0	0	0	0	0	**1**
Sphecozone sp. 2	1	0	0	1	0	0	**2**
Tutaibo aff. *phoeniceus*	1	1	0	1	1	0	**4**
Tutaibo sp. 1	3	0	0	3	4	3	**13**
Tutaibo sp. 2	2	0	0	0	0	0	**2**
Tutaibo sp. 3	0	0	1	0	0	0	**1**
Lycosidae	88	94	67	9	40	27	**108/325**
Agalenocosa sp.	0	0	0	0	0	1	**1**
Allocosa sp.	0	0	0	0	0	1	**1**
Birabenia sp. 1	0	2	1	0	4	14	**21**
Birabenia vittata (Mello-Leitão, 1945)	0	0	0	0	1	1	**2**
Gen? sp. 1	0	1	0	0	0	0	**1**
Gen? sp. 3	1	1	3	1	1	4	**11**
Hogna bivittata (Mello-Leitão, 1939)	3	3	0	2	0	1	**9**
Lobizon humilis (Mello-Leitão, 1944)	0	0	0	0	1	4	**5**
Lycosa erythrognatha Lucas, 1836	2	0	3	0	2	0	**7**
Lycosa thorelli (Keyserling, 1877)	0	2	9	0	3	1	**15**
Navira naguan Piancentini & Grismado, 2009	0	1	1	0	0	1	**3**
Schizocosa malitiosa (Tullgren, 1905)	2	15	3	3	7	0	**30**
Trochosa sp.	0	0	0	0	1	1	**2**
Microstigmatidae	0	0	1	0	0	0	**0/1**
Miturgidae	2	2	0	1	4	2	**9/11**
Teminius insularis (Lucas, 1857)	1	1	4	1	0	2	**9**
Nemesiidae	**0**	**0**	**0**	**0**	**0**	**0**	**6/0**
Pycnothele sp.	0	4	0	0	2	0	**6**
Oonopidae	0	0	0	0	2	0	**6/2**
Neotrops aff. *tucumanus*	2	2	0	0	1	1	**6**
Oxyopidae	0	0	2	0	0	0	**1/2**
Oxyopes salticus Hentz, 1845	1	0	0	0	0	0	**1**
Philodromidae	0	0	0	0	1	0	**0/1**
Pholcidae	0	0	0	1	0	0	**0/1**
Phrurolithidae	0	0	0	0	0	11	**12/11**
Orthobula sp.	0	2	1	2	1	6	**12**
Salticidae	1	0	0	0	6	20	**26/27**
aff. *Phiale* sp.	0	0	0	0	0	1	**1**
Gen? sp. 1	0	0	0	0	0	1	**1**
Gen? sp. 3	0	0	0	0	1	0	**1**
Gen? sp. 4	0	0	0	1	0	0	**1**
Gen? sp. 8	0	0	0	1	0	0	**1**
Neonella minuta Galiano, 1965	1	1	1	0	0	1	**4**
Neonella montana Galiano, 1988	0	0	1	0	1	0	**2**
Semiopyla cataphracta Simon, 1901	2	0	0	1	1	11	**15**
Sparassidae	0	1	0	0	0	0	**0/1**
Tengelidae	0	6	0	0	0	0	**0/6**

Tetragnathidae	0	0	0	0	0	2	**7/2**
Glenognatha lacteovittata (Mello-Leitão, 1944)	0	0	0	0	0	7	**7**
Theraphosidae	2	0	0	0	0	0	**1/2**
Gen? sp. 1	0	0	0	1	0	0	**1**
Theridiidae	2	2	2	1	6	5	**76/18**
Episinus sp. 1	0	1	0	0	0	0	**1**
Euryopis camis Levi, 1963	0	1	1	1	1	0	**4**
Euryopis sp. 3	0	0	0	0	1	0	**1**
Euryopis sp. 4	3	1	4	0	1	0	**9**
Euryopis spinifera (Mello-Leitão, 1944)	1	3	4	0	1	0	**9**
Guaraniella mahnerti Baert, 1984	9	7	6	5	12	6	**45**
Styposis selis Levi 1964	0	0	0	0	1	4	**5**
Thymoites Piratini Rodrigues & Brescovit, 2015	0	0	0	1	1	0	**2**
Thomisidae	1	3	1	0	1	3	**7/9**
Gen? sp. 1	0	0	0	1	0	0	**1**
Gen? sp. 2	0	1	0	0	1	0	**2**
Gen? sp. 3	0	0	3	0	0	1	**4**
Trachelidae	**0**	**0**	**0**	**0**	**0**	**0**	**2/0**
Gen? sp. 1	0	0	0	0	0	1	**1**
Meriola sp.	0	0	0	0	0	1	**1**
Not identified juveniles	1	1	1	4	0	2	**9**
Total	**134**	**90**	**136**	**113**	**154**	**148**	**775**

ARTIGO II

Grazing affects ground spider (Arachnida: Araneae) biomass and body size at Pampa biome?

GRAZING AFFECTS GROUND SPIDERS (ARACHNIDA: ARANEAE) BIOMASS AND BODY SIZE AT PAMPA BIOME?

Guilherme O. da Silva[1,2]*and Ricardo Ott[1]

[1]Fundação Zoobotânica do Rio Grande do Sul – FZB-RS. Rua: Dr Salvador França, CEP 90690-000, Porto Alegre, RS, Brazil.

[2]Universidade Federal do Rio Grande do Sul – UFRGS. Avenida Bento Gonçalves, 9500, CEP 91509-900, Porto Alegre, RS, Brazil.

ABSTRACT. Biomass is a fundamental ecological concept, being an important parameter for community size. Measure invertebrate's biomass, takes too much time and can destroy the material, thus, ends up not being widely used. This dilemma was solved with a variety of methodologies that use Mass-Length regression to estimate biomass. Most studies at the Pampa biome are correlated to the impact of cattle graze in ground and aerial plant biomass. However, researches with invertebrates, more precisely, spiders, impacted by the same factor, are very scarce. In this ways, this experiment was realized at APA do Ibirapuitã, southern Brazil. Six plots of one hectare were utilized for the experiment; Three ungrazed plots and three grazed plots. Spiders were sampled with Pitfall traps in November 2011, 2012 and 2013; and seasonally in May 2015 to February 2016. Adult spiders were identified in the lowest possible taxonomic level and measured in total body length to calculate individual biomass. Most abundant males were measured in total carapace length, for specie relative size between areas. In most species, the raw data of means of biomass were higher in grazed plots than ungrazed plots, being only significant different between them seasonally, with higher value in grazed plots. Carapace length didn´t was significant different between grazed and ungrazed plots. Spiders are bigger and heavier in grazed plots probably caused for higher abundance of preys where cattle graze. In counterpart, the shortening or partition of niches in closed plots could be causing a decrease in individual biomass.

KEYWORDS: Neotropical; Diversity; Mass-length relationship; Arachnida.

RESUMO. Biomassa é um conceito ecologico fundamental, importante na mensuração do tamanho de comunidades. Medir a biomassa de invertebrados, geralmente, consome muito tempo e destroi o material, sendo pouco utilizada. O uso de metodologias como regressões massa-comprimento surge para solucionar este dilema. Muitos estudos no Pampa correlacionam a biomassa de plantas com o impacto gerado pela herbivoria e pisoteio do gado. Contudo, o envolvimento do gado e seu impacto sobre invertebrados, mais precisamente aranhas, é escarço. Neste sentido, este experimento foi realizado na APA do Ibirapuitã, sul do Brasil. Seis parcelas, de um hectare cada, foram utilizadas para o experimento; três hectares sem pastejo e três hectares com pastejo. Aranhas foram amostradas com o uso de "*Pitfall traps*" em novembro de 2011, 2012 e 2013; e sazonalmente em maio de 2015 a fevereiro de 2016. Aranhas adultas foram identificadas no mais baixo nível taxonômico possível e seu comprimento total foi medido para calculo da biomassa individual. Machos mais abundantes tiveram sua carapaça medida em comprimento total para calcular o tamanho relativo da espécie. Os dados brutos demonstraram maiores médias de biomassa em áreas pastejadas que nas sem pastejo, sendo apenas significativamente diferentes apenas sazonalmente, sendo maiores em áreas com pastejol. Comprimento das carapaças não foi significativamente diferente entre áreas com e sem pastejo. Provavelmente, aranhas tem mais biomassa em áreas com pastejo devido à maior abundancia de prezas. Em contrapartida, o encurtamento ou partição de nichos em áreas sem pastejo pode estar causando a redução da biomassa individual.

PALAVRAS-CHAVE: Neotropical; Diversidade; Relação Comprimento-Massa; Arachnida

---

Biomass, the mass of living beings per area (Bornebusch 1930; Edwards 1966), is a fundamental ecological concept, based and applied in different organisms (Schaller 1983; Hooper 1996; Kirchman 2001; Borer et al. 2012). It is an important parameter for population size, growth rate, quantity of energy and recycle of nutrients in a system (Ganihar 1997). However, measuring invertebrate's biomass consumes too much time, due the need to dry the specimens, what usually destroys the material and could be, frequently, inaccurate (Pekár 2002; Work et al. 2002; Motobayashi et al. 2006; Indicatti et al. 2008). Therefore, biomass is rarely used in ecological works. This impasse caused the advent of a variety of methodologies for measuring invertebrate's biomass, such as mass-length regressions (Ganihar 1997; Brady & Noske 2006; Höfer&Ott 2009; Wardhaugh 2013).

For Pampa biome, a few studies were realized involving biomass. Usually, plants are used as models and biomass is measured in two ways: ground biomass, using manly grasses and roots; and aerial biomass, using shrubs and other woody plants (Pinto et al. 2008; Fidelis et al. 2009). In this way, there is a lack of knowledge in terms of invertebrates' biomass at Pampa. The Pampa is known to suffer with disturbance like grazing, fire and farming for the past 300 years (Suertegaray & Silva 2009; Rodrigues et al. 2010; Ferrando et al. 2016), affecting directly the ground and removing biomass (Evans et al. 2015). Moreover, these activities would not permit the growing of shrubs, lowering the diversity and the vegetal structure (Overbeck et al. 2009; Kilnk et al. 2015), and in addition, the accumulation of dry biomass in the ground becomes highly flammable (Gonçalves et al. 1997; Pillar & Quadros 1997; Behling et al. 2009). The exclusion of all disturbances could lead to an increase of diversity and richness of different species (Benck 2009; Fidelis et al. 2009), what would effects invertebrates, herbivore and predators, like spiders (Podgaiski et al. 2014).

Spiders (Araneae) are the second richest group in Arachnida counting with more than 45,000 described species (Miller et al. 2010; Brescovit et al. 2011; World Spider Catalog 2016). Spiders have distinct predatory behaviors, commonly generalists and varying from web-builders or predatory wanders, being strongly correlated to the vegetal structure (Turnbull 1973; Baldissera, 2004; Souza, 2007; Foelix, 2011; Pfister et al. 2015; Nogueira & Pinto-da-Rocha 2016). An assembly of spiders can pray in different kinds of invertebrates, even other spiders, in distinct trophic levels, being able to eat an equivalent of 200 kg per hectare year (Nyfeller 2000; Souza 2007; Ott 2016). A complex heterogeneity of vegetal formation, not being affected by graze, with grasses, bushes, shrubs and trees, could lead a higher diversity and biomass of spiders (Souza 2007; Rodrigues et al. 2010; Andrade et al. 2015). In this way, considering its biology, spiders' biomass could be an excellent aspect to measure the impact of cattle graze at Pampa.

The objective of this work is investigate the difference occurred in ground spiders biomass in areas where the cattle grazing was excluded compared with areas where the cattle has free access for grazing. The hypothesis is that the absence of grazing impact will not just differ but will raise the ground spider biomass.

METHODS

Study Site – The Pampa is a southern Neotropical biome that covers 750,000 km^2, covering parts of Brazil, Argentina and Uruguay (Fig. 9). To test how the cattle grazing affects ground spider biomass, experiments were carried out in three farms, at southern part of Ibirapuitã River Environmental Federal Protection Area (Área de

Proteção Ambiental – APA do Ibirapuitã). Estância do Açude (30°28’50.57”S; 055°33’10.21” W), Fazenda Rincão dos Moraes (30°28’899” S; 055º34’263” W) and Fazenda Bela Vista (30°25’54.78” S; 055°38’39.75” W), were utilized for sampling.

Two plots of one hectare, far 200 m for each other, were selected in each farm. One plot was closed with fences in August of 2012 excluding all the cattle grazing as a ungrazed plots (total of three hectares); the other plot was used as a grazed plot, with only poles in the corners to delimit the hectare, with free access for cattle grazing (total of three hectares). Nowadays, the size and height of plants differ in each plot, grazed and ungrazed. In graed plots most part of vegetation is constituted by grasses and bushes not transposing 15 cm of height. In ungrazed plots the vegetation is constituted by grasses and bushes not transposing 50 cm of height and shrubs reaching up to 1.7 m of height (Fig. 10).

Data Collection – The campaigns were realized in springs (November) of 2011, 2012 and 2013; and seasonally in autumn (May), winter (September), spring (November) of 2015 and summer (February) 2016.

Two different methodologies were applied using pitfall traps, in both, traps were exposed during one week. The traps were filled around 1/3 with a mix of formol 2% concentration and some drops of liquid soap to break superficial tension. Each trap was an independent unity of sampling (adapted from Uetz & Uzicker 1976). In 2011 (ungrazed plots were not closed yet), 2012 and 2013 were used 12 traps disposed corner to corner in an “X” format inside each plot, 24 per farm, 36 in grazed plots and 36 in ungrazed plots, summing 72 in total (G. O. Silva & R. Ott unpublished data). In 2015 and 2016 the traps are disposed in a “Y” format in opposite corners, been installed eight pitfall traps in each plot, 16 per farm, 24 in grazed plots and 24 in ungrazed plots, summing 48 in total (G. O. Silva & R. Ott unpublished data).

Data Analysis – Spiders were individually examined and only adults were identified in the lowest possible taxonomic level, due the difficulty to identify juvenile. Spiders were measured using a stereo microscope with a 10x ocular with a scale attached. The zoom level varied according and adjusting to the size of the individual. All measures were made in dorsal view and in a millimeter scale. All spiders are deposited at the aracnological collection of Museu de Ciências Naturais do Rio Grande do Sul (MCN) preserved in 80% ethanol.

All adults, males and females, were measured in total body length, from clypeus (excluding chelicerae), to the end of the abdomen (excluding the spinnerets) (Fig. 11). Most abundant species were defined as those making up ≥2 % of the total of individuals (adapted from Spiller & Schorner 1998; Petcharad et al. 2016). Only males, due it´s higher activity, were measured in total carapace length, from clypeus (excluding chelicerae) to the end of the carapace (excluding pedicel) (Fig. 12). These males choose for carapace length measures are defined as the most abundant, summing together, more than 50% of all adults.

Estimated spider biomass were obtained by Mass-Length regression, utilizing Fresh Mass coefficients (Höfer & Ott 2009). Power model was performed for ≥8 mm spiders total body length. Linear model was performed for <8 mm spiders total body length. Amazonia regression coefficients were used separately for Ctenidae and Lycosidae (Ctenidade coefficient), Gnaphosidae and Miturgidae (Hunting spiders coefficient), Araneidae, Hahniidae, Linyphiidae, Tetragnathidae and Theridiidae (Web-builder coefficient) and Oonopidae (Oonopidae coefficient); Mata Atlântica regression coefficient was used for all other spiders biomass estimative.

Student´s Tests were performed to test significant difference on spiders biomass comparing grazed and ungrazed plots in 2011, 2012, 2013, 2015 and 2016; significant difference on spiders biomass comparing springs, November 2011, 2012, 2013 and 2015; and significant difference on spiders biomass seasonally in autumn (may) 2015 to summer (february) 2016. Analysis of Variance (ANOVA) was performed to test significant difference on spider biomass between ungrazed plots, combining all the same periods above. Each comparison was performed with means of mass in grams. Means were estipulated with the sum of all masses of each species divided by their abundance. All spiders, most abundant males and their carapace length were used as models in every analysis. Year 2011, on occasion, was removed from the analysis, due to ungrazed plots were not closed yet. The most abundant species were only used in seasonal statistical analysis due to the differential number of traps in previous experiments. Data were analyzed using Past 3.5 (Hammer et al 2001).

RESULTS

A total of 1.921 adult spiders (1.424 males and 496 females) were measured in total body length. A total of 968 males of the most abundant species were measured in carapace total length. Adults measured only in springs were 1085 (808 males and 277 females), with 573 most abundant males. Adults measured seasonally in 2015 and 2016 were 1162 (861 males and 301 females), with 558 most abundant males.

The most abundant species were *Agyneta* sp. 1 (167 individuals: 125 in grazed plots, 42 in ungrazed plots), *Neohania* sp. 1 (154: 134, 20), *Erigone* sp. 1 (94: 90, 4), *Neohania* sp. 2 (74: 57, 17), *Agyneta* sp. 2 (64: 42, 22), *Guaraniella mahnerti* Baert (47: 23, 24), *Tutaibo* sp. 1 (42: 29, 13) and *Glenognatha lacteovittata* (Mello-Leitão) (41: 3, 38). These species represent 35.5 % of all spiders. The most abundant males were *Neohania* sp. 1 (124 individuals: 111 in grazed plots, 13 in ungrazed plots), *Agyneta* sp. 1 (120: 90, 30), *Erigone* sp. 1 (73: 71, 2), *Neohania* sp. 2 (59: 48, 11), *Agyneta* sp. 2

(55: 34, 21), *G. lacteovittata* (39: 3, 36), *Tutaibo* sp. 1 (37: 24, 13), *G. mahnerti* (35: 18, 17) and *Schizocosa malitiosa* (Tullgren) (16: 15, 1).

In most part of species, the means of biomass were higher in grazed plots than ungrazed plots (Table 2). However, Student´s Tests revealed no significant difference in biomass between grazed and ungrazed plots in general (2011, 2012, 2013, 2015 and 2016) when all spiders (p = 0.50551) and most abundant males (p = 0.95795) were used as models, even removing 2011 of the equation (all spiders p = 0.61685; most abundant males p = 0.9186). Spring grazed and ungrazed plots (2011, 2012, 2013 and 2015) weren´t significant different too, using the same models, all spiders (p = 0.49196) and most abundant males (p = 0.95747), even removing 2011 (all spiders p = 0.6447; most abundant males p = 0.91096). Student´s Tests revealed significant difference between grazed and ungrazed plots seasonally (2015 and 2016), with higher values in grazed plots, when all spiders (p = 0.013882) were tested, most abundant males (p = 0.87517) still revealed no significant difference though.

Also, Student´s Tests revealed significant difference between grazed and ungrazed plots in biomass seasonally, with higher values in grazed plots, when *Agyneta* sp. 1 (p = 0.010105), *Neohania* sp. 1 (p = 3.4204E-06), *Erigone* sp. 1 (p = 5.751E-11), *Tutaibo* sp. 1 (p = 0.003871) and *G. lacteovittata*(p = 3.7013E-07) were used as models. The abundance of *Neohania* sp. 2 (p = 0.49716), *Agyneta* sp. 2 (p = 0.092833), *G. mahnerti* (p = 0.85141) were not significantly different.

Analysis of Variance (ANOVA) reveled significant difference in biomass between ungrazed plots in general (2011, 2012, 2013, 2015 and 2016) when all spiders (p = 0.01643) and all spider without 2011 (p =0.01861) was used as models. Most abundant males wasn’t significant different with (p = 0.7961) and without (p = 0.8152) 2011. Spring ungrazed plots (2011, 2012, 2013 and 2015) weren´t significant different using the same models, all spiders (p = 0.3705) and most abundant males (p = 0.5889), even without 2011 (all spiders p = 0.3917; most abundant males p = 0.5897).

ANOVA reveled significant difference between ungrazed plots when all spiders (p = 0.0151) was models, being most abundant males no significant different (p = 0.7257). Moreover, *G. lacteovittata* (p = 0,01751) was the only species that ANOVA demonstrate significant difference between ungrazed plots. ANOVA wasn't significant different between ungrazed plots when tested with all most abundant species (p = 0,9016) and separately with, *Agyneta* sp. 1 (p =0,3324), *Neohania* sp. 1 (p = 0,3297), *Neohania* sp. 2 (p = 0,2378), *G. mahnerti* (p = 0,07926), *Tutaibo* sp. 1 (p = 0,4965). *Agyneta* sp. 2, *Erigone* sp. 1 couldn't be test due the absence of individuals captured in autumn (May) 2015.

The carapace length of most abundant males in grazed and ungrazed plots, were quite close to each other, with very lows standard deviations (Table 3, 4). Thus, Student's test based in the means of carapace lengths revealed no significant difference between grazed and ungrazed plots in any analysis, in general with all sampled material (p = 0.9962) and all material without 2011 (p = 0.9750), in only sampled springs, with (p = 0.9369) and without 2011 (p = 0.9609) and seasonally in 2015/2016 (p = 0.9867). ANOVA revealed no significant difference between ungrazed plots, in any analysis, in general with all sampled material (p = 0.8166) and all material without 2011 (p = 0.7905), in only sampled springs, with (p = 0.5575) and without 2011 (p = 0.4426) and seasonally in 2015/2016 (p = 0.6817).

DISCUSSION

Our data infers that in cattle grazed plots the abundance and biomass of spider is higher than where cattle do not graze. It suggests that, for spiders, the offer of preys in grazed areas probably is higher than in ungrazed ones being able to get bigger and heavier even intensively grazing destroying spider assemblage (Delchev & Kajak 1974; Bell et al. 2001). Spiders are a generalist predator group (Turnbull 1973; Nentwig 1986), however, ground dwelling ground spiders are more related to preying Collembola than other invertebrates (Alderweireldt 1994; Bell et al. 2001; Sanders & Platner 2007). For Collembola, the quality of food rather than quantity and number of functional groups of plants influence more their abundance (Salamon et al. 2004 It is possible that in ungrazed plots certain plants were reduced in numbers or climatic conditions were more homogeneous, what would lead to lower abundance of Collembola (Querner & Bruckner 2010; Winck et al. 2016). Consequently, factors like these could affect abundance and biomass of spiders, lowering it at the ungrazed plots. On the other hand, even if no data of Collembolas was presented in our results, some studies shows that Collembola abundance can also increase after partially removing sheep grazing (Bardgett et al. 1993).

The contrasts between grazed and ungrazed plots biomass could occur due a possible shortening or partition of niches (Rodrigues et al. 2009), more competition with other spiders (even cannibalism) and also other invertebrates, like ants (Sanders & Platner 2007) or a differentiation in types of potential preys inside the ungrazed areas. Spiders diversity are more related to vegetal structure than prey availability, been food not a necessarily limiting factor (Greenstone 1984; Wise 1993). However, the vegetal structure could be affecting other invertebrates (eg. removing nectar sources) and indirectly affecting spiders growth rate and capture success (Vollrath 1988), since grazers remove vegetal structures complexity and biomass (Evans et al. 2015).

Although these factors could answer differences in biomass, only a few species are really responding to ungrazed plots. Only total biomass is changing and not relatively size of the specie, given by carapace mass of the most abundant males. According to size-grain hypothesis (Kaspari & Weiser 1999) a smaller body could help in locomotion in a place where grass is higher and denser, what could lead to smaller total body length in ungrazed areas (Farji-Brener et al. 2004; Müller et al. 2014). In the meantime, this differential in total length could be not influencing the relatively size of the specie, being the size of carapace no different in grazed and ungrazed plots. Moreover, web-builders spiders could respond better to ungrazed plots, due its need for tridimensional structures to build a web (Horváth et al. 2009; Nogueira & Pinto-da-Rocha 2016). Unfortunately, our data cannot answer this question.

Unfortunately, the absence of studies about biomass productivity at Pampa probably underestimated the real ground and aerial biomass, involving animals and plants (Fidelis et al. 2009). Furthermore, the correlation with other invertebrates and plants, would allow a more certainly answer of what is really happing, granting more consistent results (Bell et al. 2001). Ground invertebrate fauna is poorly know according to some specialists in Brazilian biodiversity (Brandão et al. 2006; Bencke 2009), being this study with spider only a little piece of information.

ACKNOWLEDGEMENT

We thank the Federal University of Rio Grande do Sul for providing us with fieldwork infrastructure. Guilherme Oyarzabal da Silva Masters Scholarship from CAPES, Brazil (process 1478689).

LITERATURE CITED

Alderweireldt, M. & De Keer, R. 1990. Field and laboratory observations on the life cycle of *Pachygnatha degeeri* Sundervall, 1830 and *Pachygnatha clercki* Sundervall, 1823. Acta Zoologica Fennica, 190:35-39.

Andrade, B.O., C. Kock, I.I. Boldrini, E. Vélez-Martin, H. Hasenack, J.M. Hermann et al. 2015. Grassland degradation and restoration: a conceptual framework of stages and thresholds illustrated by southern Brazilian grasslands. Natureza & Conservação, 0:10. doi: 10.1016/j.ncon.2015.08.002

Baldissera, R.,G. Ganade, S.B. Fontoura. 2004. Web spider community response along an edge between pasture and Araucaria forest. Biological Conservation, 118:403–409.

Bardgett, R.D.,J.B. Whittaker, J.C. Frankland. 1993. The diet and food preferences of *Onychiurus procampatus* (Collembola) from upland grassland soils. Biology and Fertility of Soils, 16(4):296-298.

Brady, C.J., R.A. Noske. 2006. Generalised regression provide good estimates of insect and spider biomass in the monsoonal tropics of Australia. Australian Journal of Entomology 45:187-191.

Bell, J.R.,C.P. Whether, W.R. Cullens. 2001 The implications of grassland and heath land management for the conservation of spider communities: a review. Journal of Zoology 255:377-387.

Beheling, H., V. Jeske-Pieruschka, L. Schüler, V.P.Pillar. 2009. Dinâmica dos campos no sul do Brasil durante o Quaternário Tardio, Pp. 13-25. *In*: Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Bencke, G.A. 2009. Diversidade e conservação da fauna dos Campos do Sul do Brasil; Pp. 101-121. *In*: Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Brandão, C.R., E,M. Cancello, C.I. Yamamoto. 2000. Invertebrados terrestres. *In:* Lewinsohn, TM. Avaliação do estado do conhecimento da diversidade biológica do Brasil. MMA, Brasília. Série Biodiversidade.

Brescovit, A.D., U. Oliveira, A.J. Santos. 2011. Spiders (Araneae, Arachnida) from São Paulo State, Brazil: diversity, sampling efforts, and state-of-art. Biota Neotropica. 11(1a):718-747.

Borer, E.T., E.W. Seabloom, D. Tilman. 2012. Plant diversity controls arthropod biomass and temporal stability. Ecology Letters, 15:1457-1464.

Bornebusch, C.H. 1930. The Fauna of Forest Soil. Nielsen and Lydiche, Copenhagen.

Carter, P.E., A.L. Rypstra. 1995. Top-down effects in soybean agroecosystems: spider density affects herbivore damage. Oikos, 72:433-439.

Delchev, K., A. Kajak. 1974. Analysis of a sheep pasture ecosystem Pieniny Mountains (The Carpathians). XVI. Effect of pasture management on the number and biomass of spiders (Araneae) in two climatic regions (the Pieniny and the Sredna Gora Mountains). Polish Journal of Ecology, 22:693–710.

Edwards, C.A. 1966. Relationships between weights, volumes and numbers of soil animals. Colloquium on Dynamics of Soil Sommunities, 93:5–10.

Evans, D.M., N. Villar, N.A. Littlewood, R.J. Pakeman, S.A. Evans, P. Dennis et al. 2015.The cascading impacts of livestock grazing in upland ecosystems: a 10-year experiment. Ecosphere, 6(3):1-15.

Farji-Brener, A.G., G. Barrantes, A. Ruggiero. 2004. Environmental rugosity, body size and access to food: a test of the size-grain hypothesis in tropical litter ants. Oikos, 104:165-171

Ferrando, C.P., L.R. Podgaiski, M.K. Costa, M.D.S. Mendonça Jr. 2016. Taxonomic and Functional Resilience of Grasshoppers (Orthoptera, Caelifera) to Fire in South Brazilian Grasslands. Neotropical Entomology, 45(4):374-381. doi: 10.1007/s13744-016-0380-3.

Foelix, R.F. 2011.Biology of Spiders. 3. ed. Oxford: Oxford University Press.

Fidelis A., B. Appezzato-da-Glória, J. Pfadenhauer. 2009. A importância da biomassa e das estruturas subterrâneas nos Campos Sulinos, Pp. 88-100. *In*: Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Ganihar, S.R. 1997. Biomass estimates of terrestrial arthropods based on body length. Journal of Biosciences, 22:219-224.

Gonçalves, J.O.N., A.M. Girardi-Deiro, A.F. Mota. 1997. Limpeza de campo na Serra do Sudeste, RS.Efeito do corte e queima de plantas lenhosas, visando aumentar as áreas de pastoreio. EMBRAPA CPP-SUL, Bagé.

Hammer, Ø., D.A.T. Harper, P.D. Ryan. 2001. PAST: Paleontological Statistics package for education and data analysis. PaleontologiaEletronica 4(1):9.

Höfer, H., R. Ott. 2009. Estimating biomass of Neotropical spiders and other arachnids (Araneae, Opiliones, Pseudoscorpiones,Ricinulei) by mass-length regressions. The Journal of Arachnology 37:160–169.

Hooper, R.G. 1996. Arthropod biomass in winter and the age of longleaf pines. Forest Ecology and Management 82:115-131.

Horváth, R., T. Magura, C. Szineta, B. Tóthmérész. 2009. Spiders are not less diverse in small and isolated grasslands, but lessdiverse in overgrazed grasslands: A field study (East Hungary, Nyírség). Agriculture, Ecosystems and Environment, 130:16–22.

Indicatti, R.P., S.M. Lucas, R. Ott, A.D. Brescovit. 2008. Litter dwelling mygalomorph spiders (Araneae: Microstigmatidae, Nemesiidae) from Araucaria forests in southern Brazil, with the description of five new species. Revista Brasileira de Zoologia 25 (3):529-546.

Kaspari, M., M.D. Weiser. 1999. The size–grain hypothesis and interspecific scaling in ants. Functional Ecology, 13: 530–538.

Kirchman, D. 2001. Measuring bacterial biomass production and growth rates from Leucine Incorporation in natural aquatic environments. Methodos in Microbiology, 30:227-237.

Klink, R., F. van der Plas, C.G.E. van Noordwijk, M.F. WallisDeVries, H. Olffi. 2015. Effects of large herbivores on grassland arthropod diversity. Biological Reviews 90:347–366. doi: 10.1111/brv.12113

Miller, J.A., A. Carmichael, M.J. Ramírez, J.C. Spagna, C.R. Haddad, M. Rezaket al. 2010. Phylogeny of entelegyne spiders: affinities of the family Penestomidae (NEW RANK), generic phylogeny of Eresidae, and asymmetric rates of change in spinning organ evolution (Araneae,Araneoidea, Entelegynae). Molecular Phylogenetics and Evolution, 55:786-804.

Motobayashi, T., C. Ishijima, M. Takagi, M. Murakami, A. Taguchi, K. Hidake et al. 2006.Effects of tillage practices on spider assemblage in rice paddy fields. Applied Entomology and Zoology, 41(2):371-381.

Müller, J., S. Bae, J. Roder, A. Chao, R.K. Didham. 2014. Airborne LiDAR reveals context dependence in the effects of canopy architecture on arthropod diversity. Forest Ecology and Management, 312:129–137.

Nentwig, W. 1986. Non-webbuilding spiders: prey specialists or generalists? Oecologia, 69:571-576.

Nogueira, A.A. & Pinto-da-Rocha, R. 2016. The effects of habitat size and quality on the orb-weaving spider guild (Arachnida: Araneae) in an Atlantic Forest fragmented landscape. Journal of Arachnology, 44:36–45.

Nyfeller, M. 2000. Ecological impact of spiders predation: a critical assessment of Britowe's and Tunbull's estimates. Bulletin of the British Arachnological Society, 11:367-373.

Ott, R. 2016. Invertebrados terrestres – Aranhas; Pp. 46-47. In: Moura L.A., L. Chomenko, M.A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul.

Overbeck, G.E., S. C. Müller, A. Fidelis, J. Pfadenhauer, V.P. Pillar, C.C. Blanco et al. 2009. Os Campos Sulinos: um bioma negligenciado; pp. Pp. 26-41. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Pekár, S. 2002. Differential effects of formaldehyde concentration and detergent on the catching efficiency of surface active arthropods by pitfall traps. Pedobiologia, 46:539-547.

Petcharad, B., T. Miyashita, G.A. Gale, S. Sotthibandhu, S. Bumrungsri. 2016. Spatial patterns and environmental determinants of community composition of web-building spiders in understory across edges between rubber plantations and forests. Journal of Arachnology 44:182–193.

Pfister, S.C., R.B. Schäfer, J. Schirmel, M.H. Entling. 2015. Effects of hedgerows and riparian margins on aerial web-building spiders in cereal fields. Journal of Arachnology 43:400–405.

Pillar, V.D. & F.L.F. Quadros. 1997. Grassland-forest boundaries in southern Brazil. Coenoses, 12:119-126.

Pinto, C.E., J.A.S. Fontoura Jr., A. Frizzo, T.M.S. Freitas, C. Nabinger, P.C.F. Carvalho. 2008. Produções primária e secundária de uma pastagem natural da Depressão Central do RS submetida a diversas ofertas de fitomassa aérea total. Revista Brasileira de Zootecnia, 37:1737–1741.

Podgaiski, L.R., C.S. Goldas, C.P.R. Ferrando, F.S. Silveira, F. Joner, G.E. Overbeck, et al. 2014. Burningeffects on detritivory and litter decay in *Campos* grasslands. Austral Ecology, 39(6):686-695. doi: 10.1111/aec.12132.

Querner, P. & A. Bruckner. 2010. Combining pitfall traps and soil samples to collect Collembola for site scale biodiversity assessments. Applied Soil Ecology, 45:293-297. doi:http://dx.doi.org/10.1016/j.apsoil.2010.05.005.

Rodrigues, E.N.L., M.S. Mendonça Jr, R. Ott. 2009. Spider diversity in a rice agroecosystem and adjacent areas in southern Brazil. Revista Colombiana de Entomología, 35:78-86.

Rodrigues, E.N.L., M.S. Mendonça Jr., J.L.O. Rosado, A.E. Loeck. 2010. Soil spiders in differing environments: *Eucalyptus* plantations and grasslands in the Pampa biome, southern Brazil. Revista Colombiana de Entomología 36(2):277-284.

Roesch, L.F.W., F.C.B. Vieira, V.A. Pereira, A.L. Schünemann, I.F. Teixeira, A.J.T. Senna et al. 2009. The Brazilian Pampa: A Fragile Biome. Diversity, 1:182-198. doi: 10.3390/d1020182.

Salamon, J.A., M. Schaefer, J. Alphei, B. Schimid, S.Scheu. 2004. Effects of plant diversity on Collembola in an experimental grassland ecosystem. Oikos, 106:51-60.

Sanders, D. & Platner, C. 2007.Intraguild interactions between spiders and ants and top-down control in a grassland food web. Oecologia, 150:611-624.

Schaller, G.B. 1983. Mammals and their biomass on Brazilian ranch. Arquivos de Zoologia, 31(1):1-36.

Spiller, D.A. & T.W. Schoener. 1998. Lizard reduce spider species richness by excluding rare species. Ecology, 79:503-516.

Souza, A.L.T. 2007. Influência da estrutura do habitat na abundância e diversidade de aranhas, Pp. 25-44. *In* Gonzaga, M.O., A.J. Santos, H.F. Japyassú. Ecologia e comportamento de aranhas. Rio de Janeiro, Interciência Editora.

Suertegaray, D.M.A & L.A.P. Silva. 2009. Tchê Pampa: histórias da natureza gaúcha; Pp. 42-59. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Turnbull, A.L. 1973. Ecology of true spiders (Araneomorphae).Annual Review of Entomology, 18:305-348.

Uetz, G.W. & J.D. Unzicker. 1976. Pitfall trapping in ecological studies of wandering spiders. Journal of Arachnology. 3:101-111.

Vollrath, F. 1988. Spider growth as an indicator of habitat quality. British Arachnological Society, 7:217-219.

Wardhaugh, C.W. 2013.Estimation of biomass from body length and width for tropical rainforest canopy invertebrates. Australian Journal of Entomology, 52:291-298.

Winck, B.R., E.L.S. Sá, V.M. Rigotti, M. Chauvat. Relationship between land-use types and functional diversity of epigeic Collembola in Southern Brazil. Applied Soil Ecology, 109:49–59.

Work, T.T., C.M. Buddle, L.M. Korinus, J.R. Spence. 2002. Pitfall trap size and capture of three taxa of Litter-Dwelling arthropods: Implications for biodiversity studies. Community and Ecosystem Ecology, 31(3):438-448.

World Spider Catalog. 2016. World Spider Catalog. Version 17.5.Natural History Museum Bern. Online at: http://www.wsc.nmbe.ch/.

SUPPLEMENTAL MATERIAL

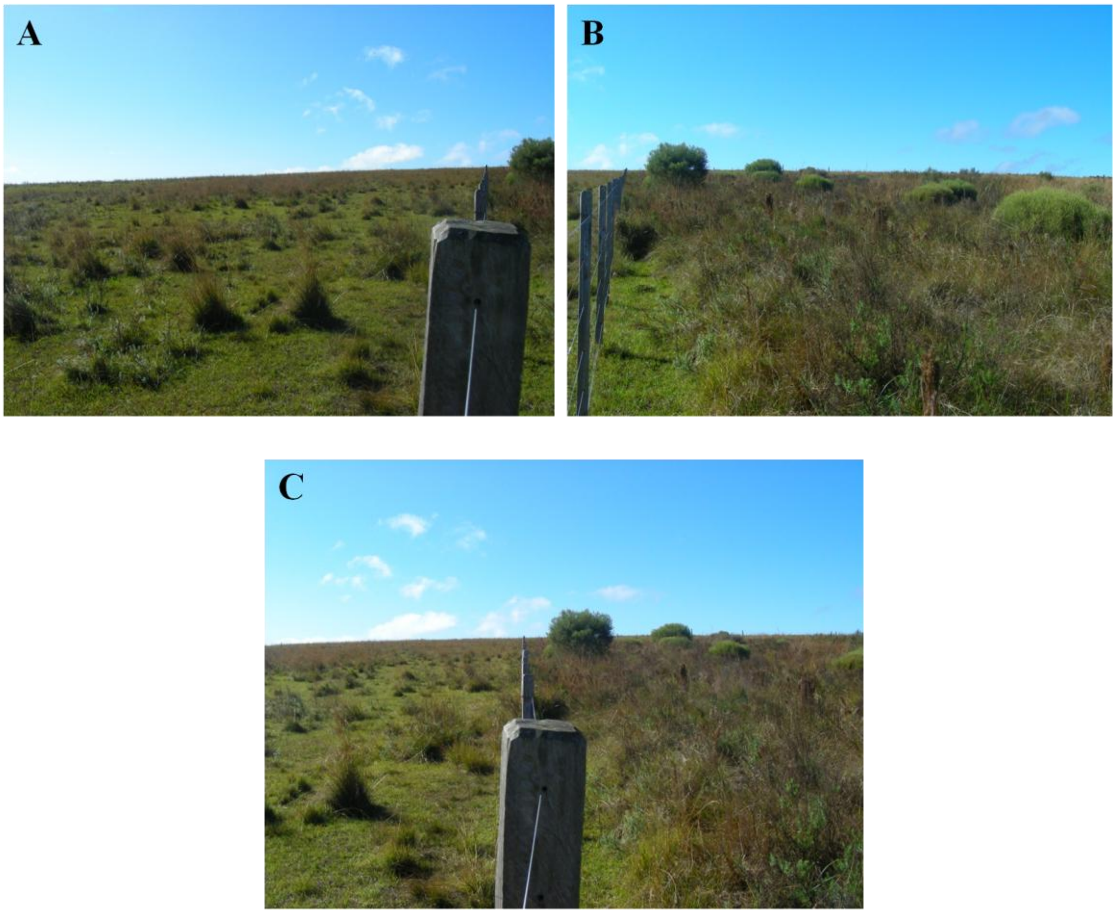

Figura 9 – Vegetation in grazed and ungrazed plots at APA do Ibirapuitã. Picture taken in May 2015. A – Grazed plots; B – Ungrazed plots; C – Comparison of graze and ungrazed plots.

Figura 10 – Hahniidae, *Neohania* sp.1, showing how was measured the total body length. From clypeus (excluding chelicerae) to the end of the abdomen (excluding the spinnerets).

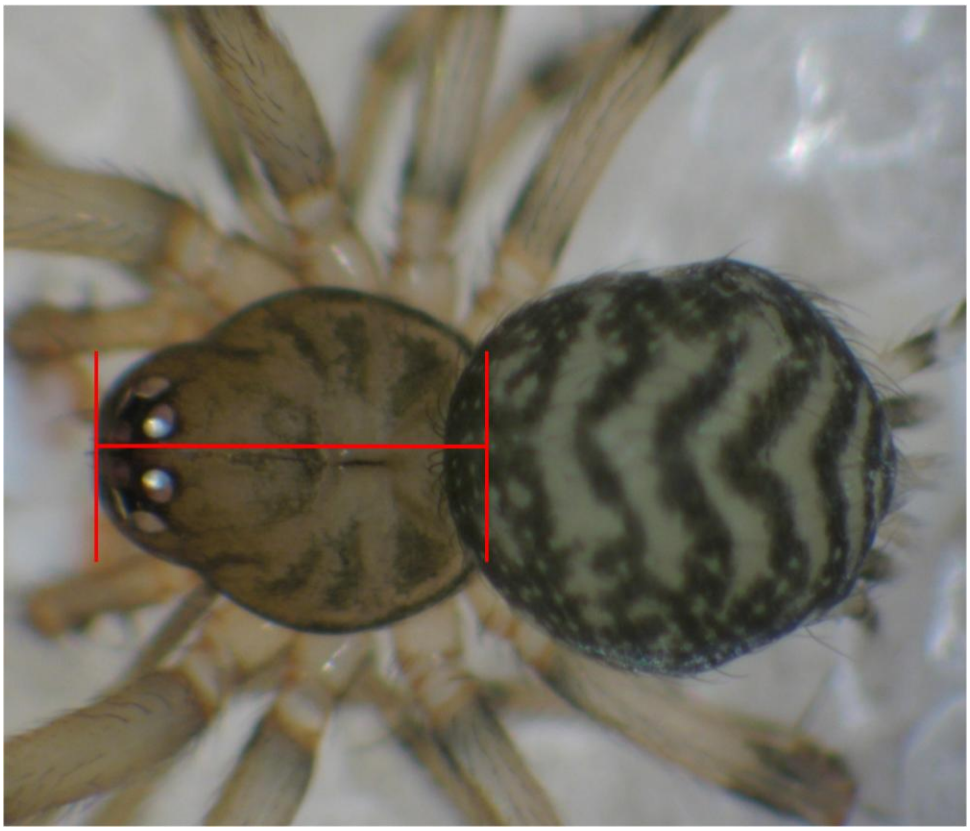

Figura 11 – Hahniidae, *Neohania* sp.1, showing how was measured the total carapace length. From clypeus (excluding chelicerae) to the end of the carapace (excluding pedicel).

Tabela 2 – Ground dweling spider biomass, in grams, of Pampa biome, southern Brazil. Biomass obtained by Mass-Length regression using Fresh Mass coefficient. Species listed here are separated in Grazed and Ungrazed plots and are from November 2011, 2012 and 2013, May, September and November 2015 and February 2016. Taxa are separate in families, genus and species. "Ind" – Number of individuals captured; "L mm" – Total length of each specie; "Me g" – Mean of total biomass of each speciemen in grams; "Mx g" – Maximum value obtained of biomass of each specie in grams; "Mn g" – Minimum value obtained of biomass of each specie in grams; "SD" – Biomass standard deviation of each species in each methodology.

	Grazed						Ungrazed					
Taxa	**Ind**	**L mm**	**Me g**	**Mx g**	**Mn g**	**SD**	**Id**	**L mm**	**Me g**	**Mx g**	**Mn g**	**SD**
Actinopodidae												
Actinopus sp.	1	8.8700	0.0653	0.0653	0.0653	0	0	0	0	0	0	0
Amphinectidae												
Metaltella simoni Keyserling, 1878	14	7.0064	0.0446	0.0727	0.0186	0.0123	31	7.3452	0.0534	0.2045	0.0282	0.0310
Anyphaenidae												
Arachosia sp.	1	3.7700	0.0708	0.0708	0.0708	0	6	3.6483	0.0649	0.0814	0.0417	0.0152
Gen? sp. 1	0	0	0	0	0	0	2	7.4450	0.6094	0.6623	0.5565	0.0748
Araneidae												
Alpaida sp.	1	6.6000	0.0118	0.0118	0.0118	0	0	0	0	0	0	0
Argiope argentata (Fabricius, 1775)	0	0	0	0	0	0	2	9.7900	0.3599	0.4930	0.2269	0.1881
Caponiidae												
Caponina notabilis (Mello-Leitão, 1939)	1	3.2200	0.0033	0.0033	0.0033	0	0	0	0	0	0	0
Corinnidae												
Castianeira chrysura Mello-Leitão, 1943	10	5.5030	0.0159	0.0242	0.0089	0.0053	4	3.7775	0.0084	0.0204	0.0006	0.0094
Castianeira gaucha Mello-Leitão, 1943	1	4.0800	0.0065	0.0065	0.0065	0	14	5.6379	0.0173	0.0265	0.0070	0.0062
Castianeira sp. 1	1	5.8200	0.0180	0.0180	0.0180	0	0	0	0	0	0	0
Castianeira sp. 2	3	2.2933	0.0013	0.0021	0.0008	0.0007	8	2.1475	0.0011	0.0019	0.0009	0.0003
Mazax sp.	0	0	0	0	0	0	2	4.1650	0.0069	0.0073	0.0065	0.0006
Ctenidae												
Asthenoctenus borellii Simon, 1897	0	0	0	0	0	0	5	10.6480	0.1727	0.2556	0.0606	0.0725
Isoctenus minusculus (Keyserling, 1891)	3	8.7700	0.1956	0.3608	0.0902	0.1449	5	9.5620	0.1231	0.1797	0.0728	0.0401
Parabatinga brevipes (Keyserling, 1891)	3	11.2833	0.1942	0.2211	0.1567	0.0335	9	11.5822	0.2220	0.3730	0.0784	0.0945
Gnaphosidae												
Apopyllus cf. *iheringi*	2	6.1350	0.0294	0.0361	0.0228	0.0094	0	0	0	0	0	0
Apopyllus sp.	1	7.1400	0.0457	0.0457	0.0457	0	0	0	0	0	0	0
Camillina galianoae Platnick & Murphy, 1987	0	0	0	0	0	0	4	3.3125	0.0046	0.0060	0.0026	0.0015
Camillina pulchra (Keyserling, 1891)	5	4.4860	0.0135	0.0247	0.0034	0.0101	2	3.4150	0.0049	0.0052	0.0047	0.0004
Echemos sp.	1	4.0400	0.0082	0.0082	0.0082	0	0	0	0	0	0	0
Eilica aff. *trilineata*	0	0	0	0	0	0	2	3.2900	0.0045	0.0051	0.0038	0.0010
Eilica trilineata (Mello-Leitão, 1941)	1	3.0900	0.0037	0.0037	0.0037	0	0	0	0	0	0	0
Eilica cf. obscura	1	4.2500	0.0096	0.0096	0.0096	0	0	0	0	0	0	0
Neodrassex ibirapuita Ott, 2013	0	0	0	0	0	0	1	1.9900	0.0010	0.0010	0.0010	0
Hahniidae												
Gen? sp. 1	1	1.9900	0.0008	0.0008	0.0008	0	6	2.2700	0.0011	0.0014	0.0008	0.0002
Neohania sp. 1	230	1.4961	0.0004	0.0007	0.0002	0.0001	110	1.4852	0.0004	0.0008	0.0002	0.0001
Neohania sp. 2	120	1.0708	0.0002	0.0004	0.0001	0.0000	109	1.0594	0.0002	0.0004	0.0001	0.0000

Neohania sp. 3	2	1.9000	0.0007	0.0008	0.0006	0.0002	17	2.1682	0.0010	0.0026	0.0006	0.0004
Linyphiidae											
Agyneta sp. 1	125	1.8110	0.0006	0.0009	0.0004	0.0001	45	1.7060	0.0006	0.0009	0.0003	0.0001
Agyneta sp. 2	52	1.5065	0.0004	0.0009	0.0003	0.0001	47	1.4774	0.0004	0.0007	0.0002	0.0001
Erigone sp. 1	110	1.2526	0.0003	0.0005	0.0001	0.0001	9	1.2000	0.0003	0.0003	0.0002	0.0000
Erigone sp. 2	4	1.4325	0.0004	0.0005	0.0003	0.0001	0	0	0	0	0	0
Fissiscapus pusillus Millidge, 1991	1	1.7600	0.0006	0.0006	0.0006	0	0	0	0	0	0	0
Labicymbium sp. 1	3	1.6067	0.0005	0.0006	0.0003	0.0001	1	1.4700	0.0004	0.0004	0.0004	0
Labicymbium sp. 2	6	1.8083	0.0006	0.0008	0.0005	0.0001	4	1.5675	0.0005	0.0008	0.0003	0.0002
Laminacauda sp. 1	1	1.5500	0.0005	0.0005	0.0005	0	0	0	0	0	0	0
Laminacauda sp. 2	0	0	0	0	0	0	1	1.9300	0.0007	0.0007	0.0007	0
Moyosi sp. 1	13	1.9692	0.0008	0.0011	0.0005	0.0002	8	1.8750	0.0007	0.0008	0.0006	0.0001
Moyosi sp. 2	1	1.8700	0.0007	0.0007	0.0007	0	0	0	0	0	0	0
Neomaso sp. 2	16	1.2044	0.0003	0.0004	0.0002	0.0001	29	1.1562	0.0002	0.0003	0.0002	0.0000
Neomaso sp. 3	1	1.6800	0.0005	0.0005	0.0005	0	2	1.4150	0.0004	0.0004	0.0003	0.0000
Neomaso sp. 4	2	1.3300	0.0003	0.0003	0.0003	0.0000	26	1.6792	0.0005	0.0008	0.0003	0.0001
Pseudotyphistes sp. 1	1	1.5700	0.0005	0.0005	0.0005	0	6	1.5900	0.0005	0.0006	0.0003	0.0001
Pseudotyphistes sp. 2	1	1.3600	0.0003	0.0003	0.0003	0	1	1.1500	0.0002	0.0002	0.0002	0
Psilocymbium lineatum (Millidge, 1991)	16	1.4681	0.0004	0.0006	0.0002	0.0001	3	1.4100	0.0004	0.0004	0.0003	0.0000
Scolecura parilis Millidge, 1991	1	1.8900	0.0007	0.0007	0.0007	0	6	1.6933	0.0006	0.0009	0.0002	0.0002
Sphecozone sp.1	3	1.6933	0.0006	0.0006	0.0005	0.0001	0	0	0	0	0	0
Sphecozone sp.2	2	1.3850	0.0004	0.0004	0.0003	0.0001	1	1.3600	0.0003	0.0003	0.0003	0
Tutaibo aff. *phoeniceus*	12	1.5025	0.0004	0.0005	0.0003	0.0000	4	1.6050	0.0005	0.0008	0.0004	0.0002
Tutaibo sp. 1	32	1.9116	0.0007	0.0011	0.0003	0.0002	23	1.8787	0.0007	0.0009	0.0005	0.0001
Tutaibo sp. 2	6	1.8800	0.0007	0.0008	0.0006	0.0001	0	0	0	0	0	0
Tutaibo sp. 3	2	2.4650	0.0013	0.0016	0.0010	0.0004	0	0	0	0	0	0
Vesicapalpus sp.	0	0	0	0	0	0	6	1.8683	0.0007	0.0014	0.0004	0.0004
Lycosidae											
Agalenocosa sp.	0	0	0	0	0	0	1	3.5100	0.0065	0.0065	0.0065	0
Allocosa sp.	1	6.9100	0.0463	0.0463	0.0463	0	1	5.2000	0.0204	0.0204	0.0204	0
Birabenia sp. 1	5	6.5400	0.0397	0.0426	0.0320	0.0044	23	6.4774	0.0391	0.0622	0.0282	0.0094
Birabenia vittata (Mello-Leitão, 1945)	1	7.1400	0.0509	0.0509	0.0509	0	2	9.4850	0.1344	0.2158	0.0530	0.1151
Hogna bivittata (Mello-Leitão, 1939)	8	8.4250	0.0842	0.1243	0.0558	0.0198	3	8.3400	0.0822	0.0963	0.0539	0.0245
Lobizon humilis (Mello-Leitão, 1944)	2	4.5150	0.0141	0.0191	0.0091	0.0071	18	4.4789	0.0136	0.0268	0.0087	0.0044
Lycosa erythrognatha Lucas, 1836	7	18.1343	0.7947	1.3424	0.3074	0.3055	2	20.6400	1.1974	1.7696	0.6253	0.8091
Lycosa sp.1	1	13.0500	0.2935	0.2935	0.2935	0	0	0	0	0	0	0
Lycosa thorelli (Keyserling, 1877)	18	10.7433	0.1810	0.3573	0.0840	0.0910	4	9.8675	0.1349	0.1997	0.0902	0.0478
Gen? sp. 1	2	4.7700	0.0168	0.0234	0.0101	0.0094	0	0	0	0	0	0
Gen? sp. 2	1	1.9500	0.0012	0.0012	0.0012	0	0	0	0	0	0	0
Gen? sp. 3	7	8.0414	0.0733	0.0963	0.0574	0.0167	14	8.0636	0.0745	0.1167	0.0509	0.0214
Navira naguan Piancentini & Grismado, 2009	4	6.4200	0.0380	0.0463	0.0261	0.0085	1	5.2000	0.0204	0.0204	0.0204	0
Schizocosa malitiosa (Tullgren, 1905)	43	18.8879	0.8999	2.7939	0.3730	0.4097	13	18.3677	0.8418	2.2107	0.4278	0.4625
Trochosa sp.	2	10.4550	0.1550	0.1659	0.1441	0.0154	2	9.1250	0.1065	0.1319	0.0812	0.0358
Microstigmatidae											

Xenomesia platensis Goloboff, 1989	0	0	0	0	0	0	1	8.3600	0.0542	0.0542	0.0542	0
Miturgidae												
Teminius insularis (Lucas, 1857)	18	7.3450	0.0557	0.1088	0.0171	0.0282	3	7.5033	0.0588	0.0990	0.0297	0.0360
Mysmenidae												
Mysmena sp.	0	0	0	0	0	0	1	0.8800	0.0001	0.0001	0.0001	0
Nesticidae												
Nesticus sp.	0	0	0	0	0	0	1	2.9900	0.0027	0.0027	0.0027	0
Oonopidae												
Neotrops aff. *tucumanus*	4	1.7800	0.0006	0.0007	0.0005	0.0001	4	1.7125	0.0005	0.0006	0.0005	0.0001
Opopaea concolor (Blackwall, 1859)	0	0	0	0	0	0	1	1.4700	0.0004	0.0004	0.0004	0
Oxyopidae												
Oxyopes salticus Hentz, 1845	7	4.4771	0.0096	0.0277	0.0061	0.0080	2	3.9600	0.0060	0.0065	0.0055	0.0007
Palpimanidae												
Otiothops birabeni Mello-Leitão, 1945	1	4.5900	0.0091	0.0091	0.0091	0	0	0	0	0	0	0
Phrurolithidae												
Orthobula sp.	6	1.7050	0.0005	0.0007	0.0004	0.0002	11	1.7882	0.0006	0.0008	0.0004	0.0001
Salticidae												
aff. *Phiale* sp.	1	9.4800	0.0806	0.0806	0.0806	0	1	10.3000	0.1047	0.1047	0.1047	0
Mopiopia sp.	1	5.3000	0.0138	0.0138	0.0138	0	0	0	0	0	0	0
Neonella minuta Galiano, 1965	3	1.2433	0.0002	0.0002	0.0002	0.0000	1	2.2000	0.0011	0.0011	0.0011	0
Neonella montana Galiano, 1988	3	1.4333	0.0003	0.0004	0.0002	0.0001	1	1.7400	0.0006	0.0006	0.0006	0
Gen? sp. 1	1	5.0400	0.0119	0.0119	0.0119	0	1	5.9300	0.0190	0.0190	0.0190	0
Gen? sp. 2	1	2.9400	0.0025	0.0025	0.0025	0	1	2.8600	0.0023	0.0023	0.0023	0
Gen? sp. 3	0	0	0	0	0	0	2	5.3300	0.0142	0.0167	0.0116	0.0036
Gen? sp. 4	0	0	0	0	0	0	1	3.9100	0.0058	0.0058	0.0058	0
Gen? sp. 5	1	5.1500	0.0127	0.0127	0.0127	0	0	0	0	0	0	0
Gen? sp. 6	1	1.7800	0.0006	0.0006	0.0006	0	0	0	0	0	0	0
Gen? sp. 7	0	0	0	0	0	0	1	2.54	0.001667	0.001667	0.001667	0
Gen? sp. 8	0	0	0	0	0	0	1	4.94	0.011264	0.011264	0.011264	0
Sarinda nigra Peckham & Peckham, 1892	1	4.2500	0.0073	0.0073	0.0073	0	0	0	0	0	0	0
Semiopyla cataphracta Simon, 1901	3	2.3500	0.0013	0.0013	0.0013	0	18	2.3189	0.0013	0.0024	0.0009	0.0004
Tetragnathidae												
Glenognatha lacteovittata (Mello-Leitão, 1944)	3	2.7733	0.0017	0.0021	0.0012	0.0005	45	2.7449	0.0017	0.0032	0.0009	0.0005
Theraphosidae												
Gen? sp. 1	0	0	0	0	0	0	1	15.9800	0.4196	0.4196	0.4196	0
Theridiidae												
Dipoena pumicata (Keyserling, 1886)	7	2.2757	0.0011	0.0013	0.0009	0.0002	6	2.1217	0.0009	0.0011	0.0007	0.0001
Episinus sp. 1	1	1.4900	0.0004	0.0004	0.0004	0	1	1.4900	0.0004	0.0004	0.0004	0
Episinus sp. 2	1	2.6200	0.0015	0.0015	0.0015	0	1	1.6800	0.0005	0.0005	0.0005	0
Euryopis camis Levi, 1963	10	2.2760	0.0011	0.0012	0.0009	0.0001	2	2.1050	0.0009	0.0010	0.0008	0.0001
Euryopis sp. 1	5	2.3160	0.0011	0.0013	0.0010	0.0001	0	0	0	0	0	0
Euryopis sp. 3	0	0	0	0	0	0	3	2.8233	0.0018	0.0020	0.0014	0.0003
Euryopis sp. 4	11	1.4445	0.0004	0.0005	0.0003	0.0001	1	1.4700	0.0004	0.0004	0.0004	0
Euryopis spinifera (Mello-Leitão,	21	2.8519	0.0018	0.0022	0.0012	0.0002	1	2.4800	0.0013	0.0013	0.0013	0

1944)											
Guaraniella mahnerti Baert, 1984	45	1.4673	0.0004	0.0011	0.0002	0.0002	47	1.4357	0.0004	0.0011	0.0002	0.0002
Steatoda ancorata (Holmberg, 1876)	1	4.2500	0.0044	0.0044	0.0044	0	0	0	0	0	0	0
Styposis selis Levi 1964	2	1.4050	0.0004	0.0004	0.0003	0.0000	10	1.3800	0.0003	0.0004	0.0003	0.0000
Theridion sp.	1	2.0400	0.0008	0.0008	0.0008	0	1	1.6200	0.0005	0.0005	0.0005	0
Thymoites piratini Rodrigues & Brescovit, 2015	6	1.4917	0.0004	0.0005	0.0004	0.0001	3	1.3867	0.0004	0.0004	0.0003	0.0000
Thomisidae												
Gen? sp. 1	0	0	0	0	0	0	1	3.6700	0.0048	0.0048	0.0048	0
Gen? sp. 2	1	6.2400	0.0220	0.0220	0.0220	0	1	5.7200	0.0172	0.0172	0.0172	0
Gen? sp. 3	3	4.0867	0.0067	0.0087	0.0049	0.0019	1	4.0100	0.0062	0.0062	0.0062	0
Tmarus sp.	0	0	0	0	0	0	3	4.4233	0.0092	0.0150	0.0030	0.0060
Trachelidae												
Gen? sp. 1	1	2.4600	0.0015	0.0015	0.0015	0	3	2.8400	0.0024	0.0034	0.0016	0.0009
Gen? sp. 2	1	3.7400	0.0051	0.0051	0.0051	0	4	3.7975	0.0053	0.0065	0.0041	0.0011

Tabela 3 – Ground dweling spider carapace length, in millimeters, of Pampa biome, southern Brazil. Species listed here are from Grazed plots of November 2011, 2012 and 2013, May, September and November 2015 and February 2016. Taxa are separate in families, genus and species. "Indiv" – Number of individuals captured; "Mean Len" – Mean of carapace length per specie in millimeters. "Min Len" – Minimum value obtained of carapace length per specie in millimeters; "Max Len" – Maximum value obtained of carapace length per specie in millimeters; "SD" – Length standard deviation of each species.

Grazed					
Taxa	**Indiv**	**Mean Len**	**Min Len**	**Max Len**	**SD**
Hahniidae					
Neohania sp.1	192	0.704219	0.82	0.63	0.02478
Neohania sp.2	106	0.503585	0.56	0.46	0.018475
Linyphiidae					
Agyneta sp.1	90	0.842889	1.01	0.73	0.033562
Agyneta sp.2	41	0.68122	0.94	0.61	0.073082
Erigone sp.1	83	0.641205	0.75	0.52	0.039429
Tutaibo sp.1	25	0.958	1.05	0.84	0.057446
Lycosidae					
Schizocosa malitiosa (Tullgren, 1905)	31	9.559677	11.12	7.44	1.011667
Tetragnathidae					
Glenognatha lacteovittata (Mello-Leitão, 1944)	3	1.333333	1.57	1.17	0.209841
Theridiidae					
Guaraniella mahnerti Baert, 1984	36	0.616667	0.86	0.48	0.093869

Tabela 4 – Ground dweling spider carapace length, in millimeters, of Pampa biome, southern Brazil. Species listed here are from Ungrazed plots of November 2011, 2012 and 2013, May, September and November 2015 and February 2016. Taxa are separate in families, genus and species. "Indiv" – Number of individuals captured; "Mean Len" – Mean of carapace length per specie in millimeters. "Min Len" – Minimum value obtained of carapace length per specie in millimeters; "Max Len" – Maximum value obtained of carapace length per specie in millimeters; "SD" – Length standard deviation of each species.

Ungrazed					
Taxa	**Indiv**	**Mean Len**	**Min Len**	**Max Len**	**SD**
Hahniidae					
Neohania sp.1	85	0.705882	0.8	0.63	0.022746
Neohania sp.2	96	0.509896	0.78	0.46	0.035049
Linyphiidae					
Agyneta sp.1	32	0.805938	0.92	0.61	0.065346
Agyneta sp.2	35	0.668571	0.84	0.52	0.066869
Erigone sp.1	5	0.65	0.67	0.61	0.028284
Tutaibo sp.1	23	0.898696	1.05	0.8	0.065734
Lycosidae					
Schizocosa malitiosa (Tullgren, 1905)	11	9.663636	11.12	8.06	0.970673
Tetragnathidae					
Glenognatha lacteovittata (Mello-Leitão, 1944)	40	1.28125	1.7	1.13	0.144083
Theridiidae					
Guaraniella mahnerti Baert, 1984	34	0.597059	0.94	0.46	0.135256

ARTIGO III

Seasonal spider diversity and species phenology in grazed and ungrazed areas in Southern America Grasslands

SEASONAL SPIDER DIVERSITY AND SPECIES PHENOLOGY IN GRAZED AND UNGRAZED AREAS IN SOUTHERN AMERICA GRASSLANDS

Guilherme O. da Silva[1,2]*and Ricardo Ott[1]

[1]Fundação Zoobotânica do Rio Grande do Sul – FZB-RS. Rua: Dr Salvador França, CEP 90690-000, Porto Alegre, RS, Brazil.

[2]Universidade Federal do Rio Grande do Sul – UFRGS. Avenida Bento Gonçalves, 9500, CEP 91509-900, Porto Alegre, RS, Brazil.

ABSTRACT. Pampa is a savanna-like Biome nowadays dominated by livestock farming. Besides that, Pampa still also suffers with crop farming, silviculture and fire, being extremely neglected in terms of management and conservation. Although cattle grazing is widely recommended for Pampa conservation, this methodology still affects biodiversity of plants and arthropods. An alternative of conservation would be the use of resilience of Pampa itself, in a self-recovery management, where all impact is removed priodically. Spiders were used in many ecological works at Pampa, however, it were never used as models for self-recovery managements. Spiders are a diverse and rich group, are well-know to respond to biotic and abiotic perturbation. Considering that, samplings using pitfall traps were realized in autumn, winter and spring of 2015 and summer of 2016 to improve the knowledge of how spider diversity change in areas with and without cattle grazing at Pampa. We expected that spider abundance will be higher in ungrazed plots. Although grazed and ungrazed spider abundance weren´t significant difference when all spiders (juveniles and adults) were used as models (p = 0.6885), abundance of most abundant species revealed difference (p = 0.0070). Ungrazed plots had some effect in spiders' abundance, even though this was smaller compared to grazed plots, refusing our hypothesis.

KEYWORDS: Neotropical; Diversity; Arachnids; Pampa

RESUMO. O Pampa é um bioma do tipo savana hoje dominado por criação de rebanhos. Além disso, o Pampa ainda sofre com a agricultura, silvicultura e queimadas, sendo extremamente negligenciado em termos de manejo e conservação. Apesar do pastejo do gado ser muito recomendado para a conservação do Pampa, essa prática afeta a biodiversidade de plantas e artrópodes. Uma alternativa de conservação seria a própria resiliência do Pampa, em manejos de auto-recuperação, nas quais todo o impacto é cessado. Aranhas são usadas como exemplos em muitos trabalhos no Pampa, contudo, nunca foram utilizadas em manejos de auto-recuperação. Aranhas são ótimos modelos ecológicos, sendo um grupo diverso e rico, conhecidas por responder a perturbações bióticas e abióticas. Amostragens usando "*Pitfall traps*" foram realizadas no outono, inverno e primavera de 2015 e verão de 2016 para incrementar o conhecimento sobre como a diversidade de aranhas se altera em áreas com e sem pastejo de gado no bioma Pampa. Esperamos que a abundancia de aranhas será maior em áreas sem pastejo. Quando aranhas jovens e adultas foram usadas como modelos, a abundância de aranhas não foi significativamente diferente entre áreas com e sem pastejo (p = 0.6885). Já a abundancia das espécies mais abundantes revelou diferença significativa entre áreas com e sem pastejo (p = 0.0070). As áreas sem pastejo tiveram alguma influencia na abundância de aranhas, apesar desta ser menor quando comparada com áreas com pastejo, refutando nossa hipótese.

PALAVRAS-CHAVE: Neotropical; Diversidade; Arachnida; Pampa

Spiders (Araneae) are a diverse group, nowadays with more than 46,000 described species, being the second richest group of Arachnida (World Spider Catalog 2016) and nearly exploiting all terrestrial habitats, excluding Antarctica (Foelix 2011). Spiders are worldwide used in many ecological works due its strong response to biotic and abiotic perturbations (Bishop & Riechert 1990; Podgaiski et al. 2013; Rodrigues et. al. 2014; Herrmann et al. 2015; Lin et al. 2016; Niba & Yekwayo 2016; Peterson et al. 2016). Fast occupation of new habitats, strong correlation with vegetal structure, the characteristic of being generalist predators (even eating other spider) and the property to consume high biomass rate made spiders great experimental models (Uetz et al. 1999; Wise 2006; Souza 2007; Foelix 2011; Silvey et al. 2015; Ott 2016).

Although spiders have been well studied in many ecosystems and biomes, specific research on grasslands spiders are still of poor knowledge. There is a high demand to know how diversity, richness and composition of these arthropods are in these ecossistems and how these parameters change under different impacts and managements (McDonald 2007; Haddad et al. 2015; Horváth et al. 2015). In southern South America grasslands, known as "Campos Sulinos", studies have been conduct involving spider and impacts like fire (Podgaiski et al. 2013), silvicultures (Rodrigues et al. 2010), farming (Liljesthröm et al. 2002; Rodrigues et al. 2009; Fritz et al. 2011) and graze (Alejandro et al. 2010). However, studies with Araneofauna and the self-recovery of the Pampa biome are a lack of knowledge.

The Pampa is a savanna-like biome originally composed by a landscape dominated by grasslands and meadows (Overbeck et al. 2007; Beheling et al. 2009). Restricted to the Neotropical region, the Pampa covers 750,000 km2 (Vélez et al. 2009) of south Brazil, northern Argentina and whole Uruguay (Andrade et al. 2015). The Köppen-Geiger climatic classification indicates a "Cfa" climates (warm temperate clime, humid, with hot summers; Kottek et al. 2006), lying in a South Temperate Zone with four well-characterized seasons (Suertegaray & Silva 2009).

For the past 300 years, after the begining of the European colonization, the Pampa has been subjected to a number of different impacts, very differently from the last 10.000 years period, since the final of the Pleistocene. Uncontrolled fire management, introduction of many agricultural practices, livestock farming and silviculture are nowadays extremely associated with this biome (Suertegaray & Silva 2009; Podgaiski et al. 2014; Ferrando et al. 2016). All these impacts have a large effect on the Pampa, improving degradation and neglecting conservation processes (Overbeck et al. 2013). The transformaton of grasslands for agricultural proposes, without regulation or controlled management, lead to an entire change in its original properties, causing an unmeasurable impact on native biodiversity (Andrade et al. 2015; Winck et al 2016).

Most studies focused on livestock activity are more concentrated in forage properties and meat production (Pinto et al. 2008; Kamali et al. 2014; Pelegrini et al. 2016; Ruviaro et al. 2016;), other than analyze in effects on native species and soil damage (Soares et al. 2011; Gantchoffet al. 2014; Bella et al. 2014; 2015; Van Klink et al. 2015). Overgrazed areas are known to suffer under high impact of herbivory, cattle trampling, lacking to forage plants quality and biodiversity (Pallarés et al., 2005; Nabinger et al. 2009; Evans et al. 2015). In the other hand, moderate grazed areas, formed by mosaics of low and high grazing intensities, are known to improve plant diversity and quality (Diaz et al., 2007; Nabinger et al. 2009). The simple maintenance of heterogeneity in grasslands like the Pampa could lead to positive enhancement of their complexity and diversity (Andrade et al. 2015; Dassou et al. 2015; Hertzog et al. 2016).

Considering that the Pampa still maintains certain original properties and seeds banks, it is possible that its resilience, as in a self-recovery system, will show some of his “original characteristics” as an alternative to the actual grassland management. This system could allow a gradually change in quality, complexity and diversity of the biota (Andrade et al. 2015). The objective of this work is to compare the ground dwelling spider’s fauna in areas with and without grazing and cattle presence considering seasonality aspects in the Pampa biome, correlating abundance and richness with the proposed managements. As spiders are usually well used as ecological models, we propose to study his abundance and richness in different sazonal periods intending to enhance knowledge of this fauna and the changes in the community related to the presence and absence of cattle and grazing activities.

METHODS

Study Site - The experiments were carried out at Ibirapuitã River Environmental Federal Protection Area “Área de Proteção Ambiental – APA do Rio Ibirapuitã” located at Western Pampas Areas of Rio Grande do Sul state, Brazil (Fig. 10). Three farms, georeferenced at 30°28’50.57” S; 055°33’10.21” W (Estancia do Açude), 30°28’899” S; 055°34’263” W (Fazendo Rincão dos Morais) and 30°25’54.78” S; 055°38’39.75” W (Fazenda Rincão Bonito) were selected for sample. In each farm a pair of plots, with one hectare and around 200 m far from each other, were established in November 2011. Each pair is constituted of a closed plot (fenced plot with total exclusion of cattle graze) and an opened plot (plot with poles in the corners to demarcate the place, cattle has free access for graze). Fenced plots have been closed since August 2012.

Nowadays the vegetation in fenced plots is complete different, in terms of height (Fig. 11), compared with the vegetation in opened plots. Fenced-Ungrazed plots are constituted of grasses and bushes that can reach up to 70 cm of height and shrubs that can reach up 1,7 m of height. In opened plots the vegetation is constituted by grasses and bushes that not transpose 15 cm of height. Opened-Grazed plots are still considered in the same environmental stage that the closed plots were before facing.

Data Collection - The sampling periods were seasonally in autumn (12 to 19 May 2015), winter (25 August to 01 September 2015), spring (17 to 24 November 2015) and summer (16 to 23 February of 2016).

The traps were made of ordinary plastic ice cream pots of 1L (10 cm depth, 20 cm diameter) inserted in a 20 cm PVC guide (Fig. 12), adapted from Uetz & Uzicker (1976) and filled 1/3 of volumen with formol 2% (preservative sampling fluid) adding some drops of neutral liquid soap for breaking superficial tension. The traps were disposed in a "Y" format, been installed eight pitfall traps in each area, four traps per "Y" (48 in total). The traps were distant 10 m of each other, 15 m distant from fences corner and diagonally at last 10 m distant from the border of the one hectare plot (Fig. 13). After each sampling event spiders were sorted out and transfereed to 80% ethanol as preservative.

Data Analysis - Spiders were examined using a stereo microscope and separated in vials containing 80% ethanol. Spiders were determinate using dichotomous key for families (Dipenaar-Schoemann & Jocqué 1997; Brescovit et al. 2002) and, in the lowest possible taxonomic level, with papers available on-line at NMBE World Spider Catalog (2016). Most abundant species were defined by their dominance, as those making up ≥3% of the total of individuals (adapted from Spiller & Schorner 1998; Petcharad et al. 2016). All adult spiders are deposited at the aracnological collection of Museu de Ciências Naturais do Rio Grande do Sul (MCN, R. Ott).

For statistical analysis, Student's tests were performed with all spiders, juveniles and adults, most abundant species and only adults' spiders excluding singletons and doubletons. These analyses were to test if abundance was significantly different between ungrazed and grazed plots in whole year and in each season. Individually, each of most abundant species was used as model for testing the same factors.

Rarefaction curves were performed to demonstrate spider richness difference between grazed and ungrazed plots trough seasons, and an Analysis of Variance (ANOVA) was performed to test significance of this result. Phenology curves for the most abundant species were performed to demonstrate seasonal activity; an ANOVA was performed to test significantly difference between curves. All statistical analyses were made in PASt (Paleontological Statistics 3.13 Hammer et al. 2001).

RESULTS

A total of 1,928 spiders of 29 families were sampled, 1.099 individuals in grazed plots (557 males; 181 females; 361 juveniles) and 829 in ungrazed plots (304 males; 120 females; 405 juveniles). Ninety-two species and morphospecies of 23 families were identified, being 36 nominal species, 43 in genera level and 13 only at family level (Table 5). Regarding Amaurobiidae, Idiopidae, Philodromidae, Pholcidae, Tengelidae and Theraphosidae only juveniles were sampled. Actinopodidae, Amaurobiidae, Palpimanidae, Philodromidae and Pholcidae were exclusively sampled in grazed plots. Idiopidae, Microstigmatidae, Mysmenidae, Nesticidae, Tengelidae and Thomisidae were exclusively sampled in ungrazed plots. Linyphiidae was the most abundant family in general with a total of 676 juveniles and adults, followed by Lycosidae (305), Hahniidae (273) and Theridiidae (198). In grazed plots, Linyphiidae was the most abundant family with 453 juveniles and adults, followed by Haniidae (207), Lycosidae (194) and Theridiidae (92). In ungrazed plots, Linyphiidae was the most abundant family with 223 juveniles and adults, followed by Lycosidae (111), Theriidiiae (106) and Haniidae (66). The five most abundant species were *Agyneta* sp. 1 (167 individuals:

125 in grazed plots, 42 in ungrazed plots), *Neohania* sp. 1 (154: 134, 20), *Erigone* sp. 1 (94: 90, 4), *Neohania* sp. 2 (74: 57, 17), *Agyneta* sp. 2 (64: 42, 22) and represent 28.7% of all spiders.

Linyphiidae was the richest family too, with 23 species and morphospecies, 20 in grazed plots and 16 in ungrazed plots, followed by Lycosidae (14: 14, 4), Theridiidae (13: 11, 8) and Salticidae (11: 9, 4) (Table 5). In terms of species richness, grazed plots registered 76 morphospecies and ungrazed plots 56. Thirty-six morphospecies were exclusively found in grazed plots and sixteen were exclusively found in ungrazed plots (Table 5).

Summer was the season with largest number of morphospecies (53), followed by winter (52); spring and autumn (both with 46). However, in grazed plots, winter was richer season with 41 registered morphospecies, followed by summer (37), autumn (33) and spring (32); this was also true for ungrazed plots in which the winter registered 35 species, followed by spring (34), summer (27) and autumn (26). Thirty morphospecies were singletons and 12 were doubletons. Regarding rarefaction curves, both grazed and ungrazed plots appear to have reached the asymptote in species accumulation (Fig. 14; 15). Moreover, Test T demonstrate significant difference between grazed and ungrazed plots richness (p = 7.94E-05), with higher richness in grazed plots.

Winter was the most abundant season with 352 adult individuals (198 in grazed plots and 154 in ungrazed plots), followed by spring (215; 112), autumn (182; 95) and summer (143; 63). The most abundant species, *Agyneta* sp. 1 registered higher abundance in autumn (65 individuals, 44 in grazed plots and 21 in ungrazed plots) (Fig. 16); *Neohania* sp. 1 registered higher abundance in spring (54: 51, 3) (Fig. 17); *Erigone* sp. 1 registered higher abundance in winter (31: 28, 3) (Fig. 18); *Neohania* sp. 2

registered higher abundance in spring (31: 22, 9) (Fig. 18) and *Agyneta* sp. 2 registered higher abundance in winter (24: 10, 14) (Fig. 20) for other seasons, see Table 5.

The T Test performance, based in all adults, revealed no significant abundance difference between grazed and ungrazed plots in autumn (p = 0.1651), winter (p = 0.5234) and spring (p = 0.1312), being only significantly different in summer (p = 0.0481; higher abundance in grazed plots). The same test, based in the most abundant species, revealed significant abundance difference between grazed and ungrazed plots in autumn (p = 0.0442), winter (p = 0.0294), spring (p = 0.0252) and summer (p = 0.0194), always with higher abundance in grazed plots. Abundance, between grazed and ungrazed plots, considering all seasons summed revealed no significant difference using as models all spiders (p = 0.6885), only adults (p = 0.1802) and adults without singletons and doubletons (p = 0.1813); most abundant species, though, revealed significant difference, with more richness in grazed plots (p = 0.0070).

T Test was performed also with each of the most abundant species separately, comparing grazed and ungrazed plots. *Agyneta* sp. 1 reveled significant difference in abundance between grazed and ungrazed plots with the sum of seasons (p = 0.0009), winter (p = 0.0018) and spring (p = 0.0099) with higher abundance in grazed plots; autumn (p = 0.0578) and summer (p = 0.1044) weren't significant different. *Neohania* sp. 1 revealed significant difference in abundance between grazed and ungrazed plots in all parameters: the sum of seasons (p = 2.0799E-07), autumn (p = 0.0020), winter (p = 0.0316), spring (p = 5.3047E-06) and summer (p = 0.0004), with higher abundance in grazed plots. *Erigone* sp. 1 was significant different in abundance between grazed and ungrazed plots with the sum of seasons (p = 1.9777E-07), winter (p = 0.0001) and spring (p = 0.0198) with higher abundance in grazed plots; autumn and summer statistics couldn't be performed due the absence of variation in the raw data. *Neohania* sp. 2 revealed significant difference in abundance between grazed and ungrazed plots with the sum of seasons (p = 0.0252) and winter (p = 0.0278) with higher abundance in grazed plots; autumn (p = 0.3831), spring (p = 0.0826) and summer (p = 0.1012) weren't significant different. *Agyneta* sp. 2 revealed significant different in abundance between grazed and ungrazed plots with the sum of seasons (p = 0.0168); winter (p = 0.3818) with higher abundance in grazed plots; spring (p = 0.7979 and summer (p = 0.0854) showed no significant difference; PASt programam could´t performed *Agyneta* sp. 2 autumn statistics due the absence of variation on the raw data.

Most phenology curves demonstrate higher male activity trough seasons, more pronounced in grazed plots (Fig. 16, 17, 18; 19, 20). Males of *Agyneta* sp. 1 (Fig. 16) exhibit a consistent curve that follow a very close parameter in both, grazed and ungrazed plots; females present distinct curves, both decreasing in spring; however ANOVA demonstrate no significant difference in these results (p = 0.5203). Males of *Neohania* sp. 1 (Fig. 17), in spring, demonstrate a great abundance peak in grazed plots, not followed by any other curve; Abundance of grazed plots females raised in summer; Curves of males and females in ungrazed plots are very close related and ANOVA demonstrate no significant difference in these results (p = 0.8519). Grazed plots males of *Erigone* sp. 1 (Fig. 18) maintain practically the same abundance trough seasons, only decaying abundance in summer; Grazed plots females do the same, practically maintaining the same abundance trough seasons; Ungrazed plots males and females registered correlated curves, changing abundance of each other in winter to spring; ANOVA demonstrate no significant difference in these results (p = 0.6836). Grazed plots males and females of *Neohania* sp. 2 (Fig. 19) increase their abundance until spring, decaying it in summer; Ungrazed plots females raised their abundance in autumn to winter, maintaining it until summer; Ungrazed plots males oscillated their abundance trough seasons; ANOVA demonstrate no significant difference in these curves (p = 0.634); Grazed plots males of *Agyneta* sp. 2 (Fig. 20) decay their abundance in autumn to winter, maintaining practically the same in spring and raising it in summer; Grazed plots females, ungrazed plots males and females registered the same parameter of curves, with low abundance in autumn, appearing to be more abundant in spring and decaying their abundance until summer; however, ANOVA demonstrate no significant difference in these curves (p = 0.6407).

DISCUSSION

In the raw data, in all the cases apresented here (abundance of families, abundance of most abundant species, richeness and exclusive species), grazed plots registered higher values than ungrazed ones. However, grazed and ungrazed plots abundance was only significant different when tested with most abundant species. Spiders respond differently from other arthropods when the impact is correlated with grazing (Ferrando et al. 2016; Woodcok et al. 2005; Polchaninova et al. 2016), being diversity directly affected by habitat structure, prey availability and competitive exclusion (Dennis et al. 2015; Rodriguez-Artigas 2016). The size-grain hypotheses (Kaspari & Weiser 1999) suggest that absence of grazing and a higher density of vegetation structure could lead, as shown in ungrazed plots, to an araneofauna dominated by smaller species. Some Lycosids species could represent exactly this case. The family is classified as cursorial/wandering spiders (Moring & Stewart 1994; Uetz et al. 1999) and is know to be much correlated with grasslands (Jocqué & Alderweireldt 2005). Althoug this family is richer and more abundant in grazed plots, *Lobizon humilis* (Mello-Leitão, 1944), a very small species of Lycosidae compared with *Schizocosa malitiosa* (Tullgren, 1905), was more abundant in ungrazed plots. In the other hand many of the most abundant spiders represented by small species of hahniids and linyphiids were significantly more abundant in grazed plots.

Two possible explanations can be used here. First, regarding that pitfall traping is based in activity, it is possible that the simple increment of vegetation density could have a deep impact on the mobility of some spiders, mainly ground web builders and ground runners in this case, and in this way the sampling methodology efficience of pitfall trapping could be deeply affected by vegetation density factor. This would represent a reduction on the mobility or activity but not necessarily a reduction in the density of these spiders. Second it is to consider that these hahniids and linyphiids species indeed have a large preference for open areas, and in this case they are much more represented in grazed plots as in ungrazed ones.

Considering the edge effect, closed plots are surrounded by massive grazed areas and spiders are good dispersers and colonizers (Bishop & Riechert 1990; Uetz et al.1999; Rodrigues et al. 2009; Baba & Tanaka 2016; Rodriguez-Artigas 2016). In this way, if closed plots would be always recolonized from the outside species since the begin of isolation, spider richness rather than abundance could be not greatly affected by the cattle absence in isolated grassland fragments (Horváth et al. 2009). Supposedly outside ungrazed plots species will be always present, even if in smaller abundance (Polchaninova et al. 2016). However, some species will be, probably, more related to the edge of the hectare, since vegetation density would hinder spider mobility (Kaspari & Weiser 1999).

About sampled species, *Actinopus* sp. was the only adult Mygalomorphae sampled. *Metaltella simoni* Keyserling, 1878 is a species commonly registered in many papers dealing with the Pampa region araneofauna (Costa & Simó, 2014; Zapata & Grismado 2015; Zanetti 2016) being recently introduced in USA and Canada (Dean

2016; World Spider Catalog 2017). This species showed higher abundance in ungrazed plots being even present in grazed ones. *Castianeira gaucha* Mello-Leitão, 1943 is only known for its type-locality, Rio Grande do sul state, Brazil (Buckup et al. 2010), *Asthenoctenus borellii* Simon, 1897 is known to inhabit periurban zones, being widely distribuited in Altantic Rain Forest and Pampa biomes (Simó et al. 2000; Buckup et al. 2010; Brescovit et al. 2011) and *Vesicapalpus* sp. were know to inhabit the south of Brazil (Rodrigues & Ott 2006); these three species were exclusively found in ungrazed plots. *Glenognatha lacteovittata* (Mello-Leitão, 1944), widely distribuited in South America (World Spider Catalog 2017), was here more related to ungrazed plots, showing a supposedly preference for areas with lass impact and higher vegetation structure, in accordance to its guild of web-builders (Battirola et al. 2016).

In contrast, *S. malitiosa*, is another widely distribuited specie (World Spider Catalog 2017) was more related to grazed plots showing a supposedly preference for open grasslands, also in accordance to the guild of wanderers (Uetz et al. 1999). *Agyneta* sp. 1, *Agyneta* sp. 2 and *Erigone* sp. are small species of linyphiidae. Species of these genus could be correlated with grasslands (Zapata & Grismado 2015) and riparian forests (Rodrigues et al. 2016). Here, they seems to be linked with grasslands, beeing more abundant in grazed areas. *Guaraniella mahnerti* Baert, 1984 is known from souther South America (Zapata & Grismado 2015; World Spider Catalog 2017); this species has already been sampled in impacted areas like silviculture and grasslands with cattle (Rodrigues et al. 2010). Here, it was the only species that presented a very similar abundance in both grazed ans ungrazed plots. Although abundant here, hahniids species (*Neohania* sp. 1 and *Neohania* sp. 2) are not well studied (Buckup et al. 2010; Pompozzi et al. 2011; Zapata & Grismado 2015). This family is widely sampled in many works (Rodrigues et al. 2010; Zapata & Grismado 2015; Podgaiski & Rodrigues

2016); however, in these papers its abundance was every time low and cannot be compared to the high abundance presented here and also found in primary and secondary Araucaria forests, and in *Pinus* spp. silvicultures at São Francisco de Paula (R. Ott personal observation). The higher abundance of hahniids can be simply related, in this case, to the high effectiveness of pitfall sampling methodology (Topping & Sunderland 1992; Patrick & Hansen, 2013).

Most spiders are usually active during warms seasons, like spring and summer (Neimelä et al. 1994; Gibb et al. 2014; Haddad et al. 2015; Nekhaeva 2015). However, spiders with higher winter-actity patterns are reported as well (Aitchison 1984, Boreau de Roicé et al. 2013; Whitey et al. 2014). In part, the main period of activity of males is usually related to the reproductive season (Schmitt et al. 1990; Salvestrini & Gasnier 2001; Clark et al. 2015). In our results it is possible to see both patterns of activity; considering males based phenograms two main patterns seems to present: autumn active males as in *Agyneta* sp. 1 and *Agyneta* sp. 2, and spring active males as in *Neohahnia* sp. 1 and *Neohahnia* sp. 2. However, all species shows the lower activity peaks in the summer.

In the region summer can be a very hot and dry season (Suertegaray & Silva 2009) and in this way not very suitable for reproductive activities or any activity at all, at last for small spider species. Moreover, *Neohahnia* sp. 1 (Fig. 17) and *Agyneta* sp. 2 (Fig. 20) seens to reverse their male activity pattern when grazed and ungrazed plots are compared. This result may be related to some abiotic factor like humidity or temperature resilience (Hatley & Macmahon 1980; Gajdos & Toft 2000; Gibb et al. 2014), wich could induce these species to delay or precipitate reproductive activity depending on the available microhabitat conditions (Jones and Parker 2000; Roberts & Uetz 2005; Moskalik & Uetz 2016).

Futhermore, Linyphiidae species (*Agyneta* sp. 1, *Agyneta* sp. 2 and *Erigone* sp.) seens to be activy trough the whole year, with peaks in autumn and winter; typically, species of erigonnines and linyphiinies have biennial life cycles (Aitchison 1984). These same linyphiids patterns has been registered in many different locations as Canada (Aitchison 1984), UK (Thorbek et al. 2004) and Uruguay (Costa & Simó 2014). However, Topping & Sunderland (1992) found for species of the linyphiids genera *Agyneta* and *Erigone* a higher activity peak in the summer. Despite of been from the same family, phenology is particular outcome of each species (Niemela et al. 1994; Thorbek et al. 2003; Santana 2015; Houser et al. 2016). A wise tip would be prudent and careful with any phenology generalization with these spiders.

ACKNOWLEDGEMENT

We thank the Federal University of Rio Grande do Sul, for providing us with fieldwork infrastructure. This work was supported also by Guilherme Oyarzabal da Silva Masters Scholarship from CAPES, Brazil (process1478689).

LITERATURE CITED

Aitchison, C.W. 1984. The phenology of winter-active spiders. The Journal of Arachnology, 12:249-271.

Alejandro, L., R.A. Distel, S.M. Zalba. 2010. Large herbivore grazing and non-native plant invasion in Montane grassland of central Argentina. Natural Areas Journal, 30(2):148-155. doi: http://dx.doi.org/10.3375/043.030.0203.

Andrade, B.O., C. Kock, I.I. Boldrini, E. Vélez-Martin, H. Hasenack, J.M. Hermann et al. 2015. Grassland degradation and restoration: a conceptual framework of stages and thresholds illustrated by southern Brazilian grasslands. Natureza & Conservação, 0:10. doi: 10.1016/j.ncon.2015.08.002.

Alvarado-Castro, J.A., M.L. Jiménez. 2016. Phenology of the Sonoran desert-endemic populations of *Homalonychus selenopoides* (Araneae: Homalonychidae). The Journal of Arachnology, 44(1):58-64.

Baba, Y.G. & K. Tanaka. 2016. Factors affecting abundance and species composition of generalist predators (Tetragnathaspiders) in agricultural ditches adjacent to rice paddy fields. Biological Control, 32 p. doi: http://dx.doi.org/10.1016/j.biocontrol.2016.09.004.

Barnett, K.L., & S.L. Facey. 2016. Grassland, invertebrates, and precipitation: A review of the effects of climate change. Frontiers in Plant Science, 7:1196.

Battirola, L.D., D.A. Batistella, G.H. Rosado-Neto, A.D. Brescovit, M.I. Masques. 2016. Spider assemblage (Arachnida: Araneae) associated with canopies of *Vochysia divergens* (Vochysiaceae) in the northern region of the Brazilian Pantanal. Zoologia, 33(4): 1-9. doi: 10.1590/S1984-4689zool-20150170.

Beheling, H., V. Jeske-Pieruschka, L.Schüler, V.P. Pillar. 2009. Dinâmica dos campos no sul do Brasil durante o quaternário tardio, Pp. 13-25. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Bella, C.E.D., E. Jacobo, R.A. Golluscio, A.M. Rodriguez. 2014. Effects of cattle grazing on soil salinity and vegetation composition along an elevation gradient in a temperate coastal salt marsh of Sambotombón Bay (Argentina). Wet lands Ecology and Management, 22:1-13.

Bella, C.E.D., A.M. Rodriguez, E. Jacobo, R.A. Golluscio, M.A. Taboada. 2015. Impact of cattle grazing on temperate coastal salt marsh soils. Soil Use and Management, 31:299-307.

Bishop, L. & Riechert, S. E. 1990. Spider colonization of Agroecosystems: Mode and Source. Entomological Society of America, 19:1738-1745.

Brescovit, A.D.,C.A. Rheims,A.B.Bonaldo.2002. Araneomorphae - Chave de identificação para famílias de aranhas brasileiras. Online at: http://pt.scribd.com/doc/123853696/Chave-de-Familias-de-Aranhas.

Bolaños, V.A., M.C. Vecchio, R.A. Golluscio. 2015. Dormición y tipo de suelo como determinantes de La germinación y establecimento de *Chloris berroi* em La Pampa Deprimida. Ecologia Austral, 25:75-80.

Boreau de Roicé C., C. Lavigne, J.F. Mandrin, C. Rollard, W.O.C. Symondson. 2013. Early-season predation on aphids by winter-active spiders in apple orchads revealed by diagnostic PCR. Bulletin of Entomological Reaserch, 103:148-154.

Bulot, A., E. Provost, T. Dutoit. 2016. Refuse pile turnover by harvester ants (Hymenoptera: Formicidae) increases seed density and seedling species richness in dry grasslands. Myrmecological News, 23:91-100.

Carvalho, L.S., N. Sebastian, H.F.P. Araújo, S.C. Dias, E. Venticinque, A.D. Brescovit et al. 2015. Climatic variables do not directly predict spider richness and abundance in semiarid Caatinga vegetation, Brazil. Environmental Entomology, 1-10.

Chatazaki, M. A., Trichas, G. Markakis, M. Mylonas. 1998. Seasonal activity of the ground spider fauna in a Mediterranean ecosystem (Mt Youchtas, Crete, Greece). Proceedings of the 17th European Colloquium of Arachnology, Edinburgh 1997.

Clark, D.L., C.K. Zeef, A. Karson, J.A. Roberts, G.W. Uetz. 2015. Risky courtship: Background contrast, ornamentation and display behavior of wolf spiders affects visual detection by toad predators. Ethology, 122:1-12.

Dassou, A.G., S. Dépigny, E. Canard, F. Vinatier, D. Carval,P. Tixier. 2015. Contrasting effects of plant diversity across arthropod trophic group in plantain-based agroecosystems. Basic and Applied Ecology, 17:11-20.

Dennis, P., J. Skartveit, A. Kunaver, D.I. McCracken. 2015. The response of spider (Araneae) assemblages to structural heterogeneity and prey abundance in sub-montane vegetation modified by conservation grazing. Global Ecology and Conservation, 3:715–728.

Dias, S.C., A.D. Brescovit, E.C.G. Couto, C.F. Martins. 2006. Species richness and seasonality of spiders (Arachnida, Araneae) in an urban Atlantic Forest fragment in Northeastern Brazil. Urban Ecosyst, 9:323–335.

Diaz, S., S. Lavorel, S. McIntyre, V. Falczuk, F. Casanoves, D.G. Milchunas et al. 2007.Plant trait responses to grazing – a globalsynthesis. Global Change Biology 13:313–341.

Dippenaar-Schoeman, A.S. & R. Jocqué.1997. African Spiders: An Indetification Manual. Plant Protection.Research institute Handbook.

Evans, D.M., N. Villar, N.A. Littlewood, R.J. Pakeman, S.A. Evans, P. Dennis et al. 2015.The cascading impacts of livestock grazing in upland ecosystems: a 10-year experiment. Ecosphere, 6(3):1-15.

Ferrando, C.P.,L.R. Podgaiski,M.K. Costa, M.D.S. Mendonça Jr. 2016. Taxonomic and Functional Resilience of Grasshoppers (Orthoptera, Caelifera) to Fire in South Brazilian Grasslands. Neotropical Entomology, 45(4):374-381. doi: 10.1007/s13744-016-0380-3.

Fritz, L.L., E.A. Heinrichs, V. Machado, T.F. Andreis, M. Pandolfo, S.M. Salles, J.V. Oliveira, L.M. Fiuza. 2011. Diversity and abundance of arthropods in subtropical rice growing areas in the Brazilian south. Biodiversity and Conservation 20(10):2211-2224.

Foelix, R.F. 2011.Biology of Spiders. 3. ed. Oxford: Oxford University Press.

Gajdos, P. & S. Toft. 2000. A twenty-year comparison of epigeic spider communities (Aranae) of Danish coastal heath habitats. The Journal of Arachnology, 28:90–96.

Gantchoff, M.G.,J. L. Belant, D.A. Masson. 2014. Land use affects mammal community composition in a multiple-use protected area, East-Central Argentina. Revista Latinoamericana de Conservación, 1:7-13.

Gibb, H. D. Muscat, M.R. Binns, C.J. Silvey, R.A. Peters, D.I. Warton, N.R. Andrew. 2014. Responses of foliage-living spider assemblage composition and traits to a climatic gradient in *Themeda* grasslands. Austral Ecology, 40(3):225-237. doi: 10.1111/aec.12195.

Gómez, J.E. J. Lohmiller, A. Joern. Importance of vegetation structure to the assembly of an aerial web-building spider community in North American open grassland. The Journal of Arachnology, 44(1):28-35. doi: http://dx.doi.org/10.1636/P14-58.1.

Haddad, C.R., S. H. Foord, R. Fourie, A.S. Dippenaar-Schoeman. 2015. Effects of fast-burning spring fire on the ground-dwelling spider assemblages (Arachnida: Araneae) in a central South Africa grassland habitat. African Zoology, 50(4): 281-292. doi: http://dx.doi.org/10.1080/15627020.2015.1088400.

Halaj J., D.W. Ross, A.R. Moldenkel. 1998. Habitat structure and prey availability as predictors of the abundance and community organization of spiders in Western Oregon forest canopies. The Journal of Arachnology, 26:203–220.

Hatley, C.L. & J.A. Macmahon. 1980. Spider community organization: seasonal variation and the role of vegetation architecture. Environmental Entomology, 9(5): 632-639.

Herrmann, J.D., I. Opatovsky, Y. Lubin, T. Pluess, E. Gavish-Regev, M. H. Entling. 2015. Effects of non-native Eucalyptus plantations on epigeal spider communities in thenorthern Negev desert, Israel. The Journal of Aracnology, 43:101–106.

Hertzog, L.R., S.T. Meyer, W.W. Weisser, A. Ebeling. 2016. Experimental manipulation of grassland plant diversity induces complex shifts in aboveground arthropod diversity. PLoS one, 11(2)1-16.doi: 10.1371/journals;pone.0148768.

Hammer, Ø., D.A.T. Harper, P.D. Ryan. 2001. PASt: Paleontological Statistics package for education and data analysis. Paleontologia Eletronica 4(1):1-9.

Houser, J.D., A.H. Porter, H.S. Ginsberg, E.M. Jakob. 2016. Effect of phenology on agonistic competitive interactions between invasive and native sheet-web spiders. Canadian Journal of Zoology, 94:427–434. doi: dx.doi.org/10.1139/cjz-2015-0221

Horváth, R., T. Magura, C. Szinetár, B. Tóthemérész. 2009. Spiders are not less diverse in small and isolated grasslands, but less diverse in overgrazed grasslands: A field study (East Hungary, Nyérség). Agriculture, Ecosystems and Environment 130:16–22.

Horváth, R., T. Magura, C. Szinetár, J. Eichardt, É. Kovács, B. Tóthmérész. 2015. In stable, unmanaged grasslands local factors are more important than landscape-level factors in shaping spider assemblages. Agriculture, Ecossystems and Environment, 208:106-113.

Inmet – Istituto Nacional de Metereologia. 2015. Boletim climático – agosto – setembro – outubro. Estado do Rio Grande do Sul, 13(07):1-6. Online at: http://www.inmet.gov.br/portal/portal_antigo/clima/prog_clima_rs/pdf/bol_jul2015.pdf.

Inmet – Istituto Nacional de Metereologia. 2015. Boletim climático – setembro – outubro – novembro. Estado do Rio Grande do Sul, 13(08):1-6. Online at: http://www.inmet.gov.br/portal/portal_antigo/clima/prog_clima_rs/pdf/bol_ago2015.pdf.

Inmet – Istituto Nacional de Metereologia. 2015. Boletim climático – novembro – dezembro – janeiro. Estado do Rio Grande do Sul, 13(10):1-6. Online at: http://www.inmet.gov.br/portal/portal_antigo/clima/prog_clima_rs/pdf/bol_out2015.pdf

Kamali, F.P., M.P.M. Meuwissen, A.G.J.M.O. Lansink. 2014. Evaluation of beef sustainability in conventional, organic, and mixed crop-beef supply chains. Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector, 1-11.

Kaspari, M., M.D. Weiser. 1999. The size–grain hypothesis and interspecific scaling in ants. Functional Ecology, 13: 530–538.

Kottek M.; J. Griser,C. Beck,B. Rudolf,F. Rubel. 2006. World map of the Köppen-Geiger climate classification updated. Meteorologische Zeitschrift,15(3):259-263.

Laws, A.N. & A. Joern. 2015. Predator–prey interactions are context dependent in a grassland plant–grasshopper–wolf spider food chain. Environmental Entomology, 1–10. doi: 10.1093/ee/nvv033

Liljesthröm, G., E. Minervino, D. Castro, A. Gonzalez. 2002. La comunidade de arañas del cultivo de soja em la província de Buenos Aires, Argentina. Neotropical Entomology, 31(2):197-209.

Lin, S., L. Vasseur, M., S. You. 2016. Seasonal Variability in Spider Assemblages in Traditional and Transgenic Rice Fields. Environmental Entomology, 0:1–10.doi: 10.1093/ee/nvw00.

Lubin, Y.D. 1978. Seasonal abundance and diversity of web-building spiders in relation to habitat structure on Barro Colorado Island, Panama. The Journal of Arachnology, 6:31–51.

Machado, I.C.S., L.M. Barros, E.V.S.B. Sampaio. 1997. Phenology of Caatinga species at Serra Talhada, PE, northeastern Brazil. Biotropica, 29:57-68.

McDonald, B. 2007. Effects of vegetation structure on foliage dwelling spider assemblages in native and non-native Oklahoma grasslands habitats. Proceedings of the Oklahoma Academy of Science, 87:85-88.

Modernel, P., W.A. Rossing, M. Corbeels, S. Dogliotti, V. Picasso, P. Tittonell. Land use change and ecosystem service provision in Pampas and Campos grasslands of southern South America. Environmental Reaserch Letters, 11:1-21. doi: 10.1088/1748-9326/11/11/113002.

Nabinger, C., E.T. Ferreira, A.K. Freitas, P.C.F. Carvalho, D.M. Sant'Anna. 2009. Produção animal com base no campo nativo: aplicações de resultados de pesquisa, Pp. 175–198. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Nekhaeva, A.A. 2015. Spider (Arachnida, Aranei) assemblages of some habitats from Kola gulf coast: Phenological aspect. Entomological Review, 95(4):544-556.

Niba, A.S. &I. Yekwayo. 2016. Epiganic invertebrate community structure in two subtropical nature reserves, Eastern Cape, South Africa: Implications for conservation management. ArachnologischeMitteilungen, Arachnology Letters, 52: 7-15.

Niemela, J. T. Pajunen, Y. Haila, P. Punttila, E. Halme. 1994. Seasonal activity of boreal forest-floor spiders (Araneae). The Journal of Arachnology, 22:23–31.

Nogueira, A.A. & R. Pinto-da-Rocha. 2016. The effects of habitat size and quality on the orb-weaving spider guild (Arachnida: Araneae) in an Atlantic Forest fragmented landscape. The Journal of Arachnology, 44:36–45.

Ott, R. 2016. Invertebrados terrestres – Aranhas; Pp. 46-47. *In* Moura L.A., L. Chomenko, M.A. Azevedo. Natureza em Revista, 14, RS Biodiversidade, Porto Alegre: Fundação Zoobotânica do Rio Grande do Sul.

Overbeck, G.E., S.C. Müller, A. Fidelis, J. Pfadenhauer, V.D. Pillar, C.C. Blancoet al., 2007. Brazil's neglected biome: the SouthBrazilian Campos. Perspectives in Plant Ecology, Evolution and Systematics, 9:101–116.

Overbeck, G.E., J. Hermann, B.O. Andrade, I.I. Boldrini, K. Kiehl, A. Kirmer et al., 2013. Restoration ecology in Brazil – time to step out of the forest. Natureza & Conservação, 11, 92–95.

Pallarés, O.R.,E.J. Berretta, G.E. Maraschin.2005. The South American campos ecosystem, Pp. 171-219.*In*: Suttie, J., S.G. Reynolds, C. Batello. Grasslands of the World. FAO, Rome.

Pelegrini, C.B., R.B. Medeiros, S.B. Carlotto, R.P.A. Garcia, C.V. Lisboa, G. Bruning. 2016. Valor nutritivo de uma pastagem nativa dominada por *Eragrotis plana* Nees e sua relação com o perfil metabólico de vacas primíparas suplementadas da gestação ao pós-parto. Ciência Animal Brasileira, 17(20):154-163.

Petcharad, B., T. Miyashita, G.A. Gale, S. Sotthibandhu, S. Bumrungsri. 2016. Spatial patterns and environmental determinants of community composition of web-building spiders in understory across edges between rubber plantations and forests. The Journal of Arachnology 44:182–193.

Peters, V.E., K.U. Campbell, G. Dienno, M. García, E. Leak, C. Loyke et al. 2016. Ants and plants as indicators of biodiversity, ecosystem services, and conservation value in constructed grasslands. Biodiversity and Conservation, 1-21. doi: 10.1007/s10531-016-1120-z.

Peterson, J. A., J.J. Obrycki, J.D. Hardwood. 2016. Spiders from multiple functional guilds are exposedto Bt-endotoxins in transgenic corn fields via preyand pollen consumption. Biocontrol Science and Technology, 26(9):1230–1248.

Pfister, S.C., R.B. Schäfer, J. Schirmel, M.H. Entling. 2015. Effects of hedgerows and riparian margins on aerial web-building spiders in cereal fields. The Journal of Arachnology, 43:400–405.

Pinto, C.E.; J.A.S. Fontoura Jr., A. Frizzo, T.M.S. Freitas, C. Nabinger, P.C.F. Carvalho. 2008. Produções primária e secundária de uma pastagem natural da Depressão Central do RS submetida a diversas ofertas de fitomassa aérea total. Revista Brasileira de Zootecnia 37:1737–1741.

Podgaiski, L.R., F. Joner, S. Lavorel, M. Moretti, S. Ibanez, M.S. Mendonça Jr. et al. 2013. Spider trait assembly patterns and resilience under fire-induced vegetation change in south Brazilian Grasslands. PLoS ONE 8(3):1-11. doi:10.1371/journal.pone.0060207.

Podgaisk, L.R., C.S. GoldaS, C.P.R. Ferrando, F.S. Silveira, F. Joner, G.E. Overbeck et al. 2014. Burning effects on detritivory and litter decay in *Campos* grasslands. Austral Ecology, 39:686–695.

Polchaninova, N., G. Savchenko, A. Drogvalenko, V. Ronkin, D. Shabanov. 2016. The impact of cattle grazing on cursorial spiders (Aranei) and true bugs (Heteroptera) in steppe gullies of northeastern Ukraine. Agriculture, Ecosystems & Environment, 234:65-71.

Pryke, J.S., F.R. Roets, M.J. Samways. 2016. Wild herbivore grazing enhances insect diversity over livestock grazing in an African grassland system. PLoS ONE, 11(10):1-15. doi: 10.1371/journal.pone.0164198.

Rodrigues, E.N.L., M.S. Mendonça Jr, R. Ott. 2009. Spider diversity in a rice agroecosystem and adjacent areas in southern Brazil. Revista Colombiana de Entomología, 35:78-86.

Rodrigues, E.N.L., M.S. Mendonça Jr, J.L.O. Rosado, A.E. Loeck. 2010. Soil spiders in differing environments: *Eucalyptus* plantations and grasslands in the Pampa biome, southern Brazil. Revista Colombiana de Entomología, 36(2):277-284.

Rodrigues, E.N.L., M.S. Mendonça Jr, L.E. Costa-Schimidt. 2014. Spider diversity responds strongly to edge effects but weakly to vegetation structure in riparian forests of Southern Brazil. Arthropod-PlantInteractions, 8:123–133. doi: 10.1007/s11829-014-9294-3.

Rodriguez-Artigas, S.M., R. Ballester, J.A. Corronca. 2016. Factors that influence the beta-diversity of spider communities in northwestern Argentinean Grasslands. PeerJ 4:e1946. doi: 10.7717/peerj.1946.

Ruviaro, C.F., J.S. Costa, T.J. Florindo, W. Rodrigues, G.I.B. Medeiros, P.S. Vasconcelos. 2016. Economic and environmental feasibility of beef production in different feed management systems in the Pampa biomes, southern Brazil. Ecological Indicators, 60:930-939.

Salvestrini, F.M.D. & T.R. Gasnier. 2001. Differences in the activity of juveniles, females and males of two hunting spiders of genus *Ctenus* (Aranea, Ctenidae): Active males or inactive females? The Journal of Arachnology, 29:276-278.

Santana, R.C. 2015. Community structure and composition of litter spiders (Arachnida: Araneae) and influence of macro-climatic factors on Parque Ecológico Jatobá Centenário, Morrinhos, Goiás, Brazil. Journal of Threatened Taxa, 7(10):7612-7624. doi: 10.11609/JoTT.o4030.7612-24.

Schmitt, A., M. Schuster, F.G. Barth. 1990. Daily locomotor activity patterns in three species of *Cupiennius* (Araneae, Ctenidae): The males are the wandering spiders. The Journal of Arachnology, 18:249-255.

Silvey C.J., M.W. Hayward, H. Gibb. 2015. Effects of reconstruction of a pre-European vertebrate assemblage on ground-dwelling arachnids in arid Australia. Oecologia, 178:497–509. doi: 10.1007/s00442-014-3189-y.

Simó, M., V. Vázquez, G. Useta. 2000. Estudio comparativo de la fenología y hábitat de Ctenus taeniatus Keyserling y Asthenoctenus borellii Simon (Araneae, Ctenidae). Bol. Soc. Zool. Uruguay, 12:32-40.

Slade, E.M., T. Reiutta, T. Roslin, H.L. Tuomisto. 2016. The role of dung beetles in reducing greenhouse gas emissions from cattle farming. Scientific Reports, 6:1-9. doi: 10.1038/srep18140.

Soares, A.B.,P.C.F. Carvalho, C. Nabinger, J.P.P. Trindade, J.K. Trindade, J.C. Mezzalira. 2011. Dinâmica da composição botânica numapastagem natural sob efeito de diferentes ofertas de forragem.Ciência Rural, 41:1459–1465.

Souza, A.L.T. 2007. Influência da estrutura do habitat na abundância e diversidade de aranhas; Pp. 25-44. *In* Gonzaga, M.O., A.J. Santos, H.F. Japyassú. Ecologia e comportamento de aranhas. Rio de Janeiro, Interciência Editora.

Spiller, D.A. & T.W. Schoener. 1998. Lizard reduce spider species richness by excluding rare species. Ecology, 79:503-516.

Suertegaray, D.M.A & L.A.P. Silva. 2009. Tchê Pampa: histórias da natureza gaúcha, Pp. 42-59. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Swift, M.J., O.W. Heal, J.M. Anderson. 1979. Decomposition in terrestrial ecosystems. Blackwell Scientific Publications, London.

Sylvain, Z.A., D.H. Wall, K.L. Cherwin, D.P. Peters, L.G. Reichmann, O.E. Sala. 2014. Soil animal responde to moisture availability are largely scale, not ecosystem dependent: insight from a cross-site study. Global Change Biology, 20:2641-2643. doi: 10.1111/gcb.12522.

Thorbek, P., K.D. Sunderland, C.J. Topping. 2003. Eggsac development rates and phenology of agrobiont linyphiid spiders in relation to temperature. Entomologia Experimentalis et Applicata, 109:89–100.

Uetz, G.W. & J.D. Unzicker.1976. Pitfall Trapping in Ecological Studies of Wandering Spiders. The Journal of Arachnology. 3:101-111.

Uetz, G.W., J. Halaj, A.B. Cady. 1999. Guild structure of spiders in major crops. The Journal of Arachnology, 27:270–280.

Van Klink, R., C. Rickert, R. Vermeulen, O. Vorst, M.F. WallisDeVries, J.P. Bakker. 2013. Grazed vegetation mosaics do not maximize arthropod diversity: evidence from salt marshes. Biological Conservation, 164:150–157.

Van Klink, R., F. van der Plas, C.G.E. van Noordwijk, M.F. WallisDeVries, H. Olffi. 2015. Effects of large herbivores on grassland arthropod diversity. Biological Reviews 90:347–366. doi: 10.1111/brv.12113

Vélez, E., L. Chomenko, W. Schaffer, M. Madeira. 2009. Um panorama sobre as iniciativas de conservação dos Campos Sulinos, Pp. 356-379. *In* Pillar, V.P., S.C. Müller, Z.M.S. Castilhos, A.V.A. Jacques. Campos sulinos: conservação e uso sustentável da biodiversidade, 1° edition, Brasília: MMA.

Whitney, T.D., B.N. Philip, J.D. Hardwood. 2014. Tradoff in two winter-active wolf spiders: Increased mortality for increased growth. Entomologia Experimentalis et Applicata, 153:191–980.

Winck, B.R., E.L.S. Sá, V.M. Rigotti, M. Chauvat. Relationship between land-use types and functional diversity of epigeic Collembola in Southern Brazil. Applied Soil Ecology, 109:49–59.

Wise, D.H. 2006. Cannibalism, food limitation, intraspecific competition, and the regulation of spider populations. Annual Review of Entomology, 51:441–65. doi: 10.1146/annurev.ento.51.110104.150947.

Woodcock, B.A., R.F. Pywell, D.B. Roy, R.J. Rose, D. Bell. 2005. Grazing management of calcareous grasslands and its implications for the conservation of beetle communities. Biological Conservation 125: 193–202.

World Spider Catalog. 2017. World Spider Catalog. Version 17.5.Natural History Museum Bern.Online at: http://www.wsc.nmbe.ch/.

SUPPLEMENTAL MATERIAL

Figura 12 – Pitfall traps used to collect ground spiders at APA do Ibirapuitã, used in May, September and November of 2015 and February of 2016. A – PVC guide. B – Trap filled with formal 2%.

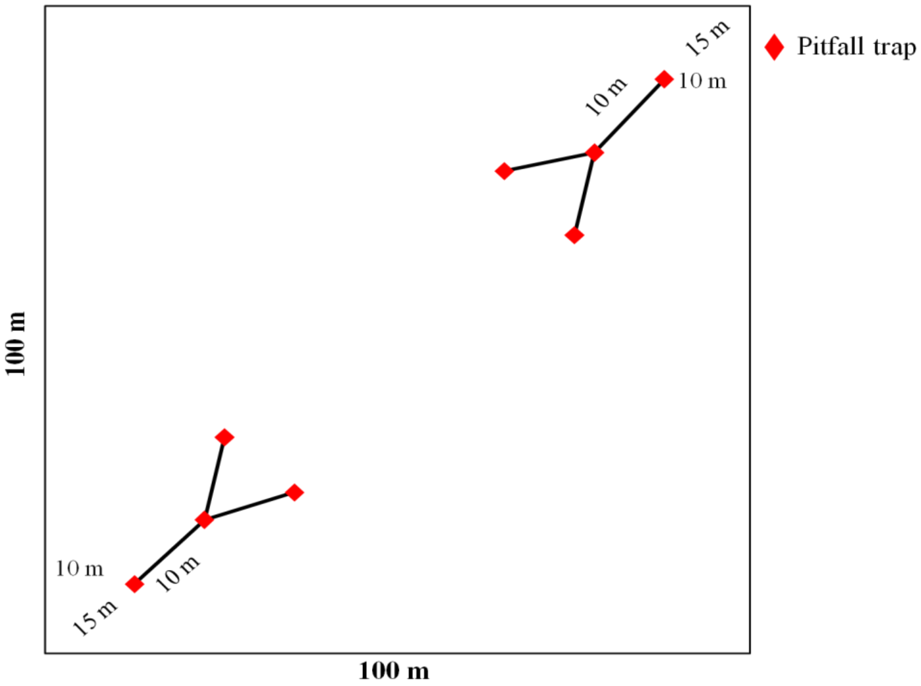

Figura 13 – Format used for exposal of pitfall traps in APA do Ibirapuitã during the campaign of 2015 and 2016. Red diamonds represent traps.

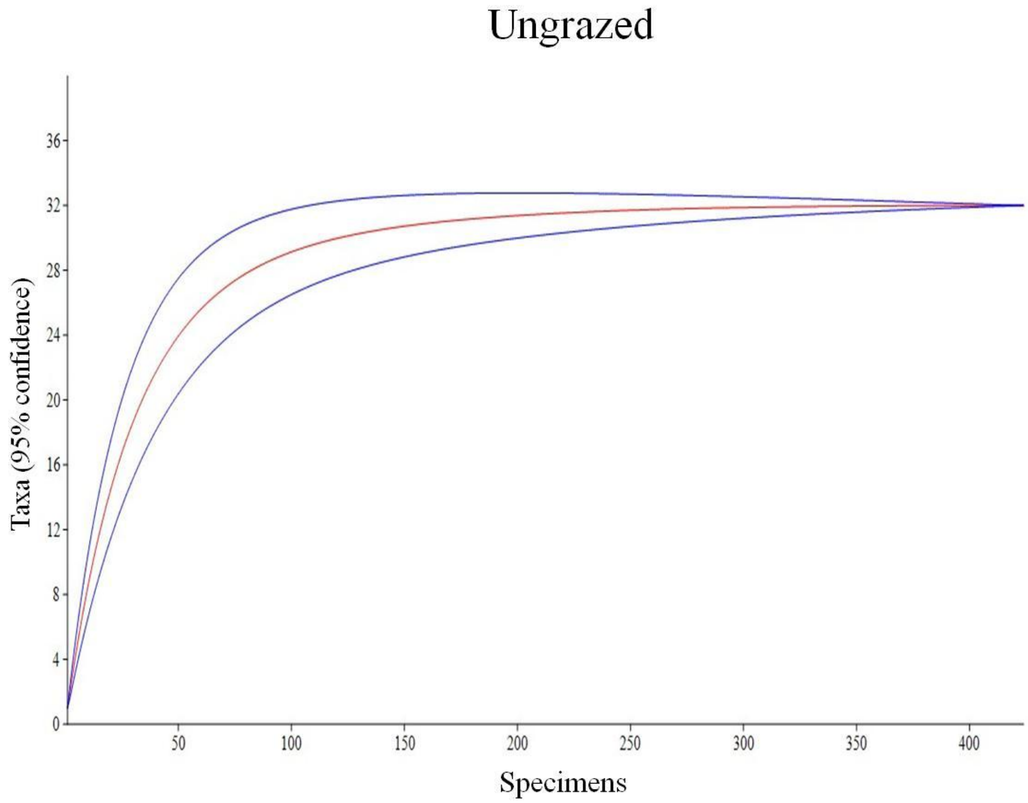

Figura 14 – Richness based rarefaction curves for spiders in grazed plots trough seasons of 2015 and 2016. Adjacent lines indicates 95% confidence intervals.

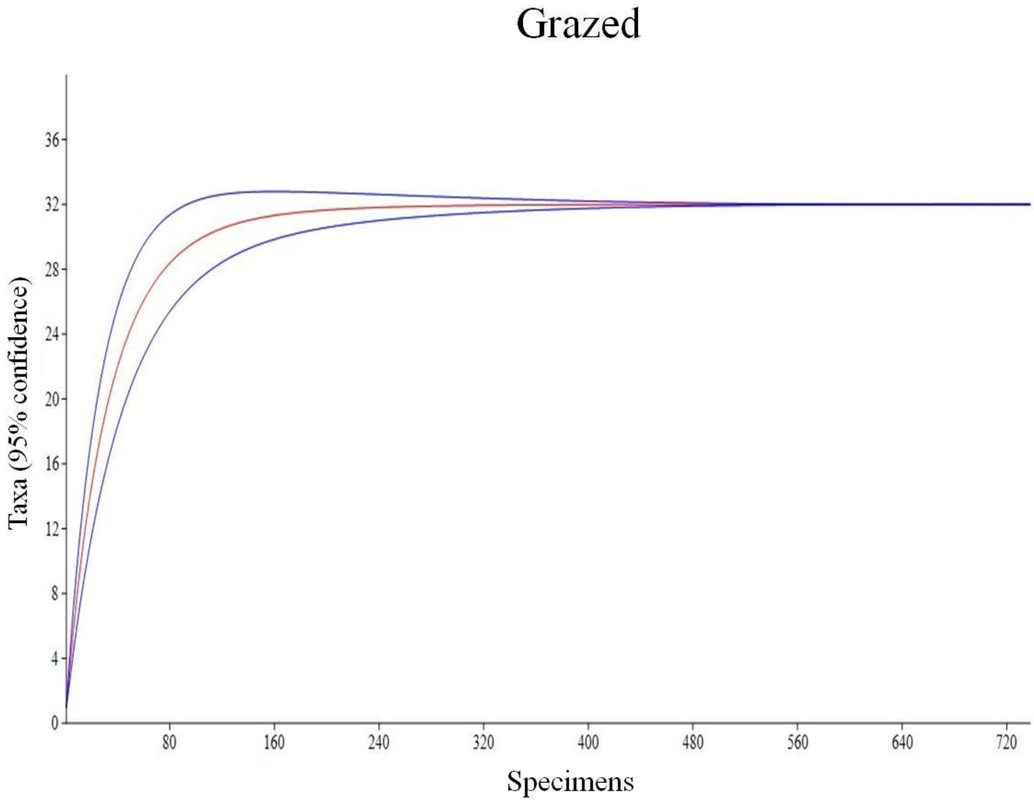

Figura 15 – Richness based rarefaction curves for spiders in ungrazed plots trough seasons of 2015 and 2016. Adjacent lines indicates 95% confidence intervals.

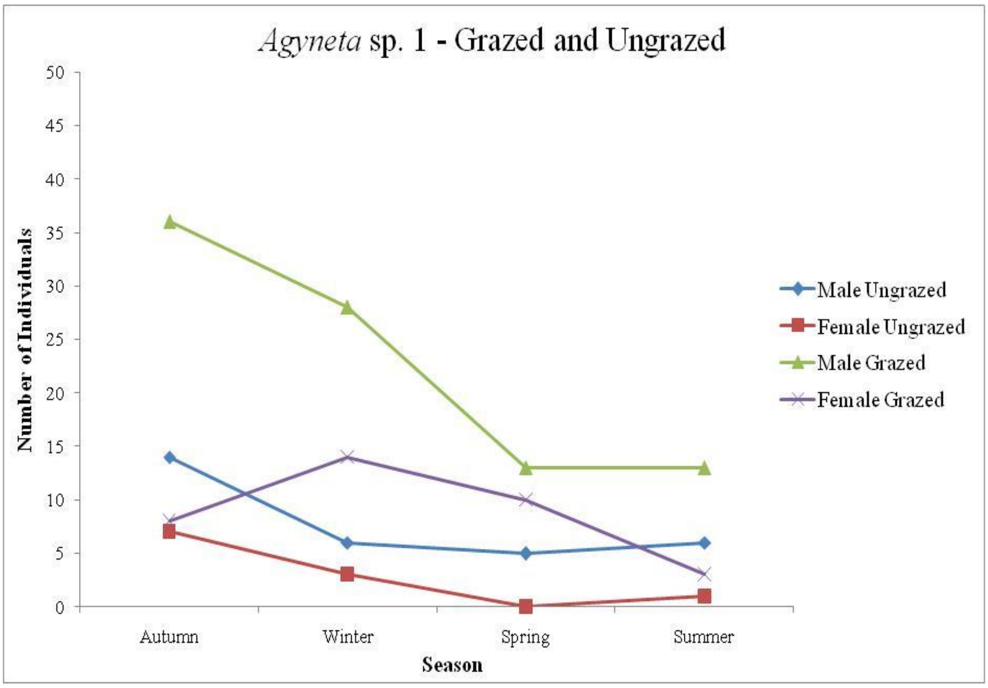

Figura 16 – *Agyneta* sp. 1 phenology curve. Each line demonstrate male or female abundance trough season in grazed and ungrazed plots.

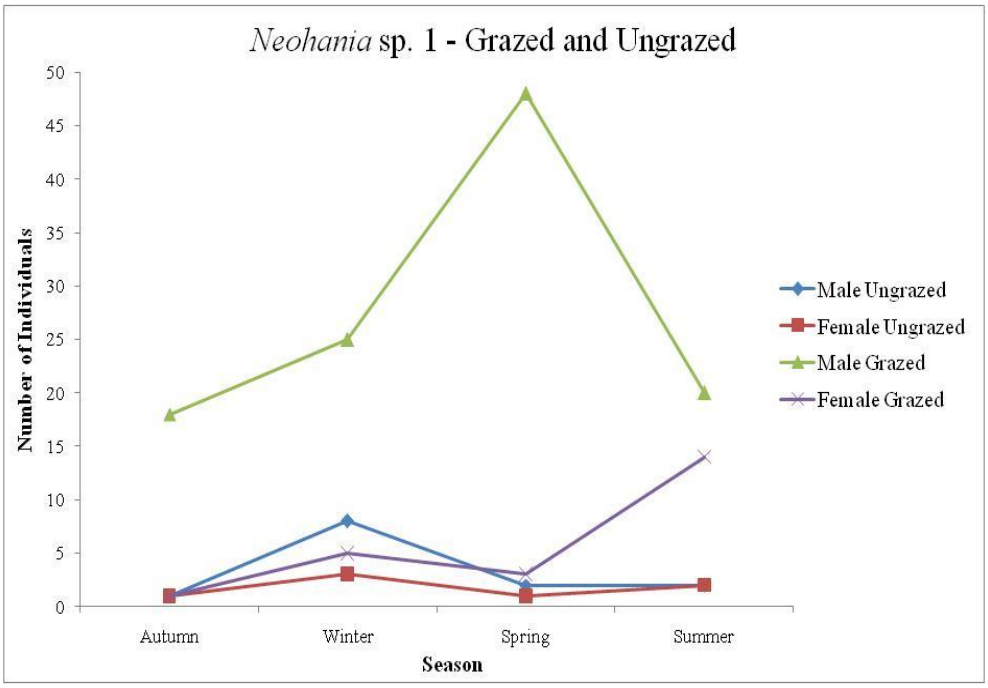

Figura 17 – *Neohania* sp. 1 phenology curve. Each line demonstrate male or female abundance trough season in grazed and ungrazed plots.

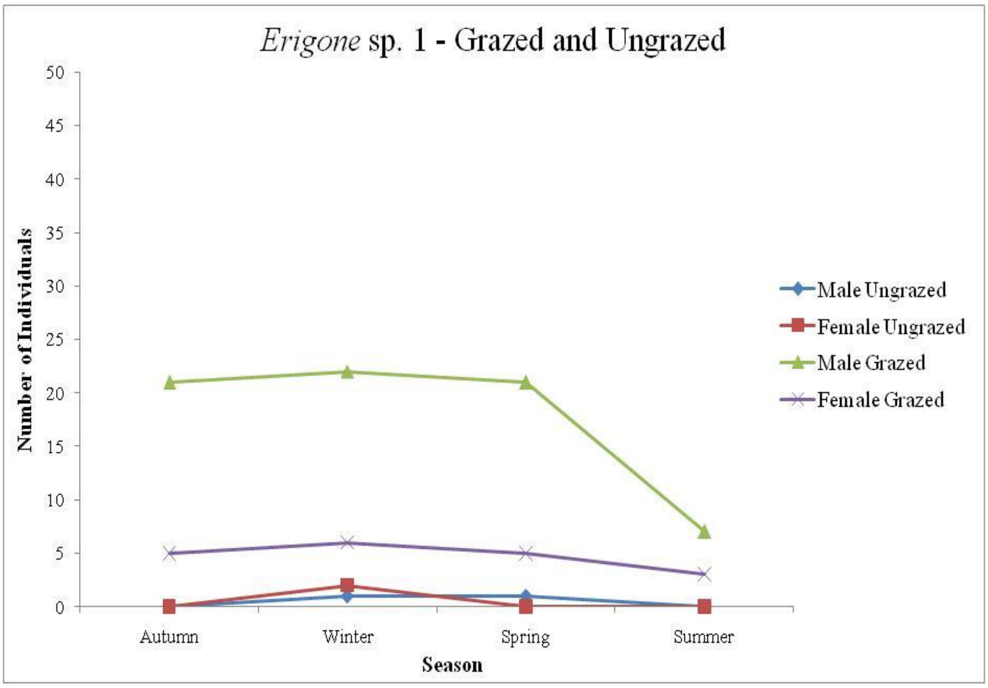

Figura 18 – *Erigone* sp. 1 phenology curve. Each line demonstrate male or female abundance trough season in grazed and ungrazed plots.

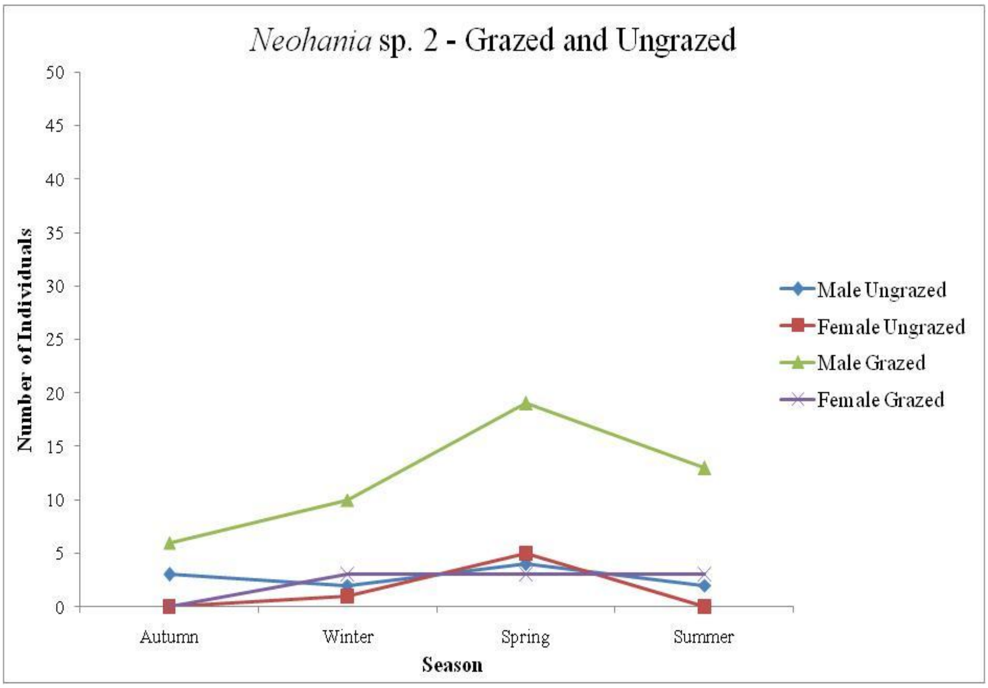

Figura 19 – *Neohania* sp. 2 phenology curve. Each line demonstrate male or female abundance trough season in grazed and ungrazed plots.

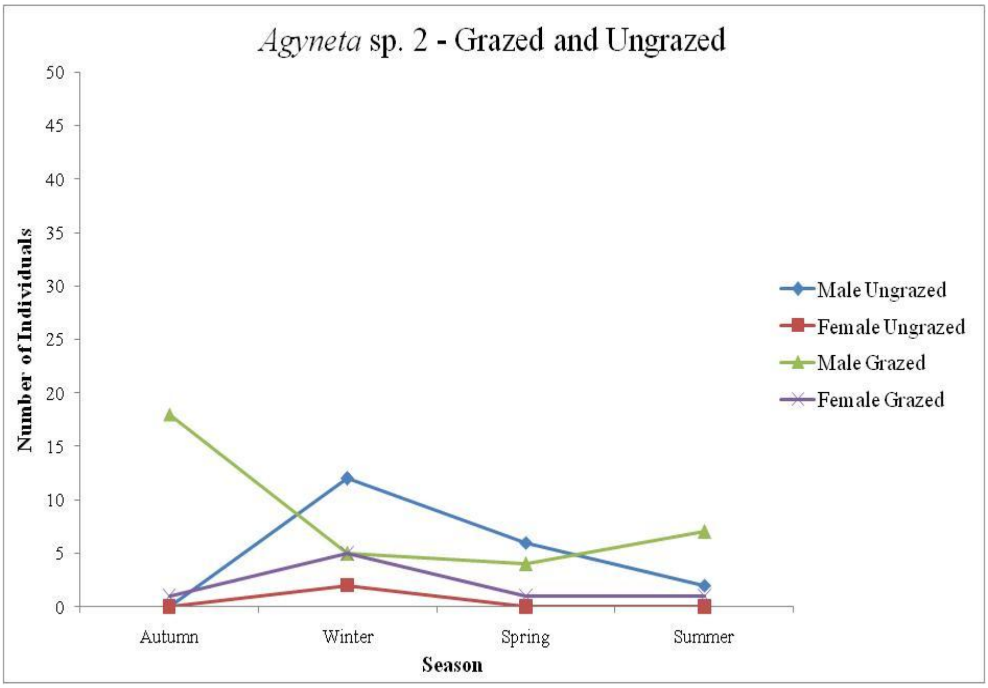

Figura 20 – *Agyneta* sp. 2 phenology curve. Each line demonstrate male or female abundance trough season in grazed and ungrazed plots.

Tabela 5 – Ground dweling spider species of Pampa biome, southern Brazil. Species listed here are from Autumn (Aut, May), Winter (Win, Sep), Spring (Spr, Nov) of 2015 and Summer (Sum, Feb) of 2016. Taxa are separate in families, genus and species. Numbers indicate the quantity of individuals, males and females. Juveniles identified only at family level and totals, indicated as adult/juveniles.

	Grazed				**Ungrazed**				
Taxa	**Aut**	**Win**	**Spr**	**Sum**	**Aut**	**Win**	**Spr**	**Sum**	**Total**
Actinopodidae	0	0	0	0	0	0	0	0	**1/0**
Actinopus sp.	0	0	0	1	0	0	0	0	**1**
Amaurobiidae	1	0	0	0	0	0	0	0	**0/1**
Amphinectidae	0	0	0	1	1	7	3	1	**29/13**
Metaltella simoni Keyserling, 1878	0	2	2	2	1	13	6	3	**29**
Anyphaenidae	0	0	0	1	0	0	2	2	**7/5**
Arachosia sp.	0	0	0	1	0	2	2	0	**5**
Gen? sp. 1	0	0	0	0	0	0	0	2	**2**
Araneidae	1	4	0	4	3	9	8	2	**1/31**
Alpaida sp.	0	1	0	0	0	0	0	0	**1**
Corinnidae	0	1	2	1	5	2	0	1	**26/12**
Castianeira chrysura Mello-Leitão, 1943	1	1	6	1	0	1	2	0	**12**
Castianeira gaucha Mello-Leitão, 1943	0	0	0	0	9	2	1	2	**14**
Ctenidae	1	0	6	3	2	2	2	19	**24/35**
Asthenoctenus borellii Simon, 1897	0	0	0	0	0	0	2	3	**5**
Isoctenus minusculus (Keyserling, 1891)	3	0	0	0	5	0	0	0	**8**
Parabatinga brevipes (Keyserling, 1891)	1	2	0	0	1	5	0	2	**11**
Gnaphosidae	0	0	0	1	0	1	4	2	**7/8**
Apopyllus iheringi (Mello-Leitão, 1943)	0	0	2	0	0	0	0	0	**2**
Apopyllus sp.	0	0	0	1	0	0	0	0	**1**
Camillina pulchra (Keyserling, 1891)	0	0	2	0	0	0	1	0	**3**
Echemos sp.	1	0	0	0	0	0	0	0	**1**
Hahniidae	3	0	5	5	0	1	1	4	**254/19**
Gen? sp. 1	0	1	0	0	0	6	0	0	**7**
Neohania sp. 1	19	30	51	34	2	11	3	4	**154**
Neohania sp. 2	6	13	22	16	3	3	9	2	**74**
Neohania sp. 3	1	1	0	0	1	15	1	0	**19**
Idiopidae	0	0	0	0	1	0	0	0	**1**
Linyphiidae	27	45	20	3	23	13	17	6	**522/154**
Agyneta sp. 1	44	42	23	16	21	9	5	7	**167**
Agyneta sp. 2	19	10	5	8	0	14	6	2	**64**
Erigone sp. 1	26	28	26	10	0	3	1	0	**94**
Erigone sp. 2	0	1	0	3	0	0	0	0	**4**
Fissiscapus pusillus Millidge, 1991	0	0	1	0	0	0	0	0	**1**
Labicymbium sp. 1	0	3	0	0	0	1	0	0	**4**
Labicymbium sp. 2	3	1	2	0	0	2	0	2	**10**
Laminacauda sp. 2	0	0	0	0	0	0	1	0	**1**
Moyosi sp. 1	2	0	6	0	1	1	1	1	**12**
Moyosi sp. 2	1	0	0	0	0	0	0	0	**1**
Neomaso sp. 2	3	3	5	0	4	4	10	5	**34**
Neomaso sp. 4	0	1	1	0	0	9	12	5	**28**

Pseudotyphistes sp. 1	0	0	0	1	2	1	2	1	**7**
Pseudotyphistes sp. 2	0	0	0	0	0	0	1	0	**1**
Psilocymbium lineatum (Millidge, 1991)	6	6	0	3	0	1	2	0	**18**
Scolecura parilis Millidge, 1991	0	1	0	0	4	1	1	0	**7**
Sphecozone sp. 1	2	1	0	0	0	0	0	0	**3**
Sphecozone sp. 2	0	1	0	0	0	0	0	0	**1**
Tutaibo aff. *phoeniceus*	3	1	5	1	1	1	0	0	**12**
Tutaibo sp. 1	5	9	15	0	3	5	3	2	**42**
Tutaibo sp. 2	0	3	0	1	0	0	0	0	**4**
Tutaibo sp. 3	0	0	1	0	0	0	0	0	**1**
Vesicapalpus sp.	0	0	0	0	1	3	0	2	**6**
Lycosidae	30	24	43	48	18	19	29	16	**78/227**
Allocosa sp.	0	0	1	0	0	0	0	0	**1**
Birabenia sp. 1	0	0	2	0	2	0	3	0	**7**
Birabenia vittata (Mello-Leitão, 1945)	0	1	0	0	0	0	0	0	**1**
Hogna bivittata (Mello-Leitão, 1939)	0	2	0	0	0	0	0	0	**2**
Lobizon humilis (Mello-Leitão, 1944)	0	1	1	0	3	6	3	1	**15**
Lycosa erythrognatha Lucas, 1836	1	0	0	1	0	0	0	0	**2**
Lycosa sp. 1	1	0	0	0	0	0	0	0	**1**
Lycosa thorelli (Keyserling, 1877)	0	0	1	6	0	0	0	0	**7**
Gen? sp. 1	0	0	0	1	0	0	0	0	**1**
Gen? sp. 2	1	0	0	0	0	0	0	0	**1**
Gen? sp. 3	0	0	2	0	0	5	3	0	**10**
Navira naguan Piancentini & Grismado, 2009	0	0	2	0	0	0	0	0	**2**
Schizocosa malitiosa (Tullgren, 1905)	9	2	7	5	0	0	2	1	**26**
Trochosa sp.	0	0	0	2	0	0	0	0	**2**
Microstigmatidae	0	0	0	0	0	0	0	0	**1/0**
Xenomesia platensis Goloboff, 1989	0	0	0	0	0	1	0	0	**1**
Miturgidae	7	4	5	6	4	2	3	2	**12/33**
Teminius insularis (Lucas, 1857)	0	0	8	4	0	0	0	0	**12**
Mysmenidae	0	0	0	0	0	0	0	0	**1/0**
Mysmena sp.	0	0	0	0	1	0	0	0	**1**
Nesticidae	0	0	0	0	0	0	0	0	**1/0**
Nesticus sp.	0	0	0	0	0	1	0	0	**1**
Oonopidae	0	1	0	0	2	2	4	3	**3/12**
Neotrops aff. *tucumanus*	0	0	0	0	2	0	0	0	**2**
Opopaea concolor (Blackwall, 1859)	0	0	0	0	1	0	0	0	**1**
Oxyopidae	0	0	2	0	1	1	0	0	**8/4**
Oxyopes salticus Hentz, 1845	0	3	0	3	0	0	0	2	**8**
Palpimanidae	0	0	0	0	0	0	0	0	**1/0**
Otiothops birabeni Mello-Leitão, 1945	0	0	1	0	0	0	0	0	**1**
Philodromidae	0	0	1	0	0	0	0	0	**0/1**
Pholcidae	0	0	0	1	0	0	0	0	**0/1**
Phrurolithidae	0	0	0	0	0	0	3	0	**5/3**
Orthobula sp.	1	0	1	1	0	0	1	1	
Salticidae	0	2	1	4	0	1	2	1	**18/11**

aff. *Phiale* sp.	0	0	1	0	0	0	0	0	**1**
Mopiopia sp.	0	0	0	1	0	0	0	0	**1**
Neonella montana Galiano, 1988	0	0	0	2	0	0	0	0	**2**
Gen? sp. 1	0	0	0	1	0	0	0	0	**1**
Gen? sp. 2	0	0	0	1	1	0	0	0	**2**
Gen? sp. 3	0	0	0	0	1	0	0	0	**1**
Gen? sp. 5	0	0	0	1	0	0	0	0	**1**
Gen? sp. 6	0	1	0	0	0	0	0	0	**1**
Gen? sp. 7	0	0	0	0	0	0	0	1	**1**
Sarinda nigra Peckham & Peckham, 1892	0	1	0	0	0	0	0	0	**1**
Semiopyla cataphracta Simon, 1901	0	0	0	1	0	0	5	0	**6**
Tengelidae	1	0	0	0	4	4	5	0	**0/14**
Tetragnathidae	1	0	0	0	4	4	5	0	**41/14**
Glenognatha lacteovittata (Mello-Leitão, 1944)	1	2	0	0	10	11	14	3	**41**
Theridiidae	7	5	2	8	26	22	9	8	**111/87**
Dipoena pumicata (Keyserling, 1886)	3	3	1	0	1	2	2	1	**13**
Episinus sp. 1	0	0	0	0	0	0	1	0	**1**
Episinus sp. 2	0	0	0	1	0	0	0	1	**2**
Euryopis camis Levi, 1963	2	5	0	1	0	0	0	0	**8**
Euryopis sp. 1	2	1	0	2	0	0	0	0	**5**
Euryopis sp. 2	0	0	0	0	0	1	1	0	**2**
Euryopis sp. 3	1	1	0	1	0	0	0	0	**3**
Euryopis spinifera (Mello-Leitão, 1944)	2	3	4	4	0	0	0	0	**13**
Guaraniella mahnerti Baert, 1984	9	4	7	3	10	6	3	5	**47**
Steatoda ancorata (Holmberg, 1876)	0	0	0	1	0	0	0	0	**1**
Styposis selis Levi 1964	1	1	0	0	0	3	1	1	**7**
Theridion sp.	0	1	0	0	0	1	0	0	**2**
Thymoites piratini Rodrigues & Brescovit, 2015	1	3	1	1	0	0	1	0	**7**
Thomisidae	0	0	0	0	1	1	2	1	**3/5**
Tmarus sp.	0	0	0	0	0	2	0	1	**3**
Trachelidae	0	0	1	0	0	0	0	1	**8/2**
Gen? sp. 1	1	0	0	0	0	2	0	0	**3**
Gen? sp. 2	0	1	0	0	4	0	0	0	**5**
Juveniles not identified	0	10	5	6	5	32	19	5	**82**
Total	**261**	**294**	**308**	**235**	**195**	**277**	**112**	**137**	**1928**

CONSIDERAÇÕES FINAIS

Contrariando nossas hipóteses, não houve diferença significativa entre as áreas com pastejo e sem pastejo. As áreas de exclusão do gado, não demonstraram maior riqueza e abundância de aranhas. Contudo, seria precoce afirmar que este resultado permanecerá o mesmo dando-se continuidade à retirada do gado das áreas.

Muitos trabalhos afirmam que o pastoreio do gado, se mantido de maneira moderada, aumenta a complexidade vegetal e consequentemente, a complexidade da fauna, devido à estrita ligação desta com a vegetação. Contudo, foi empiricamente observado que as áreas fechadas também apresentam alta complexidade de vegetação, com arbustos e gramíneas que se diferenciam, principalmente em relação à altura, das áreas com pastejo. Desta forma, o argumento da complexidade vegetal também haveria de ser usado para a remoção total ou parcial do pastejo. Infelizmente, dados de diversidade e abundancia da flora não foram levantados para que corrobora-se com os dados apresentados neste trabalho.

Ressaltamos que as áreas sem pastejo são pequenas (1 ha), em pouco número (apenas três), distantes uma da outra e cercadas por vastos campos pastejados. Assim, as áreas de exclusão, mesmo se mantidas desta forma, provavelmente, nunca serão estritamente diferentes das áreas sem exclusão. Mesmo levando em consideração a Size-Grain Hypotheses citada nos artigos, com a rugosidade da vegetação aumentada, o efeito de borda sempre estará presente, permitindo espécies das áreas pastejadas permanecerem com certa abundancia nas áreas sem pastejo. A dispersão (emigração/imigração), própria de cada grupo taxômico ou espécie, sempre influenciara na abundancia destes organismos.

A exclusão do gado ainda é recente, ocorrendo a partir de Agosto de 2012. Tendo apenas pouco menos de quatro anos de exclusão, o ambiente ainda em modificação e auto-regeneração. Portanto, consideramos que os estudos sobre a exclusão do pastejo ainda devem ser aprimorados, com levantamentos anuais da fauna, além da expansão das áreas sem pastejo, aumentando as que já existem e adicionando novas áreas a pesquisa. Ademais, uma meta-análises envolvendo a fauna e a flora se faz urgente. Sem isto, uma visão geral e mais acurada sobre ausência do gado no Pampa não é possível.

ANEXO

Figura 21 – Localização da APA do Ibirapuitã no Rio Grande do Sul, Brasil. APA localizada nos municípios de Alegrete, Quaraí, Rosário do Sul e Sant'Ana do Livramento. Autor: Comitê Ibicuí.

Tabela 6 – Aranhas de solo coletadas no experimento realizado em novembro de 2011 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	C1	C2	C3	T1	T2	T3	Total
Amphinectidae							
Metaltella simoni Keyserling, 1878	1	2	0	0	1	0	4
Jovem	2	1	0	0	1	0	4
Araneidae							
Jovem	0	0	0	1	0	0	1
Caponiidae							
Caponina notabilis (Mello-Leitão, 1939)	0	0	1	0	0	0	1
Jovem	0	1	0	0	0	0	1
Corinnidae							
Castianeira sp. 1	1	0	0	0	0	0	1
Castianeira sp. 2	0	0	2	0	0	2	4
Jovem	0	2	1	0	0	1	4
Ctenidae							
Jovem	2	0	0	0	0	1	3
Gnaphosidae							
Camillina galianoae Platnick & Murphy, 1987	0	1	0	0	0	0	1
Camillina sp.	1	0	0	1	0	0	2
Eilica aff. *trilineata*	0	0	0	0	1	0	1
Gen? sp. 1	1	0	0	0	0	0	1
Jovem	0	0	0	1	1	0	2
Hahniidae							
Neohania sp. 1	20	6	11	22	10	13	82
Neohania sp. 2	19	6	7	10	11	6	59

Jovem	3	0	1	3	0	2	9
Linyphiidae							
Agyneta sp. 2	3	2	0	4	1	1	11
Erigone sp. 1	7	2	0	1	0	0	10
Moyosi sp. 1	0	2	1	0	0	1	4
Neomaso sp. 2	2	0	0	1	0	0	3
Neomaso sp. 3	0	0	0	0	0	1	1
Psilocymbium lineatum (Millidge, 1991)	1	0	0	0	0	0	1
Sphecozone sp. 2	1	0	0	1	0	0	2
Tutaibo aff. *phoeniceus*	0	1	0	1	0	0	2
Tutaibo sp. 1	1	1	1	1	0	2	6
Tutaibo sp. 2	1	1	0	0	0	0	2
Jovem	4	2	1	6	0	0	13
Lycosidae							
Gen? sp. 2	0	0	1	0	0	1	2
Hogna bivittata (Mello-Leitão, 1939)	1	2	0	2	0	0	5
Lycosa erythrognatha Lucas, 1836	0	1	1	0	0	0	2
Schizocosa malitiosa (Tullgren, 1905)	0	1	1	0	0	3	5
Jovem	13	71	4	2	5	2	97
Miturgidae							
Teminius insularis (Lucas, 1857)	1	0	0	1	0	0	2
Jovem	1	1	0	0	0	1	3
Oonopidae							
Neotrops aff. *tucumanus*	0	1	1	0	0	0	2
Oxyopidae							
Oxyopes salticus Hentz, 1845	0	1	0	0	0	0	1
Pholcidae							
Jovem	0	0	0	0	0	1	1
Phrurolithidae							
Orthobula sp.	0	0	0	0	1	1	2
Salticidae							
Neonella minuta Galiano, 1965	0	1	0	0	0	0	1
Gen? sp. 4	0	0	0	1	0	0	1
Gen? sp. 8	0	0	0	1	0	0	1
Semiopyla cataphracta Simon, 1901	2	0	0	0	0	1	3
Jovem	1	0	0	0	0	0	1
Theraphosidae							
Gen? sp. 1	0	0	0	0	0	1	1
Jovem	2	0	0	0	0	0	2
Theridiidae							
Euryopis camis Levi, 1963	0	0	0	0	1	0	1
Euryopis sp. 4	3	0	0	0	0	0	3
Euryopis spinifera (Mello-Leitão, 1944)	0	1	0	0	0	0	1
Guaraniella mahnerti Baert, 1984	8	1	0	3	2	0	14
Thymoites piratini Rodrigues & Brescovit, 2015	0	0	0	0	0	1	1

Jovem	1	1	0	0	1	0	3
Thomisidae							
Gen? sp. 1	0	0	0	1	0	0	1
Jovem	0	0	1	0	0	0	1
Jovens não determinados	**1**	**0**	**0**	**3**	**1**	**0**	**5**
Total	**104**	**112**	**35**	**67**	**37**	**42**	**397**

Tabela 7 – Aranhas de solo coletadas no experimento realizado em novembro de 2012 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	C1	C2	C3	T1	T2	T3	Total
Amphinectidae							
Metaltella simoni Keyserling, 1878	4	0	0	2	0	0	6
Jovem	6	2	0	2	0	0	10
Anyphaenidae							
Arachosia sp.	0	0	0	1	0	0	1
Araneidae							
Jovem	0	0	0	3	1	0	4
Corinnidae							
Castianeira chrysura Mello-Leitão, 1943	0	1	0	0	1	0	2
Castianeira gaucha Mello-Leitão, 1943	0	0	1	0	0	0	1
Castianeira sp. 2	0	0	1	0	0	6	7
Mazax sp.	0	0	0	1	0	1	2
Jovem	0	1	0	6	0	2	9
Ctenidae							
Jovem	0	0	0	3	0	0	3
Gnaphosidae							
Apopyllus sp.	0	0	0	0	0	2	2
Camillina galianoae Platnick & Murphy, 1987	0	0	0	1	0	0	1
Camillina pulchra (Keyserling, 1891)	2	1	0	1	0	0	4
Camillina sp.	0	0	1	0	0	0	1
Eilica aff. *trilineata*	0	0	0	0	1	0	1
Eilica trilineata (Mello-Leitão, 1941)	0	1	0	0	0	0	1
Gen? sp. 1	0	0	1	3	0	1	5
Jovem	0	1	1	1	0	0	3
Hahniidae							
Neohania sp. 1	4	0	4	9	7	9	33
Neohania sp. 2	1	9	4	16	20	13	63
Gen? sp. 1	0	0	1	0	0	0	1
Jovem	1	1	0	0	2	0	4
Linyphiidae							
Agyneta sp. 1	0	0	0	0	1	0	1
Agyneta sp. 2	0	0	0	2	5	1	8

Erigone sp. 1	0	2	0	1	0	0	3
Moyosi sp. 1	1	0	0	0	0	0	1
Neomaso sp. 2	1	0	0	1	0	0	2
Tutaibo aff. *phoeniceus*	0	1	0	1	0	0	2
Tutaibo sp. 1	0	0	0	4	0	0	4
Jovem	1	0	1	5	1	2	10
Lycosidae							
Birabenia sp. 1	1	1	0	4	0	0	6
Birabenia vittata (Mello-Leitão, 1945)	0	0	0	0	1	0	1
Gen? sp. 1	1	0	0	0	0	0	1
Gen? sp. 2	0	1	0	1	0	0	2
Hogna bivittata (Mello-Leitão, 1939)	1	1	1	0	0	0	3
Lobizon humilis (Mello-Leitão, 1944)	0	0	0	1	0	0	1
Lycosa erythrognatha Lucas, 1836	0	0	0	0	2	0	2
Lycosa thorelli (Keyserling, 1877)	2	0	0	0	3	0	5
Navira naguan Piancentini & Grismado, 2009	1	0	0	0	0	0	1
Schizocosa malitiosa (Tullgren, 1905)	4	5	6	0	4	3	22
Trochosa sp.	0	0	0	1	0	0	1
Jovem	72	14	7	18	8	14	133
Ooteca	0	0	1	0	0	0	1
Miturgidae							
Teminius insularis (Lucas, 1857)	0	1	0	0	0	0	1
Jovem	0	0	2	2	0	2	6
Nemesiidae							
Pycnothele sp.	3	1	0	2	0	0	6
Oonopidae							
Neotrops aff. *tucumanus*	0	0	2	0	0	1	3
Jovem	0	0	0	1	0	1	2
Philodromidae							
Jovem	0	0	0	1	0	0	1
Phrurolithidae							
Orthobula sp.	1	0	1	0	0	1	3
Salticidae							
Gen? sp. 3	0	0	0	0	0	1	1
Neonella minuta Galiano, 1965	1	0	0	0	0	0	1
Neonella montana Galiano, 1988	0	0	0	1	0	0	1
Semiopyla cataphracta Simon, 1901	0	0	0	1	0	0	1
Jovem	0	0	0	1	3	2	6
Sparassidae							
Jovem	0	1	0	0	0	0	1
Tengelidae							
Jovem	5	0	1	0	0	0	6
Theridiidae							
Episinus sp. 1	0	0	1	0	0	0	1
Euryopis camis Levi, 1963	0	1	0	0	1	0	2

Euryopis sp. 3	0	0	0	1	0	0	1
Euryopis sp. 4	1	0	0	1	0	0	2
Euryopis spinifera (Mello-Leitão, 1944)	2	1	0	1	0	0	4
Guaraniella mahnerti Baert, 1984	5	2	0	9	0	3	19
Styposis selis Levi 1964	0	0	0	1	0	0	1
Thymoites piratini Rodrigues & Brescovit, 2015	0	0	0	0	1	0	1
Jovem	1	0	1	3	0	3	8
Thomisidae							
Gen? sp. 2	1	0	0	1	0	0	2
Jovem	1	2	0	0	0	1	4
Jovens não determinados	1	0	0	0	0	0	1
Total	**125**	**51**	**38**	**114**	**62**	**69**	**459**

Tabela 8 – Aranhas de solo coletadas no experimento realizado em novembro de 2013 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	**C1**	**C2**	**C3**	**T1**	**T2**	**T3**	**Total**
Amphinectidae							
Metaltella simoni Keyserling, 1878	0	1	0	2	3	0	6
Jovem	0	0	0	2	0	0	2
Anyphaenidae							
Arachosia sp.	0	0	0	0	0	1	1
Araneidae							
Argiope argentata (Fabricius, 1775)	0	0	0	0	2	0	2
Jovem	3	0	0	0	3	4	10
Corinnidae							
Jovem	0	0	0	0	1	0	1
Ctenidae							
Parabatinga brevipes (Keyserling, 1891)	0	0	0	1	0	0	1
Jovem	0	1	0	0	0	0	1
Gnaphosidae							
Camillina galianoae Platnick & Murphy, 1987	0	0	0	3	0	0	3
Eilica cf. *obscura*	0	0	1	0	0	0	1
Neodrassex ibirapuita Ott, 2013	0	0	0	0	0	1	1
Jovem	0	0	0	1	0	1	2
Hahniidae							
Neohania sp. 1	39	4	8	4	8	8	71
Neohania sp. 2	8	4	5	4	4	8	33
Jovem	2	0	0	0	1	1	4
Linyphiidae							
Agyneta sp. 1	0	0	0	0	0	2	2
Agyneta sp. 2	0	1	4	2	3	6	16

Erigone sp. 1	5	2	2	0	3	0	12
Laminacauda sp. 1	0	0	1	0	0	0	1
Moyosi sp. 1	0	0	1	1	1	1	4
Neomaso sp. 2	1	1	0	1	1	2	6
Neomaso sp. 3	1	0	0	0	0	1	2
Pseudotyphistes sp. 2	1	0	0	0	0	0	1
Tutaibo sp. 1	0	0	0	0	2	1	3
Tutaibo sp. 3	1	0	0	0	0	0	1
Jovem	3	0	1	1	0	4	9
Lycosidae							
Agalenocosa sp.	0	0	0	0	0	1	1
Allocosa sp.	0	0	0	1	0	0	1
Birabenia sp. 1	0	1	0	11	1	2	15
Birabenia vittata (Mello-Leitão, 1945)	0	0	0	0	1	0	1
Gen? sp. 2	3	0	0	1	3	0	7
Hogna bivittata (Mello-Leitão, 1939)	0	0	0	0	1	0	1
Lobizon humilis (Mello-Leitão, 1944)	0	0	0	3	1	0	4
Lycosa erythrognatha Lucas, 1836	0	0	3	0	0	0	3
Lycosa thorelli (Keyserling, 1877)	6	3	0	0	1	0	10
Navira naguan Piancentini & Grismado, 2009	0	1	0	1	0	0	2
Schizocosa malitiosa (Tullgren, 1905)	0	1	2	0	0	0	3
Trochosa sp.	0	0	0	1	0	0	1
Jovem	10	11	46	18	8	1	94
Microstigmatidae							
Jovem	0	1	0	0	0	0	1
Miturgidae							
Teminius insularis (Lucas, 1857)	2	2	0	0	2	0	6
Jovem	0	0	0	0	1	1	2
Oonopidae							
Neotrops aff. *tucumanus*	0	0	0	0	0	1	1
Oxyopidae							
Jovem	1	0	1	0	0	0	2
Phrurolithidae							
Orthobula sp.	0	1	0	3	0	3	7
Jovem	0	0	0	6	3	2	11
Salticidae							
aff. *Phiale* sp.	0	0	0	0	1	0	1
Gen? sp. 1	0	0	0	1	0	0	1
Neonella minuta Galiano, 1965	0	1	0	1	0	0	2
Neonella montana Galiano, 1988	0	1	0	0	0	0	1
Semiopyla cataphracta Simon, 1901	0	0	0	5	5	1	11
Jovem	0	0	0	6	6	8	20
Tetragnathidae							
Glenognatha lacteovittata (Mello-Leitão, 1944)	0	0	0	1	1	5	7

Jovem	0	0	0	1	1	0	2
Theridiidae							
Euryopis camis Levi, 1963	0	1	0	0	0	0	1
Euryopis sp. 4	4	0	0	0	0	0	4
Euryopis spinifera (Mello-Leitão, 1944)	4	0	0	0	0	0	4
Guaraniella mahnerti Baert, 1984	5	0	1	5	0	1	12
Styposis selis Levi 1964	0	0	0	1	3	0	4
Jovem	0	2	0	2	3	0	7
Thomisidae							
Gen? sp. 3	2	1	0	0	1	0	4
Jovem	1	0	0	0	1	2	4
Trachelidae							
Meriola sp.	0	0	0	0	0	1	1
Gen? sp. 1	0	0	0	1	0	0	1
Jovens não determinados	1	0	0	1	1	0	3
Total	**103**	**41**	**76**	**92**	**77**	**70**	**459**

Tabela 9 – Aranhas de solo coletadas no experimento realizado em maio de 2015 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	C1	C2	C3	T1	T2	T3	Total
Amaurobiidae							
Jovem	1	0	0	0	0	0	1
Amphinectidae							
Metaltella simoni Keyserling, 1878	0	0	0	0	0	1	1
Jovem	0	0	0	0	1	0	1
Araneidae							
Jovem	0	0	1	0	1	2	4
Corinnidae							
Castianeira chrysura Mello-Leitão, 1943	0	0	1	0	0	0	1
Castianeira gaucha Mello-Leitão, 1943	0	0	0	0	0	9	9
Jovem	0	0	0	1	0	4	5
Ctenidae							
Isoctenus minusculus (Keyserling, 1891)	1	2	0	1	0	4	8
Parabatinga brevipes (Keyserling, 1891)	0	1	0	0	1	0	2
Jovem	1	0	0	0	1	1	3
Gnaphosidae							
Echemos sp.	0	0	1	0	0	0	1
Hahniidae							
Neohania sp. 1	5	3	11	0	1	1	21
Neohania sp. 2	4	0	2	1	2	0	9
Neohania sp. 3	0	1	0	0	1	0	2
Jovem	0	1	2	0	0	0	3

Idiopidae							
Jovem	0	0	0	1	0	0	1
Linyphiidae							
Agyneta sp. 1	8	11	25	7	7	7	65
Agyneta sp. 2	8	5	6	0	0	0	19
Erigone sp. 1	7	12	7	0	0	0	26
Labicymbium sp. 2	0	3	0	0	0	0	3
Moyosi sp. 1	0	0	2	0	1	0	3
Moyosi sp. 2	0	1	0	0	0	0	1
Neomaso sp. 2	1	1	1	1	2	1	7
Pseudotyphistes sp. 1	0	0	0	0	1	1	2
Psilocymbium lineatum (Millidge, 1991)	0	1	5	0	0	0	6
Scolecura parilis Millidge, 1991	0	0	0	1	3	0	4
Sphecozone sp. 1	2	0	0	0	0	0	2
Tutaibo aff. *phoeniceus*	0	3	0	0	0	1	4
Tutaibo sp. 1	0	2	3	2	0	1	8
Vesicapalpus sp.	0	0	0	0	1	0	1
Jovem	2	13	12	9	9	5	50
Lycosidae							
Birabenia sp. 1	0	0	0	0	0	2	2
Gen? sp. 2	0	1	0	0	0	0	1
Lobizon humilis (Mello-Leitão, 1944)	0	0	0	0	1	2	3
Lycosa erythrognatha Lucas, 1836	0	1	0	0	0	0	1
Lycosa sp.1	0	0	1	0	0	0	1
Schizocosa malitiosa (Tullgren, 1905)	2	4	3	0	0	0	9
Jovem	5	2	23	12	3	3	48
Miturgidae							
Jovem	1	3	3	2	1	1	11
Mysmenidae							
Mysmena sp.	0	0	0	1	0	0	1
Oonopidae							
Neotrops aff. *tucumanus*	0	0	0	1	0	1	2
Opopaea concolor (Blackwall, 1859)	0	0	0	0	1	0	1
Oonopidae_jovem	0	0	0	1	0	1	2
Oxyopidae							
Jovem	0	0	0	0	1	0	1
Phrurolithidae							
Orthobula sp.	0	1	0	0	0	0	1
Salticidae							
Gen? sp. 2	0	0	0	1	0	0	1
Gen? sp. 3	0	0	0	0	1	0	1
Tengelidae							
Jovem	0	0	0	1	0	0	1
Tetragnathidae							
Glenognatha lacteovittata (Mello-Leitão, 1944)	0	1	0	4	1	5	11

Jovem	0	1	0	2	0	2	5
Theridiidae							
Dipoena pumicata (Keyserling, 1886)	1	1	1	0	0	1	4
Euryopis camis Levi, 1963	2	0	0	0	0	0	2
Euryopis sp. 1	1	1	0	0	0	0	2
Euryopis sp. 4	1	0	0	0	0	0	1
Euryopis spinifera (Mello-Leitão, 1944)	2	0	0	0	0	0	2
Guaraniella mahnerti Baert, 1984	4	4	1	5	2	3	19
Styposis selis Levi 1964	1	0	0	0	0	0	1
Thymoites piratini Rodrigues & Brescovit, 2015	0	1	0	0	0	0	1
Jovem	0	7	0	7	10	9	33
Thomisidae							
Jovem	0	0	0	1	0	0	1
Trachelidae							
Gen? sp. 1	1	0	0	0	0	0	1
Gen? sp. 2	0	0	0	1	1	2	4
Jovens não determinados	0	0	0	2	2	1	5
Total	**61**	**88**	**111**	**65**	**56**	**71**	**452**

Tabela 10 – Aranhas de solo coletadas no experimento realizado em setembro de 2015 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	C1	C2	C3	T1	T2	T3	Total
Amphinectidae							
Metaltella simoni Keyserling, 1878	2	0	0	3	8	2	15
Jovem	0	0	0	1	3	3	7
Anyphaenidae							
Arachosia sp.	0	0	0	0	2	0	2
Araneidae							
Alpaida sp.	0	0	1	0	0	0	1
Jovem	0	2	2	2	3	4	13
Corinnidae							
Castianeira chrysura Mello-Leitão, 1943	0	1	0	1	0	0	2
Castianeira gaucha Mello-Leitão, 1943	0	0	0	0	2	0	2
Jovem	1	0	0	0	2	0	3
Ctenidae							
Parabatinga_brevipes (Keyserling, 1891)	1	1	0	1	2	2	7
Jovem	0	0	0	1	1	0	2
Gnaphosidae							
Jovem	0	0	0	0	1	0	1
Hahniidae							
Gen? sp. 1	1	0	0	4	1	1	7
Neohania sp. 1	2	12	16	1	3	7	41

Neohania sp. 2	5	2	6	0	1	2	16
Neohania sp. 3	0	1	0	6	9	0	16
Jovem	0	0	0	0	0	1	1
Linyphiidae							
Agyneta sp. 1	3	18	21	2	4	3	51
Agyneta sp. 2	3	5	2	4	5	5	24
Erigone sp. 1	8	12	8	0	1	2	31
Erigone sp. 2	0	1	0	0	0	0	1
Labicymbium sp. 1	1	2	0	0	1	0	4
Labicymbium sp. 2	0	0	1	1	1	0	3
Moyosi sp. 1	0	0	0	0	1	0	1
Neomaso sp. 2	2	1	0	0	1	3	7
Neomaso sp. 4	1	0	0	2	3	4	10
Pseudotyphistes sp. 1	0	0	0	0	1	0	1
Psilocymbium lineatum (Millidge, 1991)	1	1	4	0	0	1	7
Scolecura parilis Millidge, 1991	0	1	0	0	1	0	2
Sphecozone sp. 1	1	0	0	0	0	0	1
*Sphecozon*e sp. 2	0	0	1	0	0	0	1
Tutaibo aff. *phoeniceus*	0	1	0	0	0	1	2
Tutaibo sp. 1	1	4	4	2	2	1	14
Tutaibo sp. 2	2	1	0	0	0	0	3
Vesicapalpus sp.	0	0	0	0	1	2	3
Jovem	10	22	13	1	11	1	58
Lycosidae							
Birabenia vittata (Mello-Leitão, 1945)	1	0	0	0	0	0	1
Gen? sp. 3	0	0	0	0	5	0	5
Hogna bivittata (Mello-Leitão, 1939)	0	1	1	0	0	0	2
Lobizon humilis (Mello-Leitão, 1944)	0	0	1	2	3	1	7
Schizocosa malitiosa (Tullgren, 1905)	1	0	1	0	0	0	2
Jovem	5	5	14	3	7	9	43
Microstigmatidae							
Xenomesia platensis Goloboff, 1989	0	0	0	1	0	0	1
Miturgidae							
Jovem	0	1	3	2	0	0	6
Nesticidae							
Nesticus sp.	0	0	0	0	1	0	1
Oonopidae							
Jovem	0	1	0	1	0	1	3
Oxyopidae							
Oxyopes salticus Hentz, 1845	2	0	1	0	0	0	3
Jovem	0	0	0	1	0	0	1
Salticidae							
Gen? sp. 6	0	1	0	0	0	0	1
Sarinda nigra Peckham & Peckham, 1892	1	0	0	0	0	0	1
Jovem	2	0	0	0	0	1	3
Tetragnathidae							

Glenognatha lacteovittata (Mello-Leitão, 1944)	0	1	1	5	5	1	13
Jovem	0	0	0	1	1	2	4
Theraphosidae							
Jovem	0	0	0	0	1	0	1
Theridiidae							
Dipoena pumicata (Keyserling, 1886)	0	2	1	0	2	0	5
Euryopis camis Levi, 1963	5	0	0	0	0	0	5
Euryopis sp. 1	0	1	0	0	0	0	1
Euryopis sp. 3	0	0	0	0	0	1	1
Euryopis sp. 4	1	0	0	0	0	0	1
Euryopis spinifera (Mello-Leitão, 1944)	1	2	0	0	0	0	3
Guaraniella mahnerti Baert, 1984	2	0	2	1	1	4	10
Styposis selis Levi 1964	1	0	0	2	1	0	4
Theridion sp.	0	0	1	0	0	1	2
Thymoites piratini Rodrigues & Brescovit, 2015	0	1	2	0	0	0	3
Jovem	1	3	1	1	12	9	27
Thomisidae							
Tmarus sp.	0	0	0	0	0	2	2
Jovem	0	0	0	0	1	0	1
Trachelidae							
Gen? sp. 1	0	0	0	0	0	2	2
Gen? sp. 2	0	0	1	0	0	0	1
Jovens não determinados	1	9	0	7	12	13	42
Total	**69**	**116**	**109**	**59**	**123**	**92**	**568**

Tabela 11 – Aranhas de solo coletadas no experimento realizado em novembro de 2015 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	C1	C2	C3	T1	T2	T3	Total
Amphinectidae							
Metaltella simoni Keyserling, 1878	1	1	0	0	6	0	8
Jovem	0	0	0	0	1	2	3
Anyphaenidae							
Arachosia sp.	0	0	0	1	1	0	2
Jovem	0	0	0	0	2	0	2
Araneidae							
Jovem	0	0	0	0	2	6	8
Corinnidae							
Castianeira chrysura Mello-Leitão, 1943	0	3	3	1	0	1	8
Castianeira gaucha Mello-Leitão, 1943	0	0	0	0	0	1	1
Jovem	0	2	0	0	0	0	2
Ctenidae							

Asthenoctenus borellii Simon, 1897	0	0	0	2	0	0	2
Jovem	3	3	0	1	0	1	8
Gnaphosidae							
Apopyllus cf. *iheringi* (Mello-Leitão, 1943)	1	1	0	0	0	0	2
Camillina pulchra (Keyserling, 1891)	0	2	0	0	1	0	3
Jovem	0	0	0	2	0	2	4
Hahniidae							
Neohania sp. 1	14	10	27	0	0	3	54
Neohania sp. 2	7	3	12	2	7	0	31
Neohania sp. 3	0	0	0	1	0	0	1
Jovem	1	0	4	0	0	1	6
Linyphiidae							
Agyneta sp. 1	4	3	16	1	0	4	28
Agyneta sp. 2	1	1	3	6	0	0	11
Erigone sp. 1	7	9	10	0	1	0	27
Fissiscapus pusillus Millidge, 1991	1	0	0	0	0	0	1
Labicymbium sp. 2	1	1	0	0	0	0	2
Laminacauda sp. 2	0	0	0	0	1	0	1
Moyosi sp. 1	2	0	4	0	1	0	7
Neomaso sp. 2	2	2	1	7	0	3	15
Neomaso sp. 4	1	0	0	3	1	8	13
Pseudotyphistes sp. 1	0	0	0	0	1	1	2
Pseudotyphistes sp. 2	0	0	0	0	0	1	1
Psilocymbium lineatum (Millidge, 1991)	0	0	0	2	0	0	2
Scolecura parilis Millidge, 1991	0	0	0	0	1	0	1
Tutaibo aff. *phoeniceus*	0	2	3	0	0	0	5
Tutaibo sp. 1	3	1	11	0	2	1	18
Tutaibo sp. 3	0	1	0	0	0	0	1
Jovem	5	7	8	1	9	7	37
Lycosidae							
Allocosa sp.	0	1	0	0	0	0	1
Birabenia sp. 1	2	0	0	0	0	3	5
Gen? sp. 3	0	2	0	1	2	0	5
Lobizon humilis (Mello-Leitão, 1944)	1	0	0	0	1	2	4
Lycosa thorelli (Keyserling, 1877)	1	0	0	0	0	0	1
Navira naguan Piancentini & Grismado, 2009	1	1	0	0	0	0	2
Schizocosa malitiosa (Tullgren, 1905)	3	1	3	1	1	0	9
Jovem	10	12	21	4	22	3	72
Miturgidae							
Teminius insularis (Lucas, 1857)	4	3	1	0	0	0	8
Jovem	2	1	2	2	1	0	8
Oonopidae							
Jovem	0	0	0	0	3	1	4
Oxyopidae							

Jovem	0	1	1	0	0	0	2
Palpimanidae							
Otiothops birabeni Mello-Leitão, 1945	1	0	0	0	0	0	1
Philodromidae							
Jovem	1	0	0	0	0	0	1
Phrurolithidae							
Orthobula sp.	1	0	0	1	0	0	2
Jovem	0	0	0	2	1	0	3
Salticidae							
aff. *Phiale* sp.	1	0	0	0	0	0	1
Jovem	1	0	0	0	0	2	3
Semiopyla cataphracta Simon, 1901	0	0	0	0	3	2	5
Tetragnathidae							
Glenognatha lacteovittata (Mello-Leitão, 1944)	0	0	0	5	1	8	14
Jovem	0	0	0	3	0	2	5
Theraphosidae							
Jovem	0	0	0	0	0	1	1
Theridiidae							
Dipoena pumicata (Keyserling, 1886)	0	0	1	0	1	1	3
Episinus sp. 1	0	0	0	0	0	1	1
Euryopis sp. 3	0	0	0	0	1	0	1
*Euryopis spinif*era (Mello-Leitão, 1944)	3	1	0	0	0	0	4
Guaraniella mahnerti Baert, 1984	3	1	3	0	2	1	10
Styposis selis Levi 1964	0	0	0	1	0	0	1
Thymoites piratini Rodrigues & Brescovit, 2015	0	0	1	0	0	1	2
Jovem	1	0	1	2	3	4	11
Thomisidae							
Jovem	0	0	0	0	0	2	2
Trachelidae							
Jovem	1	0	0	0	0	0	1
Jovens não determinados	1	2	2	3	9	7	24
Total	**92**	**78**	**138**	**55**	**88**	**83**	**534**

Tabela 12 – Aranhas de solo coletadas no experimento realizado em fevereiro de 2016 na APA do Ibirapuitã, Bioma Pampa, RS, Brasil. Taxa indica famílias de aranhas. Cada família contém espécies, morfoespécies e jovens respectivos. Números em jovens indicam indivíduos, em espécies e morfoespécies indicam indivíduos adultos, machos e fêmeas. C1: Com Pastejo da Estância do Açude; C2: Com Pastejo da Fazenda Rincão dos Moraes; C3: Com Pastejo da Fazenda Bela Vista. T1: Sem Pastejo da Estância do Açude; T2: Sem Pastejo da Fazenda Rincão dos Moraes; T3: Sem Pastejo da Fazenda Bela Vista.

Taxa	C1	C2	C3	T1	T2	T3	Total
Actinopodidae							
Actinopus sp.	0	1	0	0	0	0	1
Amphinectidae							
Metaltella simoni Keyserling, 1878	0	2	0	1	2	0	5
Jovem	0	1	0	0	1	0	2
Anyphaenidae							
Arachosia sp.	1	0	0	0	0	0	1
Gen? sp. 1	0	0	0	0	0	2	2
Jovem	1	0	0	1	1	0	3
Araneidae							
Jovem	2	2	0	2	0	0	6
Corinnidae							
Castianeira chrysura Mello-Leitão, 1943	0	1	0	0	0	0	1
Castianeira gaucha Mello-Leitão, 1943	0	0	0	0	1	1	2
Jovem	0	1	0	1	0	0	2
Ctenidae							
Asthenoctenus borellii Simon, 1897	0	0	0	0	2	1	3
Parabatinga brevipes (Keyserling, 1891)	0	0	0	0	2	0	2
Jovem	1	1	1	6	8	5	22
Gnaphosidae							
Apopyllus sp.	0	1	0	0	0	0	1
Jovem	0	0	1	1	0	1	3
Hahniidae							
Neohania sp. 1	13	11	10	3	1	0	38
Neohania sp. 2	6	1	9	0	2	0	18
Jovem	0	2	3	3	0	1	9
Linyphiidae							
Agyneta sp. 1	1	7	8	4	1	2	23
Agyneta sp. 2	5	3	0	1	1	0	10
Erigone sp. 1	3	3	4	0	0	0	10
Erigone sp. 2	0	3	0	0	0	0	3
Labicymbium sp. 2	0	0	0	0	2	0	2
Moyosi sp. 1	0	0	0	1	0	0	1
Neomaso sp. 2	0	0	0	0	5	0	5
Neomaso sp. 4	0	0	0	4	1	0	5
Pseudotyphistes sp. 1	1	0	0	0	0	1	2
Psilocymbium lineatum (Millidge, 1991)	1	1	1	0	0	0	3
Tutaibo aff. *phoeniceus*	0	1	0	0	0	0	1
Tutaibo sp.1	0	0	0	1	1	0	2
Tutaibo sp.2	1	0	0	0	0	0	1

Vesicapalpus sp.	0	0	0	0	1	1	2
Jovem	0	1	2	1	2	3	9
Lycosidae							
Gen? sp. 1	0	1	0	0	0	0	1
Lobizon humilis (Mello-Leitão, 1944)	0	0	0	1	0	0	1
Lycosa erythrognatha Lucas, 1836	0	1	0	0	0	0	1
*Lycosa thor*elli (Keyserling, 1877)	0	5	1	0	0	0	6
*Schizocosa maliti*osa (Tullgren, 1905)	1	3	1	1	0	0	6
Trochosa sp.	2	0	0	0	0	0	2
Jovem	12	25	11	11	4	1	64
Miturgidae							
Teminius insularis (Lucas, 1857)	1	0	3	0	0	0	4
Jovem	0	4	2	0	2	0	8
Oonopidae							
Jovem	0	0	0	0	2	1	3
Oxyopidae							
Oxyopes salticus Hentz, 1845	1	2	0	2	0	0	5
Pholcidae							
Jovem	0	0	1	0	0	0	1
Phrurolithidae							
Orthobula sp.	0	1	0	0	1	0	2
Salticidae							
Mopiopia sp.	1	0	0	0	0	0	1
Neonella montana Galiano, 1988	0	0	2	0	0	0	2
Gen? sp. 1	1	0	0	0	0	0	1
Gen? sp. 2	1	0	0	0	0	0	1
Gen? sp. 5	0	1	0	0	0	0	1
Gen? sp. 7	0	0	0	0	1	0	1
Semiopyla cataphracta Simon, 1901	0	1	0	0	0	0	1
Jovem	1	0	3	0	1	0	5
Tetragnathidae							
Glenognatha lacteovittata (Mello-Leitão, 1944)	0	0	0	0	0	3	3
Theraphosidae							
Jovem	1	0	1	0	0	0	2
Theridiidae							
Dipoena pumicata (Keyserling, 1886)	0	0	0	0	1	0	1
Episinus sp.2	0	1	0	0	1	0	2
Euryopis camis Levi, 1963	1	0	0	0	0	0	1
Euryopis sp. 1	0	2	0	0	0	0	2
Euryopis sp. 4	1	0	0	0	0	0	1
Euryopis spinifera (Mello-Leitão, 1944)	2	2	0	0	0	0	4
Guaraniella mahnerti Baert, 1984	1	2	0	1	0	4	8
Steatoda ancorata (Holmberg, 1876)	0	1	0	0	0	0	1
Styposis selis Levi 1964	0	0	0	1	0	0	1

Thymoites piratini Rodrigues & Brescovit, 2015	0	0	1	0	0	0	1
Jovem	1	7	0	5	3	0	16
Thomisidae							
Tmarus sp.	0	0	0	0	1	0	1
Jovem	0	0	0	0	1	0	1
Trachelidae							
Jovem	0	0	0	1	0	0	1
Jovens não determinados	0	2	4	0	0	5	11
Total	**64**	**104**	**69**	**53**	**52**	**32**	**374**