

Records of Spiders (Arachnida: Araneae) of the Parque Estadual Mata São Francisco, Paraná, Brazil

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ABSTRACT: A list of spider species recorded from the Parque Estadual Mata São Francisco, Paraná, Brazil was compiled based on 7,942 specimens, of which 2,872 are adults (36.15%) and 5,071 are juveniles (63.85%). Adults were identified as belonging to 45 families, 140 genera and 209 species and morphospecies (101 nominal species and 108 morphotypes). Forty-one species were recorded for the first time from the state of Paraná, most of them belonging to Araneidae (14), Oonopidae (4), Theridiidae (4), and Uloboridae (3). *Conifaber guarani* Grismado, 2004 and *Oonops nigromaculatus* Mello-Leitão, 1944 were recorded for the first time from Brazil. These results place Paraná as the sixth state with the highest number of records of spiders from Brazil, currently 465 species. This study increases in 10% the number of species recorded from Paraná, and the Atlantic Forest fragment becomes one of the most well sampled areas in the state, with 20% of all known species in Paraná.

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INTRODUCTION

Spiders represent the second largest order within the arachnids. They are a group of predators that occur in various physical and biological conditions of the terrestrial environment (Foelix 1996). Due to this adaptive success, these animals are found in all zoogeographical regions of the world except the Arctic and Antarctic regions (Foelix 1996). With fossil records dating from the middle of the Devonian (approximately 380 million years ago), the order Araneae was one of the first groups to conquer the terrestrial environment (Selden *et al.* 1991). Currently, there are 45,081 described species of spiders, distributed in 3,928 genera and 114 families (World Spider Catalog 2014). The Neotropical region is known for its high araneofauna diversity, but is still poorly studied. Brazil has the highest diversity of spiders in the southeast region, including records of 3,203 species in 659 genera and 72 families, as reported by Brescovit *et al.* (2011).

Studies of the araneofauna from the state of Paraná, date of field expeditions conducted by European naturalists from the XIX century, who described the first species of spiders (Keyserling 1880; Simon 1893). After that, only sporadic studies were published. Mello-Leitão (1941) proposed the first spider catalog for the state, including 222 species, and a few years later (Mello-Leitão 1947) described 48 additional species. Pinto-da-Rocha (1995) recorded 11 cave dwelling species. Few non-standardized inventories were also conducted in different areas of the state (Lopes *et al.* 2006, 2008; Buschini *et al.* 2010a, b). Brescovit *et al.* (2011) published a list of 424 literature records of species recorded from the state, ranking Paraná as the sixth state in species richness of spiders from Brazil. Although the state of Paraná is only a political denomination, with no biogeographical implication, it is here used to enable the

comparisons with the previous literature (Brescovit *et al.* 2011; Mello-Leitão 1941, 1947).

In this study, we compiled a list of species from the Parque Estadual Mata São Francisco, one of the largest fragments of Atlantic Forest in northern Paraná (Bornschein and Reinert 2000), contributing towards the knowledge on the spider fauna of Brazil and highlighting the importance of the conservation of the area.

MATERIALS AND METHODS

Study site

The Parque Estadual Mata São Francisco (PEMSF) is located in the municipalities of Santa Mariana and Cornélio Procopio (28°08'47.3" S, 50°34'19.5" W, 543 m average altitude), in the state of Paraná (Figure 1). It has a total area of 832.5 ha, of which 27% in the municipality of Santa Mariana and 73% in Cornélio Procopio. Agricultural properties, dominated by monocultures of soybeans, corn, wheat, and pastures surround the park (Tomé *et al.* 1999). The botanical fauna of the PEMSF includes 85 tree species (belonging to 36 families), the most dominant being: *Gallesia integrifolia* (Spreng.) Harms (Phytolaccaceae), *Croton floribundus* Spreng. (Euphorbiaceae), *Piptadenia gonoacantha* (Mart.) J.F. Macbr (Mimosaceae), *Sebastiania brasiliensis* Spreng. (Euphorbiaceae), *Pachystroma longifolium* (Ness) I.M. Johnst (Euphorbiaceae), *Nectandra megapotamica* (Spreng.) Mez (Lauraceae), *Aspidosperma polyneuron* Müll.Arg. (Apocynaceae), *Alchornea glandulosa* Poepp. & Endl. (Euphorbiaceae), *Sorocea bonplandii* (Baill.) W.C. Burger, Lanjouw & Boer (Moraceae) and *Bougainvillea glabra* Choisy (Nyctaginaceae) (Tomé *et al.* 1999).

According to Maack (1950), the PEMSF is characterized by a warm, humid subtropical weather, with drier periods during winter, temperatures above 22°C during the

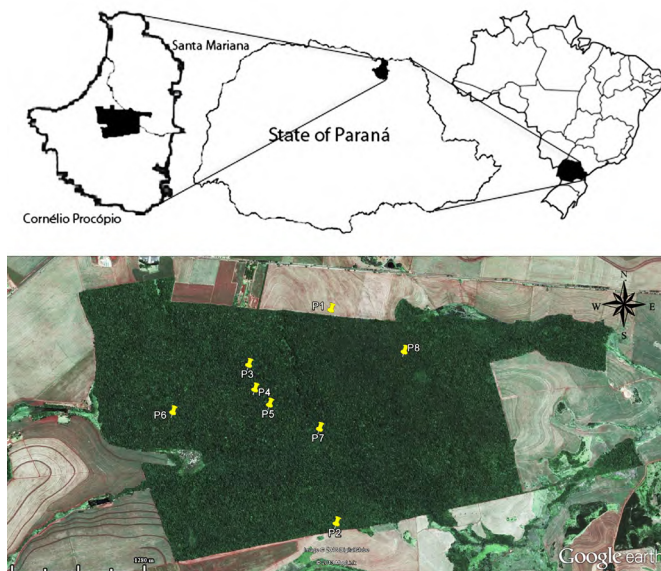


FIGURE 1. Geographic location of the eight sampling sites of the Parque Estadual Mata São Francisco, in the state of Paraná, Brazil.

warmest months and rare frosts. The average rainfall is 1200–1400 mm per year, with the trimester of December, January and February being the wettest, with an average of 500–600 mm, and the trimester of June, July and August the driest, with an average of 150–175 mm (IAPAR 2013).

Data collection

The sampling in PEMSF was conducted in eight sampling points (P1–P8, Figure 1), which were chosen due to their easy access and phytophysionomic differences. We collected spiders using five sampling methods to access the fauna in different microhabitats. Nevertheless, not all methods were used in all sampling sites, as described below.

In five sampling sites, we installed 16 m² plots (P1: 23°09'03" S, 50°33'51" W; P2: 23°10'11" S, 50°33'51" W; P3: 23°09'20" S, 50°34'20" W; P4: 23°09'28" S, 50°34'18" W; and P5: 23°09'33" S, 50°34'13" W). In these, we employed four sampling methods: diurnal active manual-searching (DM), beating tray (BT), litter sifting (LS) and pitfall traps (PT). DM consisted in sampling spiders from leaf litter, fallen trunks, under rocks, bushes and tree trunks. One DM sample corresponds to 1 hour of continuous sampling (Coddington *et al.* 1991). BT was used to collect spiders that occupy shrubby stratum up to 2 m high, by beating the bushes onto a structure formed by a white cloth (60 × 60 cm), sustained by two wooden rods (80 × 2 × 2 cm) (Coddington *et al.* 1991; Podgaiski *et al.* 2007; Carvalho and Avelino 2010). One BT sample corresponds to 40 minutes of continuous sampling. LS was conducted according to Barreiros *et al.* (2005); the sampling unit for this method corresponds to the inspection of approximately 1 m² of soil, collected randomly, and sieved using a screen of 0.5 cm in the laboratory. We obtained 60 samples, 12 per sampling point, for each method described above. We used PTs, similar to those employed by Carvalho and Avelino (2010), to sample the litter inhabiting species. To prevent the excess of organic matter and rainwater inside the traps, we installed plastic plates, supported by four wooden rods, five inches above the cup openings (Indicatti *et al.* 2005). In each sampling site, we installed two pitfall

traps that we left exposed for 30 days. Each pitfall trap corresponded to one sample, totaling 120 samples, 24 per sampling point.

We delimited plots of 300 m² (30 X 10 m) in three sampling sites (P6: 23°09'35" S, 50°34'46" W; P7: 23°09'41" S, 50°33'56" W; and P8: 23°09'18" S, 50°33'26" W) (Figure 1), where we conducted nocturnal manual-searching (NM). The technique consisted in sampling spiders from leaf litter, fallen trunks, under rocks, bushes and tree trunks during 1 hour. With this sampling method, we obtained 90 samples, 30 for each sampling site.

We sampled the sites monthly for one year, from May 2009 to April 2010, resulting in 300 samples from five points (P1–P5) and 90 samples from three points (P6–P8), totaling 390 samples. We preserved all collected material in 70% alcohol and identified it with the number of the sample and area. We deposited vouchers in the collection of Instituto Butantan (IBSP 150237-150300) in São Paulo, SP, Brazil. The research in the Parque Estadual Mata São Francisco was authorized by the Instituto Ambiental do Paraná (IAP) with collecting permits from the SisBio system of the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA number: 2122-1; Request: 10254).

The previous records of species we present in this study were based on Brescovit *et al.* (2011), inventories carried out in Paraná (Keyserling 1880; Simon 1893; Mello-Leitão 1947, 1941; Pinto-da-Rocha 1995; Lopes *et al.* 2006, 2008; Buschini *et al.* 2010a, b) and in the database of the collection of the Instituto Butantan — IB, Brasil.

RESULTS

We collected 7,942 spider specimens, of which 2,872 adults (36.15%) divided in 1,129 males and 1,743 females. The observed richness was 45 families, 140 genera (based only on identified genera) and 209 morphospecies with approximately 48% of these taxa identified to species level, 101 nominal species and 108 morphospecies (Table 1). Clubionidae, Oecobiidae, Philodromidae and Segestriidae were represented only by juvenile specimens. The families with the largest number of species were Theridiidae (35), Araneidae (31), Salticidae (17) and Uloboridae (10), while nineteen families were represented by a single species (Table 1 and Figure 2).

Based on the data presented by Brescovit *et al.* (2011) we found 41 new records for the state of Paraná, with major contributions from Araneidae, with 14 species (Figure 3), followed by Theridiidae and Oonopidae with four, Uloboridae with three, Linyphiidae, Pholcidae and Thomisidae with two and ten families with one species each (Table 1 and Figure 4). *Conifaber guarani* Grismado, 2004 (Uloboridae, Figure 4j) and *Neotrops nigromaculatus* (Mello-Leitão, 1944) were restricted to Paraguay, Uruguay and Argentina, and are here recorded for the first time in Brazil.

Among the sampling methods, we obtained the largest number of species using NM, resulting in 104 morphospecies (61 exclusive for this method), of which 23 were new records. BT obtained 85 morphospecies (40 exclusives), followed by PT with 65 (19), LS with 40 (4) and DM with 22 (2) species (see Table 1). Eighty-three morphospecies were sampled using two or more methods.

TABLE 1. List of species and abundance, by collection method, of the spiders obtained from Parque Estadual Mata São Francisco, Cornélio Procópio, Paraná. Information: Litter sifting (LS); Diurnal manual-searching (DM); Nocturnal manual-searching (NM); Beating tray (BT); Pitfall traps (PT); and the new records for the state.

TAXON	COLLECTION METHOD					STATUS
	LS	DM	NM	BT	PT	
Amaurobiidae						
Amaurobiidae sp. 1					1	
Amaurobiidae sp. 2	2				6	
Amphinectidae						
Metaltella sp. 1	4				19	
Anyphaenidae						
Aysa triunfo Brescovit, 1992				1		
Iguarima censoria (Keyserling, 1891)			5	3	1	
Jessica osoriana (Mello-Leitão, 1922)			1			
Osoriella tahela Brescovit, 1998				2		
Araneidae						
Acacesia tenella (L. Koch, 1871)			8			
Alpaida alto Levi, 1988			7			New record
Alpaida bicornuta (Taczanowski, 1878)			6			
Alpaida itapua Levi, 1988 (Figure 3A)			2			New record
Alpaida leucogramma (White, 1841) (Figure 3B)			11			New record
Alpaida trispinosa (Keyserling, 1892) (Figure 3C)			5			New record
Alpaida truncata (Keyserling, 1865)				1		
Alpaida aff. negro				1	1	
Araneus omnicolor (Keyserling, 1893)			39			
Araneus venatrix (C.L. Koch, 1838)		1	9	1		
Araneus sp. 1			9			
Bertrana striolata Keyserling, 1884			5			New record
Cyclosa fililineata Hingston, 1932		1	20	3		
Cyclosa tapetifaciens Hingston, 1932		1	5	1		
Eustala taquara (Keyserling, 1892)			16	1		
Gasteracantha cancriformis (Linnaeus, 1758)		2	2			New record
Kapogea sellata (Simon, 1895)			2			New record
Mangora enseada Levi, 2007			4			
Mangora missa Levi, 2007			5			
Mangora sp. 1				9		
Manogea porracea (C.L. Koch, 1838)		1		2		
Metepeira compsa (Chamberlin, 1916) (Figure 3D)			7			New record
Micrathena peregrinatorum (Holmberg, 1883) (Figure 3E)		5		20	2	New record
Micrathena plana (C.L. Koch, 1836) (Figure 3F)		8	59	6		New record
Neoscona nautica (L. Koch, 1875) (Figure 3G)			2			New record
Ocrepeira covillei Levi, 1993 (Figure 3H)			21			New record
Parawixia audax (Blackwall, 1863)			13			
Parawixia velutina (Taczanowski, 1878)			17			
Pronous tuberculifer Keyserling, 1881			7			
Testudinaria lemniscata (Simon, 1893) (Figure 3I)				1		New record
Wagneriana taim Levi, 1991 (Figure 3J)			14			New record
Barychelidae						
Barychelidae sp. 1					1	
Caponiidae						
Caponina notabilis (Mello-Leitão, 1939) (Figure 4A)	1				8	
Nyetnops guarani Platnick & Lise, 2007					3	
Corinnidae						
Castianeira sp. 1					1	
Corinna nitens (Keyserling 1981)			6		1	
Ianduba varia (Keyserling, 1891)					4	
Falconina gracilis (Keyserling, 1891)			7			
Tupirinna sp. 1					1	
Ctenidae						
Ctenus medius Keyserling, 1891			15		1	
Enoploctenus cyclothorax (Bertkau, 1880)			4			
Isoctenus coxalis (F.O.P.-Cambridge, 1902)			6			
Isoctenus ordinario Polotow & Brescovit, 2009			5			
Isoctenus segredo Polotow & Brescovit, 2009			11		2	
Parabatinga brevipes (Keyserling, 1891) (Figure 4B)					1	
Phoneutria nigriventer (Keyserling, 1891)		1	7			
Viracucha andicola (Simon, 1906)			1			New record
Deinopidae						
Deinopis sp. 1			4			

TABLE 1. Continued.

TAXON	COLLECTION METHOD					STATUS
	LS	DM	NM	BT	PT	
Dictynidae						
<i>Dictyna</i> sp. 1	1			17		
Dipluridae						
<i>Diplura</i> aff. <i>catharinensis</i>			1		5	
Eutichuridae						
<i>Cheiracanthium inclusum</i> (Hentz, 1847)			3			
<i>Radulphius</i> sp. 1			1			
Gnaphosidae						
<i>Vectius niger</i> (Simon, 1880)					1	New record
Hahniidae						
<i>Neohahnia</i> sp. 1	2			1	22	
Hahniidae sp. 1	1				2	
Hersiliidae						
<i>Ypypuera crucifera</i> (Vellard, 1924)			1			
Idiopidae						
<i>Idiops</i> sp. 1					7	
Linyphiidae						
<i>Agyneta</i> sp. 1	11				43	
<i>Agyneta</i> sp. 2	3				35	
<i>Lygarina</i> sp. 1	4			2		
<i>Moyosi prativaga</i> (Keyserling, 1886) (Figure 4C)	7				21	New record
<i>Neomaso</i> sp. 1	7				27	
<i>Scolecurea cambara</i> Rodrigues, 2005	31			3	81	
<i>Scolecurea</i> aff. <i>parilis</i>	1				12	
<i>Sphecozone novaetentoniae</i> (Baert, 1987)					37	New record
Linyphiidae sp. 1	4		1		53	
Lycosidae						
<i>Hogna gumia</i> (Bertkau, 1880) (Figure 4D)		1	3		2	New record
<i>Lycosa erythrogna</i> Lucas, 1836			50			
<i>Lycosa</i> aff. <i>sericovittata</i>			1			
<i>Lycosa</i> gr. <i>sericovittata</i> sp. 1			19			
<i>Lycosa</i> gr. <i>sericovittata</i> sp. 2			28			
<i>Lycosa</i> sp. 1			3			
<i>Lycosa</i> sp. 2			3			
<i>Trochosa</i> sp. 1			5			
Mimetidae						
<i>Arocha</i> sp. 1			1			
<i>Ero lata</i> Keyserling, 1891			10	11		
<i>Ero</i> sp. 1			9			
<i>Gelanor altithorax</i> Keyserling, 1893			10	9		New record
<i>Gelanor zonatus</i> (C.L. Koch, 1845)			17			
Miturgidae						
<i>Odo</i> sp. 1	7				10	
Mysmenidae						
<i>Mysmena</i> sp. 1	26				191	
Nemesiidae						
<i>Rachias</i> aff. <i>brachythelus</i>					2	
<i>Stenoterommata</i> aff. <i>platensis</i>			1			
<i>Stenoterommata</i> sp. 1					2	
<i>Stenoterommata</i> sp. 2					4	
Nephilidae						
<i>Nephila clavipes</i> (Linnaeus, 1767)		2	22			New record
Nesticidae						
<i>Nesticus potrei</i> Ott & Lise, 2002				1		
Ochyroceratidae						
<i>Speocera</i> sp. 1	8				1	
Oonopidae						
<i>Escaphiella morro</i> Platnick & Dupérré, 2009 (Figure 4E)	1					New record
<i>Gamasomorpha</i> sp. 1	2				2	
<i>Neoxyphinus termitophilus</i> (Bristowe, 1938)	4				7	
<i>Neotrops nigromaculatus</i> (Mello-Leitão, 1944)					11	New record
<i>Neotrops</i> sp. 1	8			10	50	
<i>Opopaea concolor</i> (Blackwall, 1859)	2					New record
<i>Orchestina</i> sp. 1	1			3		
<i>Triaeris stenaspis</i> Simon, 1891 (Figure 4F)	17				14	New record
Oonopidae sp. 1	1					

TABLE 1. Continued.

TAXON	COLLECTION METHOD					STATUS
	LS	DM	NM	BT	PT	
Oxyopidae						
Hamataliwa sp. 1				1		
Palpimanidae						
Otiotrops birabeni Mello-Leitão, 1945 (Figure 4G)					1	New record
Pholcidae						
Mesabolivar luteus (Keyserling, 1891)			23	8		
Mesabolivar mairiyara Machado et al., 2007					8	New record
Metagonia bonaldoi Huber, 2000				4		New record
Phrurolithidae						
Orthobula sp. 1	39				32	
Pisauridae						
Architis spinipes (Taczanowski, 1874)			3			
Salticidae						
Beata sp. 1				1		
Chira sp. 1			1			
Coryphasia sp. 1	1				1	
Coryphasia sp. 2	1				1	
Coryphasia sp. 3				1		
Cotinusa magna (Peckham & Peckham, 1894)			1	11		
Lyssomanes sp. 1			1			
Mopiopia labyrinthea (Mello-Leitão, 1947)		1		15		
Mopiopia tristis (Mello-Leitão, 1947)				15		
Noegus sp. 1				3		
Soesilarishius aff. lunatus	2				2	
Euophryinae sp. 1	4				1	
Euophryinae sp. 2				3		
Euophryinae sp. 3				1		
Euophryinae sp. 4					1	
Salticidae sp. 1				1		
Salticidae sp. 2	1					
Scytodidae						
Scytodes globula Nicolet, 1849			7		1	
Selenopidae						
Selenops occultus Mello-Leitão, 1918			6			
Sparassidae						
Caayguara cupepemassu Rheims, 2010			2			
Polybetes pythagoricus (Holmberg, 1875)			3			
Symphytognathidae						
Anapistula sp. 1	12				4	
Tengelidae						
Ciniflrella sp. 1					3	
Tetragnathidae						
Azilia histrio Simon, 1895			2			New record
Chrysometa boraceia Levi, 1986			11			
Chrysometa ludibunda (Keyserling, 1893)			1			
Dolichognatha sp. 1				3		
Leucauge sp. 1		6	64	25		
Leucauge sp. 2		3	40	2		
Opas melanoleuca (Mello-Leitão, 1944)			4			New record
Tetragnatha sp. 1			21			
Tetragnatha sp. 2			4			
Theraphosidae						
Magulla aff. obesa					1	
Sickius longibulbi Soares & Camargo, 1948			2			
Vitalius paranaensis Bertani, 2001		1	3		4	
Theridiidae						
Achaearanea gr. trapezoidalis				3		
Anelosimus sp. 1				1		
Ariamnes sp. 1		1		2		
Argyrodes elevatus Taczanowski, 1873		2	2	20		
Argyrodes aff. elevatus			15			
Argyrodes sp. 1			4	1		
Chrysso pulcherrima (Mello-Leitão, 1917)				1		New Record
Coleosoma floridanum Banks, 1900	1				4	New Record
Chrosiothes sp. 1				10	18	
Chrysso sp. 1	1				4	

TABLE 1. Continued.

TAXON	COLLECTION METHOD					STATUS
	LS	DM	NM	BT	PT	
<i>Chrysso</i> sp. 2	3				2	
<i>Chrysso</i> sp. 3				1		
<i>Cryptachaea cinnabarina</i> (Levi, 1963)			1			New Record
<i>Cryptachaea hirta</i> (Taczanowski, 1873)			6	20		
<i>Dipoena</i> sp. 1			2	7	16	
<i>Dipoena</i> sp. 2				3		
<i>Dipoena</i> sp. 3				3		
<i>Episinus</i> sp. 1			2			
<i>Euryopsis</i> sp. 1			16	5		
<i>Faiditus</i> sp. 1				6		
<i>Latrodectus geometricus</i> C.L. Koch, 1841			5			
<i>Neopispinus</i> aff. <i>fiapo</i>				11		
<i>Neopispinus</i> gr. <i>cognatus</i>	1		22	4	1	
<i>Platnickina mneon</i> (Bösenberg & Strand, 1906) (Figure 4H)				5		New Record
<i>Steatoda</i> sp. 1		1				
<i>Styposis selis</i> Levi, 1964	186				34	
<i>Theridion calcynatum</i> Holmberg, 1876			12	1		
<i>Theridion</i> sp. 1	1	1	18	27	1	
<i>Theridion</i> sp. 2			16		1	
<i>Theridion</i> sp. 3				1		
<i>Theridion</i> sp. 4				1		
<i>Thymoites</i> sp. 1	1			6	3	
<i>Tidarren</i> sp. 1				1		
<i>Thwaitesia affinis</i> O.P.-Cambridge, 1882			32	12		
<i>Wirada</i> sp. 1				1		
Theridiosomatidae						
<i>Chthonos</i> sp. 1				3		
<i>Naatlo</i> aff. <i>fauna</i>				4		
<i>Plato</i> sp. 1			3	2	1	
Theridiosomatidae sp. 1				1		
Thomisidae						
<i>Acentroscelus</i> sp. 1			1			
<i>Aphantochilus taurifrons</i> (O.P.-Cambridge, 1881)	1			2		New record
<i>Epicadus</i> sp. 1				1		
<i>Onocolus echinatus</i> (Taczanowski, 1872)				7		New record
<i>Tmarus</i> sp. 1			7	11		
<i>Tmarus</i> sp. 2				7		
<i>Tmarus</i> sp. 3				1		
<i>Tmarus</i> sp. 4				1		
<i>Tobias</i> sp. 1				1		
Trachelidae						
<i>Trachelas</i> sp. 1			1	1		
<i>Trachelas</i> sp. 2				1		
Trechaleidae						
<i>Neoctenus comosus</i> Simon, 1897			2			New record
<i>Paratrechalea ornata</i> (Mello-Leitão, 1943)			3			
<i>Trechaleoides biocellata</i> (Mello-Leitão, 1926) (Figure 4I)			27			New record
Uloboridae						
<i>Conifaber guarani</i> Grismado, 2004 (Figure 4J)		1				New record
<i>Miagrammopes</i> aff. <i>brasiliensis</i>			6	1		
<i>Miagrammopes guttatus</i> Mello-Leitão, 1937			11	5		
<i>Miagrammopes unipus</i> Chickering, 1968			2	3		New record
<i>Philoponella fasciata</i> (Mello-Leitão, 1917)		15		45		
<i>Sybota</i> sp. 1				1		
<i>Uloborus trilineatus</i> Keyserling, 1883		2	34	23		New record
<i>Uloborus</i> aff. <i>elongatus</i>			9	6		
<i>Uloborus</i> sp. 1			15	2		
<i>Zosis</i> aff. <i>geniculata</i>		48	2			
Total abundance	411	105	1031	485	840	
Total richness	40	22	104	85	65	

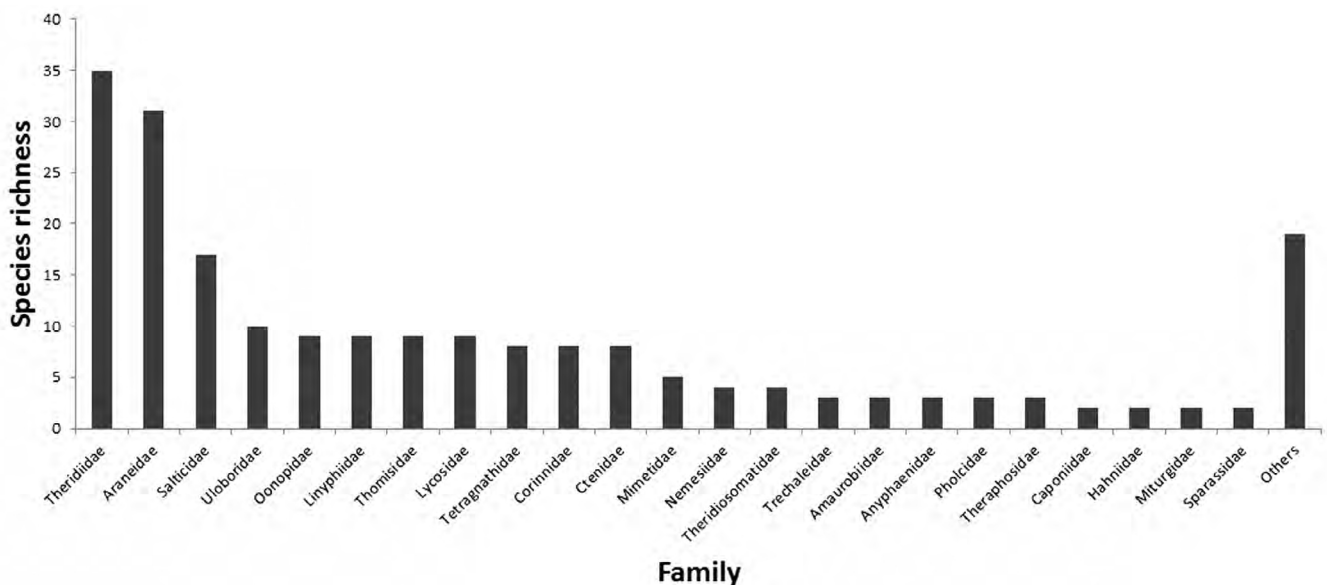


FIGURE 2. Species richness of spiders sampled from each family in Parque Estadual Mata São Francisco - PR.

DISCUSSION

Brazilian regions with the highest spider diversity are the south and southeast (Brescovit *et al.* 2011), with the most well sampled sites located in São Paulo and Rio Grande do Sul. Paraná is the sixth site in terms of number of spider records (Brescovit *et al.* 2011). However, it is important to highlight that these data are strongly biased by the large concentration of arachnologists and biological collections in these regions (Brescovit *et al.* 2011) and the low current proportion of forest in each state, which result in proportionally more complete inventories. As discussed by Brescovit *et al.* (2011) the number of species recorded from Brazilian regions is mainly explained by differences in the sampling effort; since the northern region is expected to harbor a higher diversity than the others.

The new records, as well as the large number of taxa obtained in this study is due to the use of different collecting methods, since inventories carried out in Paraná using a single method registered no more than 80 species/morphospecies (*e.g.*, Lopes *et al.* 2006, 2008; Buschini *et al.* 2010 a, b). The NM method contributed with 29,2% of the total number of exclusively recorded species, followed by BT. The number of species here obtained (209) was one of the largest recorded for the Atlantic Forest (see Azevedo *et al.* 2014). Podgaiski *et al.* (2007) used five methods and obtained 447 species/morphotypes, followed by other studies resulting in numbers between 212-293 species (Bonaldo *et al.* 2007; Álvares *et al.* 2004; Azevedo *et al.* 2014). In these studies, and ours, approximately 50% of the species were identified to species level. The taxonomic resolution in this paper and other papers dealing with spiders is relatively low if compared to others arachnids (*e.g.*, Tourinho *et al.* 2014). This fact is mainly due to the lack of taxonomic revisions and the large number of non-described species sampled from different groups (*e.g.*, Nogueira *et al.* 2006; Podgaiski *et al.* 2007; Carvalho and Avelino 2010).

Based on the literature (see Levi 1967, 1985, 1988, 1991, 1993), many species include records that are

quite distant from one another. Examples are the gaps in the geographical distribution of *Alpaida leucogramma* (White, 1841) (Figure 3B), *Micrathena plana* (C. L. Koch, 1836) (Figure 3F), *Ocrepeira covillei* Levi, 1993 (Figure 3H), *Wagneriana taim* Levi, 1991 (Figure 3J), *Chrysso pulcherrima* (Mello-Leitão, 1917) and *Platnickina mneon* (Bösenberg & Strand, 1906) (Figure 4H). *Gelanor altithorax* Keyserling, 1893 is broadly distributed in almost all of the Atlantic forest, but had not yet been recorded the sites of Paraná. *Escaphiella morro* Platnick & Dupérré, 2009 (Figure 4E), also recorded in this study, was known only from the type locality (São Paulo) and Mato Grosso, Brazil. *Triaeris stenaspis* Simon, 1891 (Figure 4F) is a parthenogenetic species with Pantropical distribution, introduced in Europe and now found in southern Brazil (see Platnick *et al.* 2012).

The large number of morphotypes and new records of Araneidae and Theridiidae are probably the result of the high richness of known species of these families in the world (World Spider Catalog 2014), since similar results were observed in several inventories conducted in Atlantic Forest fragments (*e.g.*, Silva 2005; Dias *et al.* 2006; Podgaiski *et al.* 2007). Thus, with the new records presented in this study, Paraná becomes the sixth state in Brazil with the highest number of recorded species of spiders, totaling 465 species (Brescovit *et al.* 2011). This represents an increase of 10% in the number of recorded species, and this fragment of Atlantic Forest becomes one of the most well studied areas in the state, harboring one of the largest inventories carried out in Paraná, with a record of 20% of all known species.

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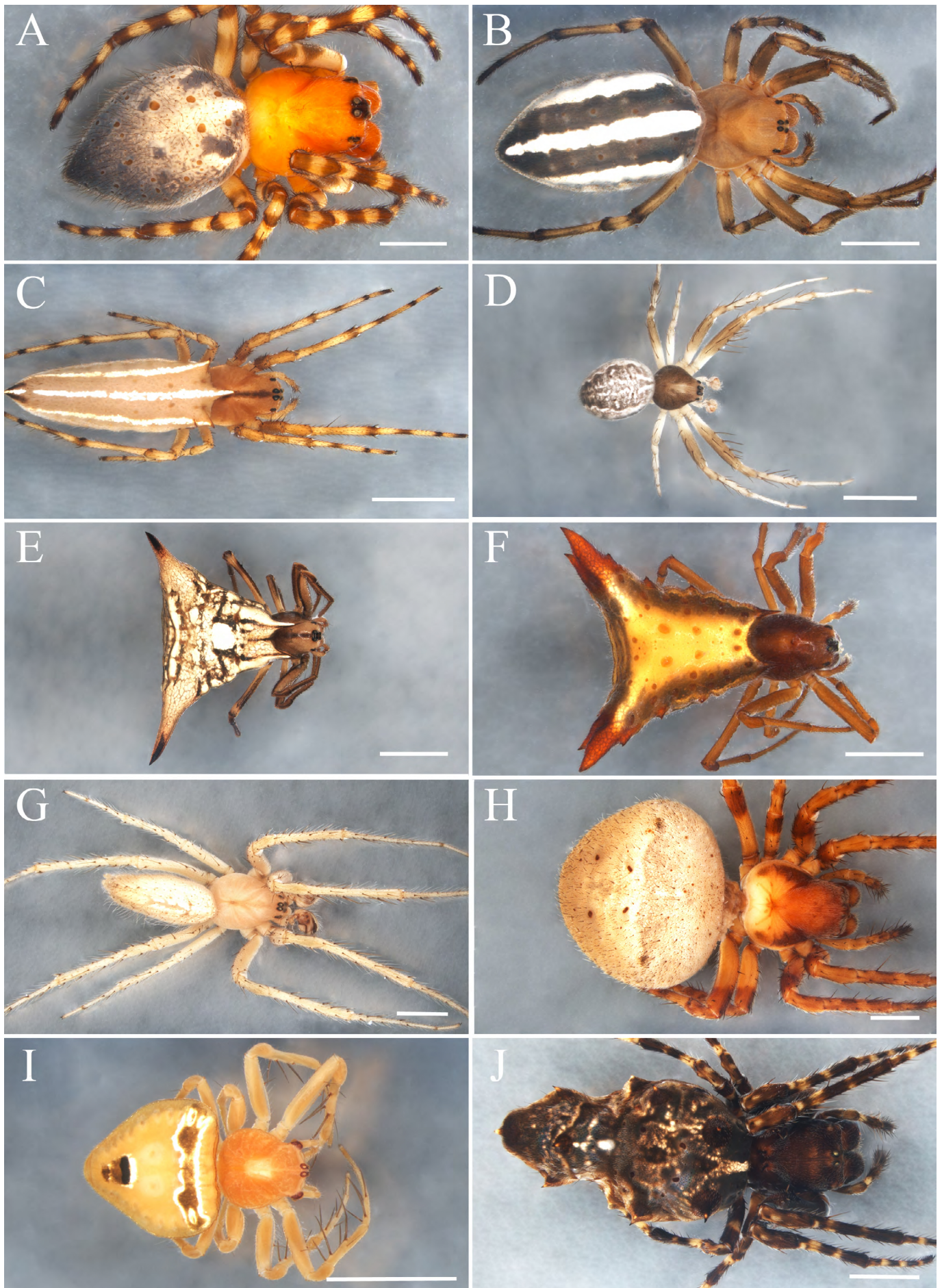


FIGURE 3. Araneidae species recorded for the first time from the state of Paraná, Brazil. A: *Alpaida itapua* (Female); B: *Alpaida leucogramma* (Female); C: *Alpaida trispinosa* (Female); D: *Metepeira compsa* (Male); E: *Micrathena peregrinatorum* (Female); F: *Micrathena plana* (Female); G: *Neoscona nautica* (Male); H: *Ocrepeira covillei* (Female); I: *Testudinaria lemniscata* (Female); J: *Wagneriana taim* (Female). Scale bars: 1mm.

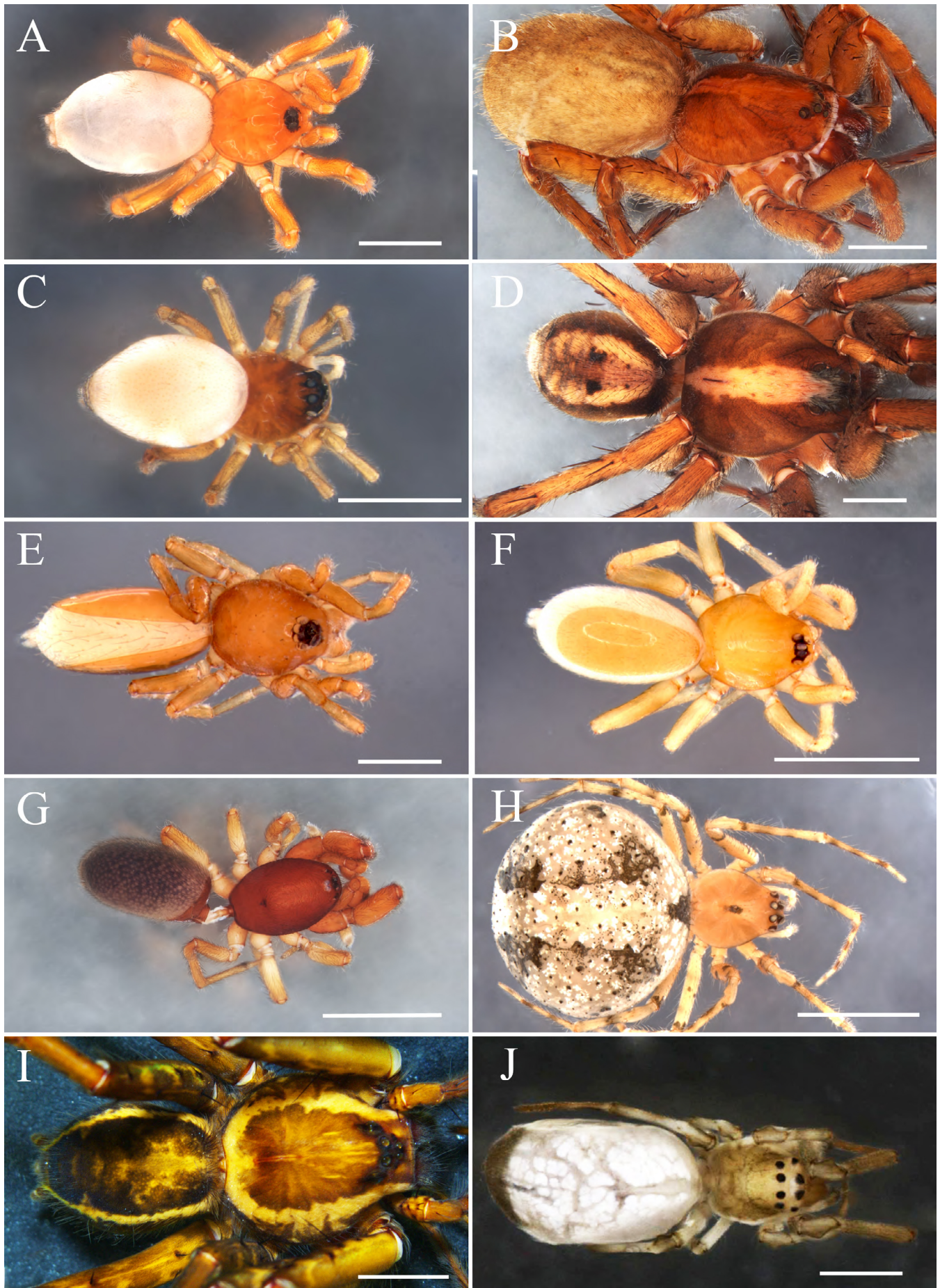


FIGURE 4. Species from different families recorded for the first time from the state of Paraná, Brazil. A: *Caponina notabilis* (Female) (Caponiidae); B: *Parabatinga brevipes* (Female) (Ctenidae); C: *Moyosi prativaga* (Female) (Linyphiidae); D: *Hogna gumia* (Female) (Lycosidae); E: *Escaphiella morro* (Female) (Oonopidae); F: *Triaeris stenaspis* (Female) (Oonopidae); G: *Otiotrops birabeni* (Male) (Palpimanidae); H: *Platnickina mneon* (Female) (Theridiidae); I: *Trechaleoides biocellata* (Female) (Trechaleidae); J: *Conifaber guarani* (Female) (Uloboridae). Scale bars: Figs. A, C, E, and F = 1mm; Figs. G, H and J = 2mm; Figs. B, D and I = 4mm.