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Species and guild structure of a Neotropical spider assemblage (Araneae) from Reserva Ducke, Amazonas, Brazil

Abstract

We present a species list of spiders collected over a period of more than 5 years in a rainforest reserve in central Amazonia –Reserva Ducke. The list is mainly based on intense sampling by several methods during two years and frequent visual sampling during 5 years, but also includes records from other arachnologists and from the literature, in total containing 506 (morpho-)species in 284 genera and 56 families. The species records from this Neotropical rainforest form the basis for a biodiversity database for Amazonian spiders with specimens from several Brazilian collections and the collection of the State Museum of Natural History Karlsruhe, where it is housed. This database will in the future facilitate species identification of Neotropical spider collections, allow comparison of morphospecies and serve as an important background for biodiversity evaluation in natural and anthropogenic habitats and the recognition of species distribution and loss. For further evaluation of the structure of Neotropical spider assemblages and their ecological function we present an analysis of the guild structure of the fauna of Reserva Ducke, although we also emphasize the lack of knowledge on natural history and behavior for many of the species.

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Key words

Araneae, Neotropical, assemblage guilds, inventory

1. Introduction

The forest reserve „Reserva Florestal ADOLPHO DUCKE“ belongs to the Instituto Nacional de Pesquisas da Amazônia (INPA) and is certainly one of the best studied areas of Amazonian rainforest. It is situated in central Amazonia, 26 km northeast of the city of Manaus (59°58'W, 2°54'S) and comprises 100 km² (10 x 10 km). A summarized description of geology, soil characteristics, floristic composition is presented in GENTRY'S comparison of „Four Neotropical Rainforests“ (GENTRY 1990). A "Flora da Reserva Ducke" has recently been presented in book form (RIBEIRO et al. 1999). PENNY & ARIAS (1982) made a first survey of the knowledge on insects of the reserve and HÖFER & BECK (1995, 1996) gave a synopsis of the arachnids collected there. Zoo-

logical species inventories have been presented by APOLINÁRIO (1993) for termites, BECK (1971) for oribatid mites, HARADA & ADIS (1997) for ants, HERO (1990) for frogs, LOURENÇO (1988) for scorpions, MAHNERT & ADIS (1985) for pseudoscorpions and WILLIS (1977) for birds. A book on the arthropod fauna of the reserve, edited by INPA scientists is in preparation.

We present here a species list of spiders collected in the reserve. The list is based on more than 2 years of intense sampling by diverse methods in ecological studies (GASNIER et al. 1995, GASNIER & HÖFER 2001, HÖFER 1997, HÖFER et al. 1994a, b, HÖFER et al. 1996, VIEIRA & HÖFER 1994, VIEIRA & HÖFER 1998), but also includes species records from frequent visual sampling over more than five years and specimens collected by other people over a period of about 20 years, which were deposited in Brazilian collections, and few additional species records from the literature.

The species records from this Neotropical rainforest represent the basis of a biodiversity database for Amazonian spiders with specimens from several Brazilian collections and the collection of the State Museum of Natural History Karlsruhe. This database will on the long run be completed by at best all records of identified species from Amazonia and also include morphospecies characterized by a character matrix to allow comparison and recognition of species identity or complementarity. The collections of several institutions will become accessible and their specimens available for comparison, thus enhancing taxonomic work but also allowing better recognition of species in ecological investigations - today internationally recognized demands (GBIF-Global Biodiversity Information Facility: www.gbif.org). The database will allow biogeographic evaluation and serve as an important background for biodiversity inventories of natural and anthropogenic habitats and the recognition of species distribution and loss.

The knowledge of natural history and ecology of spiders is essential for an understanding of the role of spiders in natural and agroecosystems (SUNDERLAND & GREENSTONE 1999), but these informations are especially scarce from tropical assemblages. Assemblage guilds (JAKSIČ & MEDEL 1990) have been proposed to be used as ecological units instead of species or other taxonomically defined units, especially in studies on the effects of spiders on pests in agroecosystems.

UETZ et al. (1999) summarized and discussed the concept and proposed and tested a guild classification for North American spider assemblages. We made a similar analysis for the spider assemblage of a Neotropical primary terra firme rainforest (Reserva Ducke) and propose here a guild classification which can be compared with classifications from other climatic and geographic zones and which has to be tested with assemblages of other Neotropical natural or anthropogenic ecosystems.

2. Material and Methods

Our own collections have been made by pitfall traps, litter quadrat sampling, ground-photoeclectors and trunk (arboreal) funnel traps (HÖFER 1990), insecticide fogging in the canopy of two trees (HÖFER et al. 1994a), intensive nocturnal transect sampling (GASNIER 1996, GASNIER & HÖFER 2001) by the aid of cap lamps, one day sampling with a protocol proposed by CODDINGTON et al. (1991) and conventional hand sampling during hundreds of excursions. Five ground-eclectors and 3 trunk funnel traps were run for 12 respectively 17 months in 1991 and 1992 within an area of about 5 hectares. The ground-eclectors enclosed 1 m² each, were put up in a line of 50 m and remained always 4 weeks in the same position before being moved 10 meters forward in the forest. The trunk funnel traps were mounted on three medium sized tree trunks, 50 - 70 m distant from each other, in a height of 1.5 m above ground. Arthropods caught in all these traps, filled with picric acid, were collected weekly. In two experimental sites of 400 m² each, within this area, we repeatedly collected 20 litter quadrat samples, which were handsorted, and run 30 pitfall traps during three periods of 4 weeks each.

In addition we checked the collections of the Instituto Nacional de Pesquisas da Amazônia (INPA) in Manaus and the Museo de Ciências Naturais (MCN) in Porto Alegre and all available literature (e.g. the numerous publications of H.W. LEVI and M.E. GALIANO) for additional species records.

Many specialists identified species from our collections and included specimens in their taxonomic work. Corinnidae were identified and revised by ALEXANDRE BONALDO (Belem), Salticidae were identified by HEIKO METZNER, Theridiidae by ERICA BUCKUP and APARECIDA MARQUES (Porto Alegre), Thomisidae by ARNO LISE (PORTO ALEGRE); PABLO GOLOBOFF (Buenos Aires) identified most of the mygalomorph spiders. Morphospecies in genera, where an identification could not be done to date, were only included with a confirmed deposition/availability of specimens.

Because the material collected with traps could only be identified or separated in morphospecies during revisionary work in the course of the last 8 years, a reasonably correct calculation of diversity indices of samples with abundances of every morphospecies is not possible. Species numbers given and dominance values are estimates based on lists with experienced assignment of juvenile specimens to species. The number of observed species including juveniles is already an estimate, because the species belonging of many juveniles cannot be finally determined. Estimation of species numbers based on adult specimens were made using the first order jackknife and the CHAO 2 function of the computer program BioDiversity Professional (Beta version 1 by LAMBSHEAD, PATERSON and GAGE). These two models have shown the best performance

in the tests of TOTI et al. (2000). Due to the long lasting identification process and the failure of an encoded specimen database we could only use the total catches over the whole period of always one trap as unit and not the weekly samples. From such a weak database no accurate estimates can be derived and the resulting species estimates have to be regarded with caution.

Criteria used to analyse the guild structure of the Neotropical spider assemblage partly followed UETZ et al. (1999), but were supplemented with criteria considered important for the Amazonian spider assemblage (see table 5). Cluster analysis was done with the same method and program that UETZ et al. (1999) used, the unweighted pair group average method (Statistica, StatSoft 1997).

Most specimens from our samples will lastly be deposited in the collection of the Instituto Nacional de Pesquisas da Amazônia (INPA) in Manaus, however a large part of the material is at the moment still on loan to taxonomists or to the two authors. Abbreviations used for the collections where specimens are deposited: AMNH, American Museum of Natural History, New York, USA (N.I. PLATNICK); CAS, California Academy of Sciences, San Francisco, USA (C. GRISWOLD); IBSP, Instituto Butantan, São Paulo, Brazil (A.D. BRESOVIT); INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil (C. MAGALHÃES); MACN, Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina (C. SCIOSCIA); MCN, Museo de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil (E.H. BUCKUP); MCTP, Museu de Ciências e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil (A.A. LISE); MCZ, Museum of Comparative Zoology, Harvard, USA (L. LEIBENSPERGER); MEG, private collection of M.E. GALIANO, Buenos Aires, Argentina; MNRJ, Museu Nacional, Universidade Federal de Rio de Janeiro, Brazil (A. KURY); MZSP, Museu de Zoologia, Universidade de São Paulo, Brazil (E. CANCELLO); SMNK, Staatliches Museum für Naturkunde Karlsruhe, Germany (H. HÖFER).

3. Results

3.1 Species inventory

The species list contains at the moment 506 recognized morphospecies in 284 genera and 56 families (tab. 1). The list is highly resolved, which means that 279 species are identified, 67 (13 %) are confirmed new species. Reserva Ducke is the type locality of 39 species. For 3 species the paratypes or the first described male or female are from Reserva Ducke. When we started our study more than 20 % of the spider fauna were undescribed.

In the families Araneidae (*Eustala*), Linyphiidae, Mysmenidae, Oonopidae, Sparassidae, Theridiidae and Theridiosomatidae, additional species might well be recognized by revisional work based on our material. The list thus gives the minimum number of species recorded for the locality.

Salticidae is the most species rich family with 112 identified species (22 %) followed by Araneidae with 91 species (18 %), Theridiidae with 59 (12 %), Corinnidae with 43 (9 %) and Ctenidae with 16 species

(3 %). Mygalomorph spiders are represented by 22 species from 10 families. The ratio of species to genera (S/G) for the whole list is 1.8, for the ground eclector samples 1.9 and for the trunk funnel samples 1.8.

Continuously run traps like ground-eclectors and trunk funnels were most effective in capturing high species numbers, but single fogging procedures also contributed considerably to the species inventory (tab. 2, HÖFER et al. 1994a), demonstrating the expected (and still unrevealed) high species richness of the tropical forest canopy. Pitfall traps and quadrat samples collected considerably less species. Our manual sampling

principally served to collect species living in lower vegetation and large hunting spiders of the ground, which on the other hand were rarely caught as adult specimens in the traps.

None of the mean randomized (50 runs) observed species accumulation curves from the three different methods (ground eclectors, trunk funnel traps, CODDINGTON's protocol) reached an asymptote. Richness estimates (first order jackknife and CHAO 2) from three different sample sets, using only adult specimens, show very different values (tab. 2), all clearly below the species number of our list resulting from all methods together.

Table 1. List of species recorded from Reserva Ducke RD (ud – undescribed, tl – type locality RD, pt – paratype collected at RD, occurrence – method or stratum where specimens were recorded, when no information is given it was collected manually: be – beating of vegetation, f – fogging, ge – ground eclector, ld – looking down, lu – looking up, pf – pitfall trap, te – trunk eclector, veg – in vegetation; da – dial activity: di – diurnal, no – nocturnal).

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
Actinopodidae							
<i>Actinopus</i>	sp.	.	.	.	MCN, SMNK	pf	no
Anapidae							
<i>Anapis</i>	<i>caluga</i>	PLATNICK & SHADAB	.	.	SMNK	lu	di
<i>Anapis</i>	sp.	.	.	.	MCN	te	
<i>Pseudanapis</i>	sp.	.	.	.	MCN	m	
Anyphaenidae							
<i>Anyphaenoides</i>	<i>coddingtoni</i>	BRESOVIT	.	+	IBSP, USNM	te	
<i>Hibana</i>	<i>melloleitaoi</i>	(CAFORIACCO)	.	.	INPA, MCN	lu ge be f	di
<i>Isigonia</i>	<i>limbata</i>	SIMON	.	.	INPA, SMNK	te	
<i>Patrera</i>	sp.	.	.	.	MCN	te f	
<i>Pippuhana</i>	sp.	.	.	.	IBSP on loan	te	
<i>Teudis</i>	sp.	.	+	.	MCN	te	
<i>Wulfila</i>	<i>modesta</i>	CHICKERING	.	.	SMNK, MCN	te f	
<i>Wulfilopsis</i>	n.sp.	.	.	+	INPA	te	
gen. ?	sp.	.	.	.	IBSP on loan	te	
Araneidae							
<i>Acacesia</i>	cf. <i>cornigera</i>	PETRUNKEVITCH	.	.	MCN	f	
<i>Actinosoma</i>	<i>pentacanthum</i>	(WALCKENAER)	.	.	INPA, MCN	.	di
<i>Alpaida</i>	<i>acuta</i>	(KEYSERLING)	.	.	MCZ		
<i>Alpaida</i>	<i>bicornuta</i>	(TACZANOWSKI)	.	.	NHRM	f	
<i>Alpaida</i>	<i>carminea</i>	(TACZANOWSKI)	.	.	MEG, MZSP		
<i>Alpaida</i>	<i>delicata</i>	(KEYSERLING)	.	.	SMNK		
<i>Alpaida</i>	n.sp. <i>prope antonio</i>	.	.	+	SMNK on loan	ge	
<i>Alpaida</i>	n.sp. <i>prope simila</i>	.	.	+	SMNK on loan	ge	
<i>Alpaida</i>	n.sp.?	.	.	.	SMNK on loan	ge	
<i>Alpaida</i>	<i>negro</i>	LEVI	.	.	SMNK		
<i>Alpaida</i>	<i>tabula</i>	(SIMON)	.	.	SMNK	te	no
<i>Alpaida</i>	<i>trispinosa</i>	(KEYSERLING)	.	.	MEG	.	
<i>Alpaida</i>	<i>truncata</i>	(KEYSERLING)	.	.	INPA, SMNK	be	di
<i>Alpaida</i>	<i>urucuca</i>	LEVI	.	.	MCN		
<i>Amazonepeira</i>	<i>herrera</i>	LEVI	.	.	MCN		
<i>Amazonepeira</i>	<i>masaka</i>	LEVI	.	.	MCN		
<i>Araneus</i>	<i>guttatus</i>	(KEYSERLING)	.	.	MEG		
<i>Araneus</i>	<i>venatrix</i>	(C.L.KOCH)	.	.	MCN		
<i>Argiope</i>	<i>argentata</i>	(FABRICIUS)	.	.	MCN		
<i>Bertrana</i>	<i>elinguis</i>	(KEYSERLING)	.	.	SMNK, MEG	ge	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
<i>Chaetacis</i>	<i>cornuta</i>	(TACZANOWSKI)	.	.	MCN		
<i>Chaetacis</i>	<i>cucharas</i>	LEVI	.	.	MCN		
<i>Chaetacis</i>	<i>necopinata</i>	(CHICKERING)	.	.	INPA		
<i>Chaetacis</i>	<i>abrahami</i>	MELLO-LEITÃO	.	.	MCN		
<i>Chaetacis</i>	<i>aureola</i>	(C.L.KOCH)	.	.	INPA, MCN, MEG		
<i>Cyclosa</i>	<i>bifurcata</i>	(WALCKENAER)	.	.	INPA, MCZ, SMNK	veg	
<i>Cyclosa</i>	<i>caroli</i>	LEVI	.	.	INPA, MCN		
<i>Cyclosa</i>	<i>diversa</i>	(O. P. CAMBRIDGE)	.	.	INPA, MCTP, MCN		
<i>Cyclosa</i>	<i>fillineata</i>	HINGSTON	.	.	INPA, MCN, SMNK		
<i>Cyclosa</i>	<i>rubronigra</i>	CAPORIACCO	.	.	MCTP, MCZ		
<i>Cyclosa</i>	<i>tapetifaciens</i>	HINGSTON	.	.	INPA, MACN, MCN, SMNK		
<i>Cyclosa</i>	<i>vieirae</i>	LEVI	.	.	MACN		
<i>Dubiepeira</i>	<i>dubitata</i>	(SOARES & CAMARGO)	.	.	MCN		
<i>Edriscus</i>	sp.	.	.	.	MCN		
<i>Epeiroides</i>	<i>bahiensis</i>	(KEYSERLING)	.	.	MCN		
<i>Eriophora</i>	<i>fuliginea</i>	(C.L.KOCH)	.	.	MCN		
<i>Eustala</i>	spp.	.	.	.	MCN, SMNK	lu be te f	no
<i>Gasteracantha</i>	<i>cancriformis</i>	(LINNAEUS)	.	.	.	only photo	
<i>Hingstepeira</i>	<i>dimona</i>	LEVI	.	.	MCN, MCZ		
<i>Hingstepeira</i>	<i>folisecens</i>	LEVI	.	.	INPA, MCN, SMNK	veg	no
<i>Hypognatha</i>	<i>scutata</i>	(PERTY)	.	.	INPA		
<i>Kapogea</i>	<i>alayi</i>	(ARCHER)	.	.	MCN		
<i>Kapogea</i>	<i>sexnotata</i>	(SIMON)	.	.	MCZ		
<i>Larinia</i>	sp.	.	.	.	MCN on loan		
<i>Mangora</i>	sp.	.	.	.	IBSP, SMNK, MCN	veg te f	
<i>Manogea</i>	<i>porracea</i>	(C.L.KOCH)	.	.	INPA, MCN, MCZ		
<i>Mecynogea</i>	sp.	.	.	.	MCN		
<i>Metazygia</i>	<i>castaneoscutata</i>	(SIMON)	.	.	MCN		
<i>Metazygia</i>	<i>ducke</i>	LEVI	.	+	MCN		
<i>Metazygia</i>	<i>enabla</i>	LEVI	.	.	MCN		
<i>Metazygia</i>	<i>laticeps</i>	(O. P. CAMBRIDGE)	.	.	SMNK	veg	
<i>Metazygia</i>	<i>manu</i>	LEVI	.	.	MCN		
<i>Metazygia</i>	<i>mariahelenae</i>	LEVI	.	+	MACN		
<i>Metazygia</i>	<i>yucumo</i>	LEVI	.	.	MCN		
<i>Micrathena</i>	<i>acuta</i>	(WALCKENAER)	.	.	SMNK on loan		
<i>Micrathena</i>	<i>clypeata</i>	(WALCKENAER)	.	.	INPA, SMNK	lu f	di
<i>Micrathena</i>	<i>coca</i>	LEVI	.	.	MCN, MEG		
<i>Micrathena</i>	<i>evansi</i>	CHICKERING	.	.	INPA, MEG		
<i>Micrathena</i>	<i>excavata</i>	(C.L.KOCH)	.	.	INPA, MCN		
<i>Micrathena</i>	<i>exlinae</i>	LEVI	.	.	MCN		
<i>Micrathena</i>	<i>furcula</i>	(O. P. CAMBRIDGE)	.	.	MCN		
<i>Micrathena</i>	<i>horrida</i>	(TACZANOWSKI)	.	.	MCN		di
<i>Micrathena</i>	<i>kirbyi</i>	(PERTY)	.	male	INPA, MCN, SMNK	veg	di
<i>Micrathena</i>	<i>lata</i>	CHICKERING	.	.	MZSP		
<i>Micrathena</i>	<i>plana</i>	(C.L.KOCH)	.	.	SMNK on loan		
<i>Micrathena</i>	<i>pungens</i>	(WALCKENAER)	.	.	AMNH, SMNK		
<i>Micrathena</i>	<i>schreibersi</i>	(PERTY)	.	.	INPA, MCZ, SMNK	veg	di
<i>Micrathena</i>	<i>triangularis</i>	(C.L.KOCH)	.	.	INPA, MCN		
<i>Micrathena</i>	<i>triangularispinosa</i>	(DE GEER)	.	.	INPA, MCN, MEG		
<i>Micrathena</i>	<i>ucayali</i>	LEVI	.	.	MCN		
<i>Micrepeira</i>	<i>fowleri</i>	LEVI	.	.	INPA, MCZ		
<i>Micrepeira</i>	<i>hoeferi</i>	LEVI	.	.	INPA, MCN, SMNK, MCZ	veg	
<i>Micrepeira</i>	<i>tubulofaciens</i>	(HINGSTON)	.	.	MCN		
<i>Ocrepeira</i>	<i>maraca</i>	LEVI	.	.	MEG		
<i>Ocrepeira</i>	<i>albopunctata</i>	(TACZANOWSKI)	.	.	MCN, MEG		
<i>Ocrepeira</i>	<i>covillei</i>	LEVI	.	.	MCN		

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
<i>Parawixia</i>	<i>hypocrita</i>	(O. P. CAMBRIDGE)	.	.	MCN	veg	
<i>Parawixia</i>	<i>kochi</i>	(TACZANOWSKI)	.	.	INPA, MCN	veg te	no
<i>Parawixia</i>	<i>tarapoa</i>	LEVI	.	.	MCN	wasp prey	
<i>Pronous</i>	<i>tuberculifer</i>	KEYSERLING	.	.	MCZ		
<i>Spilasma</i>	<i>duodecinguttata</i>	(KEYSERLING)	.	.	INPA, MCN, SMNK		
<i>Testudinaria</i>	sp.	.	.	.	SMNK	lu	no
<i>Verrucosa</i>	sp.	.	.	.	SMNK	lu te	no
<i>Wagneriana</i>	<i>acrosomoides</i>	(MELLO-LEITÃO)	.	.	INPA		
<i>Wagneriana</i>	<i>bamba</i>	LEVI	.	.	MCN		
<i>Wagneriana</i>	<i>jelskii</i>	(TACZANOWSKI)	.	.	INPA, CAS		
<i>Wagneriana</i>	<i>lechuza</i>	LEVI	.	.	MCN		
<i>Wagneriana</i>	<i>maseta</i>	LEVI	.	.	INPA		
<i>Wagneriana</i>	<i>neblina</i>	LEVI	.	.	MCN		
<i>Wagneriana</i>	<i>transitoria</i>	(C.L. KOCH)	.	.	MCN		
<i>Xylethrus</i>	<i>scrupeus</i>	SIMON	.	.	SMNK	veg	
Barychelidae							
<i>Strophaeus</i>	sp.	.	.	.	AMNH on loan	ge	
Caponiidae							
<i>Caponinae</i>	sp.	.	.	.	AMNH on loan	ge	
<i>Nops</i>	sp.	.	.	.	INPA, MCN	ge	
Clubionidae							
<i>Clubiona</i>	aff. kiwoa	.	.	.	MCN on loan		
<i>Elaver</i>	sp.	.	.	.	IBSP	te	
Corinnidae							
<i>Abapeba</i>	<i>hoeferi</i>	BONALDO	.	+	MCN, SMNK	te	
<i>Abapeba</i>	<i>lacertosa</i>	SIMON	.	.	INPA, MCN, SMNK	te	
<i>Abapeba</i>	<i>taruma</i>	BONALDO	.	.	INPA, SMNK	te	
<i>Apochinomma</i>	sp.	.	.	.	BONALDO on loan		
<i>Castianeira</i>	sp.2	.	.	.	MCN, SMNK	ge	
<i>Castianeira</i>	sp.4	.	.	.	MCN, SMNK	te	
<i>Castianeira</i>	sp.6	.	.	.	MCN, SMNK	te	
<i>Corinna</i>	<i>ducke</i>	BONALDO	.	+	INPA, MCN, SMNK	ge te	
<i>Corinna</i>	<i>recurva</i>	BONALDO	.	+	INPA, MCN, SMNK	ge pf te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 2	.	.	+	INPA (BONALDO on loan)	ge	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 3	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 4	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 5	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 6	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 7	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 9	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 11	.	.	+	INPA (BONALDO on loan)	te	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 12	.	.	+	INPA (BONALDO on loan)	m	
<i>Corinna</i>	grupo <i>ducke</i> n.sp. 13	.	.	+	INPA (BONALDO on loan)	m	
<i>Creugas</i>	n.sp.	.	.	+	INPA (BONALDO on loan)	te	
<i>Ecitocobius</i>	<i>comissator</i>	BONALDO & BRESCOVIT	.	+	INPA	with ants	
<i>Falconina</i>	n.sp.	.	.	+	INPA (BONALDO on loan)	.	
<i>Mazax</i>	cf. <i>pax</i>	.	.	.	SMNK	sandy area veg	
<i>Myrmecotypus</i>	sp.	.	.	.	SMNK	f	
<i>Myrmecium</i>	<i>bifasciatum</i>	(TACZANOWSKI)	.	.	INPA, SMNK	veg te	
<i>Myrmecium</i>	cf. <i>gounelley</i>	SIMON	.	.	SMNK on loan	veg	
<i>Myrmecium</i>	cf. <i>velutinum</i>	SIMON	.	.	SMNK on loan	veg	
<i>Parachemmis</i>	<i>manauara</i>	BONALDO	.	.	MCN, INPA, IBSP, SMNK	te	
<i>Parachemmis</i>	n.sp. 1	.	.	+	INPA (BONALDO on loan)	te	
<i>Parachemmis</i>	n.sp. 2	.	.	+	INPA (BONALDO on loan)	te	
<i>Simonestus</i>	n.sp. 3	.	.	+	INPA (BONALDO on loan)	te	
<i>Simonestus</i>	n.sp. 5	.	.	+	INPA (BONALDO on loan)	termite nest	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
<i>Simonestus</i>	n.sp. 7	.	+	.	INPA (BONALDO on loan)	te	
<i>Sphecotypus</i>	cf. <i>niger</i>	.	.	.	INPA (BONALDO on loan)	f	di
<i>Stethorrhagus</i>	<i>lupulus</i>	SIMON	.	.	MCN, SMNK	te f	
<i>Tapixaua</i>	<i>callida</i>	BONALDO	.	+	INPA, SMNK	te	
Trachelinae gen.	n.sp.2	.	.	.	INPA (BONALDO on loan)	te	
Trachelinae gen.	n.sp.4	.	.	.	INPA (BONALDO on loan)	te	
Trachelinae gen.	n.sp.5	.	.	.	INPA (BONALDO on loan)	te	
Trachelinae gen.	n.sp.6	.	.	.	INPA (BONALDO on loan)	te	
<i>Tupirinna</i>	<i>rosae</i>	BONALDO	.	+	INPA, IBSP, SMNK	te	
<i>Tupirinna</i>	n.sp. 1	.	+	.	INPA (BONALDO on loan)	m	
<i>Xeropigo</i>	n.sp. 5	.	+	.	INPA (BONALDO on loan)	te	
Ctenidae							
<i>Acanthoctenus</i>	<i>spiniger</i>	KEYSERLING	.	.	IBSP on loan	m	no
<i>Asthenoctenus</i>	<i>longistylus</i>	BRESCOVIT & SIMÓ	.	.	INPA, SMNK	te	no
<i>Centroctenus</i>	<i>acara</i>	BRESCOVIT	.	+	INPA, IBSP, SMNK	ld	no
<i>Centroctenus</i>	<i>auberti</i>	(CAFORIACCO)	.	.	MCN, INPA, SMNK	te	no
<i>Centroctenus</i>	<i>miriuma</i>	BRESCOVIT	.	.	SMNK	te	no
<i>Centroctenus</i>	<i>ocelliventer</i>	(STRAND)	.	.	INPA, IBSP, MCN, SMNK	te	no
<i>Ctenus</i>	<i>amphora</i>	MELLO-LEITÃO	.	.	INPA, IBSP, SMNK	ge ld te	no
<i>Ctenus</i>	<i>crulsi</i>	MELLO-LEITÃO	.	.	INPA, IBSP, SMNK	ge ld	no
<i>Ctenus</i>	<i>inaja</i>	HÖFER, BRESCOVIT & GASNIER	+	.	NPA, MCN	te	no
<i>Ctenus</i>	<i>manauara</i>	HÖFER, BRESCOVIT & GASNIER	.	+	INPA, SMNK	m	no
<i>Ctenus</i>	<i>minor</i>	F.O. P. CAMBRIDGE	.	.	INPA, MCN	m	no
<i>Ctenus</i>	<i>villasboasi</i>	MELLO-LEITÃO	.	.	INPA, SMNK	ld	no
<i>Cupiennius</i>	<i>celerrimus</i>	SIMON	.	.	IBSP, MCN, SMNK, UA	veg	no
<i>Enoploctenus</i>	n.sp.	.	+	.	INPA, IBSP, MCN, SMNK	te	no
<i>Gephyroctenus</i>	n.sp.	.	+	.	MCN	ge bete	
<i>Phoneutria</i>	<i>fera</i>	PERTY	.	.	SMNK, MCN	veg te	no
<i>Phoneutria</i>	<i>reidyi</i>	(F.O. P. CAMBRIDGE)	.	.	SMNK, MCN	veg te	no
Ctenizidae							
<i>Ummidia</i>	sp.	.	.	.	AMNH on loan	m	no
Cyrtoucheniidae							
<i>Bolostromus</i>	sp.	.	.	.	INPA, IBSP, SMNK on loan	ge qu	
<i>Fufius</i>	sp.	.	.	.	MCN, AMNH on loan	ge in wasp nest	
<i>Rhytidicolus</i>	sp.	.	.	.	AMNH on loan	pf	
Deinopidae							
<i>Deinopis</i>	sp.	.	.	.	MCN	lu be te	no
<i>Dictyna</i>	sp.	.	.	.	MCN	f	
<i>Thallumetus</i>	sp.	.	.	.	INPA, IBSP	ge	
Dipluridae							
<i>Diplura</i>	sp.	.	.	.	MCN	qu pf ld te	no
<i>Masteria</i>	n.sp.1	.	+	.	SMNK, MCN, AMNH on loan	qu ge pf te	
<i>Masteria</i>	n.sp.2	.	+	.	SMNK, MCN, AMNH, on loan	qu ge pf te	
Gnaphosidae							
<i>Amazoromus</i>	<i>becki</i>	BRESCOVIT & HÖFER	.	+	INPA, SMNK	te	
<i>Amazoromus</i>	<i>kedus</i>	BRESCOVIT & HÖFER	.	+	INPA, SMNK, MCN	te	
<i>Apopyllus</i>	sp.	.	.	.	IBSP on loan		
<i>Apodrassodes</i>	sp.	.	.	.	SMNK on loan	te	
<i>Cesonia</i>	sp.	.	.	.	MCN		
<i>Zimiromus</i>	n.sp. aff. <i>nadleri</i>	.	+	.	IBSP on loan	te	
<i>Zimiromus</i>	<i>kleini</i>	BUCKUP & BRESCOVIT	.	.	INPA, IBSP, MCN, SMNK	veg	
<i>Zimiromus</i>	<i>syenus</i>	BUCKUP & BRESCOVIT	.	.	INPA, IBSP, MCN, SMNK	veg	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
Hahniidae							
<i>gen. ?</i>	sp.	.	.	.	INPA, MCN, SMNK on loan		
<i>Tama</i>	aff. <i>crucifera</i>	.	.	.	IBSP, SMNK on loan	te f	
I Idiopidae							
<i>Idiops</i>	sp.	.	.	.	MCN, SMNK	ge te	no
Linyphiidae							
<i>Erigone</i>	sp.	.	.	.	MCN		
<i>Sphecozone</i>	sp.	.	.	.	MCN	ge	
<i>Orthobula</i>	n.sp.	.	+	.	MCN on loan	ge	
Lycosidae							
<i>Aglaoctenus</i>	<i>castaneus</i>	(MELLO-LEITÃO)	.	.	MCN	ge	di
<i>Lycosa</i>	group <i>thorelli</i> sp.	.	.	.	SMNK	pf	
Microstigmatidae							
n.gen.	n.sp.	.	+	.	INPA, SMNK on loan	qu ge pf	
Mimetidae							
<i>Arocha</i>	sp.	.	.	.	IBSP		
n.gen.	n.sp.	.	+	.	MCN on loan	ge	
<i>Ero</i>	sp.	.	.	.	MCN	ge lu be te	
<i>Gelanor</i>	sp.	.	.	.	MCN	m	
<i>Mimetus</i>	group <i>melanostoma</i> sp.	.	.	.	MCN		
<i>Cheiracanthium</i>	<i>inclusum</i>	(HENTZ)	.	.	INPA, MCN	veg	
<i>Terminius</i>	<i>insularis</i>	(LUCAS)	.	.	SMNK	pf	
Mysmenidae							
<i>Microdipoena</i>	sp.	.	.	.	SMNK	ge	
<i>Mysmenopsis</i>	sp.	.	.	.	SMNK	ge	
Nemesiidae							
<i>Neodiplothele</i>	n.sp.	.	.	+	AMNH on loan	ge	
cf. <i>Nesticus</i>	sp.	.	.	+	MCN on loan		
gen. ?	sp.	.	.	+	MCN on loan	m	no
Ochyroceratidae							
<i>Ochyrocera</i>	n.sp. p	.	.	+	SMNK	pf	
<i>Ochyrocera</i>	<i>hamadryas</i>	BRIGNOLI	.	+	SMNK	pf	
<i>Ochyrocera</i>	n.sp. b	.	.	+	SMNK, MCN	ge pf te	
<i>Speocera</i>	<i>amazonica</i>	BRIGNOLI	.	+	SMNK	qu ge	
<i>Speocera</i>	<i>irritans</i>	BRIGNOLI	.	.	SMNK	qu ge	
<i>Speocera</i>	<i>molesta</i>	BRIGNOLI	.	+	SMNK	qu ge	
<i>Speocera</i>	n.sp. iw	.	.	+	SMNK	ge pf	
<i>Speocera</i>	n.sp. j	.	.	+	SMNK	pf	
<i>Speocera</i>	n.sp. m	.	.	+	SMNK	ge	
<i>Speocera</i>	n.sp. pn	.	.	+	SMNK	qu	
Oecobiidae							
<i>Oecobius</i>	cf. <i>concinus</i>	SIMON	.	.	IBSP on loan	f juv.	
Oonopidae							
cf. <i>Ischnothyreus</i>	sp.	.	.	.	SMNK	ge be	
<i>Gamasomorpha</i>	cf. <i>patquiana</i>	BIRABEN	.	.	SMNK on loan	ge	
Gamasomorphinae	sp.	.	.	.	SMNK on loan	ge te	
Gamasomorphinae	sp.	.	.	.	SMNK on loan	ge te	
Gamasomorphinae	sp.	.	.	.	SMNK on loan	ge te	
<i>Neoxyphinus</i>	<i>termitophilus</i>	(BRISTOWE)	.	.	MCN	pf q	
Oonopinae	sp.	.	.	.	SMNK on loan	ge te	
Oonopinae	sp.	.	.	.	SMNK on loan	ge te	
Oonopinae	sp.	.	.	.	SMNK on loan	ge te	
Oonopinae	sp.	.	.	.	SMNK on loan	ge te	
<i>Xyccarph</i>	<i>myops</i>	BRIGNOLI	.	+	INPA, MCN, SMNK	qu ge	
<i>Xyccarph</i>	<i>wellingtoni</i>	HÖFER & BRESCOVIT	.	+	INPA, MCN, SMNK	qu	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
Oxyopidae							
<i>Hamataliwa</i>	sp.	.	.	.	MCN	ge	
<i>Oxyopes</i>	sp.	.	.	.	MCN	te	
<i>Peucetia</i>	sp.	.	.	.	MCN, SMNK	m	di
<i>Schaenicoscelis</i>	sp.	.	.	.	MCN	m	
<i>Tapinillus</i>	sp.	.	.	.	IBSP on loan	m	
Palpimanidae							
<i>Fernandezina</i>	sp.	.	.	.	IBSP	m	
<i>Otiotops</i>	<i>hoeferi</i>	BONALDO & BRESCOVIT	.	+	INPA, SMNK	pf	
<i>Otiotops</i>	<i>oblongus</i>	SIMON	.	.	INPA, MCN, SMNK	ge te f	no
Paratropididae							
<i>Paratropis</i>	sp.	.	.	.	MCN, SMNK	qu ge pf	no
Philodromidae							
<i>Paracleocnemis</i>	sp.	.	.	.	MCTP on loan	f	
Pholcidae							
<i>Carapoa</i>	<i>fowleri</i>	HUBER	.	.	INPA, SMNK, MCZ, MCTP	ge lu te	
<i>Carapoa</i>	<i>ocaina</i>	HUBER	.	.	INPA, SMNK	ge	
gen. ?	sp.	.	.	.	SMNK on loan	ge pf	
<i>Mesabolivar</i>	<i>aurantiacus</i>	(MELLO-LEITÃO)	.	.	INPA, MCN, MCTP, SMNK	ge lu te	di
<i>Mesabolivar</i>	<i>difficilis</i>	(MELLO-LEITÃO)	.	.	SMNK	.	di
<i>Modisimus</i>	sp.	.	.	.	SMNK	ge	
<i>Metagonia</i>	<i>taruma</i>	HUBER	.	.	INPA, MCN	ge	
<i>Litoporus</i>	<i>dimona</i>	HUBER	.	.	SMNK	te	
Pisauridae							
<i>Ancylometes</i>	<i>rufus</i>	(WALCKENAER)	.	.	INPA, SMNK	mte	no
<i>Ancylometes</i>	<i>terrenus</i>	HÖFER & BRESCOVIT	.	+	INPA, SMNK	m	no
<i>Architis</i>	<i>nitidopilosa</i>	SIMON	.	.	SMNK	lu be te	di
<i>Architis</i>	<i>tenuis</i>	SIMON	.	.	SMNK	tef	di
<i>Staberius</i>	<i>spinipes</i>	(TACZANOWSKI)	.	.	SMNK	ld	
<i>Thaumasia</i>	<i>annulipes</i>	F.O. P. CAMBRIDGE	.	.	SMNK, MCN	m	no
<i>Thaumasia</i>	sp.	.	.	.	SMNK, MCN	mte	no
Prodidomidae							
<i>Lygromma</i>	<i>gasnieri</i>	BRESCOVIT & HÖFER	.	pt	INPA, IBSP, SMNK	ge pf	
<i>Lygromma</i>	<i>huberti</i>	PLATNICK	.	.	INPA, IBSP, MCN, SMNK	ge pf	
Salticidae							
<i>Acragas</i>	<i>castaneiceps</i>	SIMON	.	.	MCN		
<i>Acragas</i>	cf. <i>procalvus</i>	SIMON	.	.	SMNK		
<i>Acragas</i>	<i>quadriguttatus</i>	(F.O. P. CAMBRIDGE)	.	.	INPA		
<i>Amphidraus</i>	<i>duckei</i>	GALIANO	.	+	INPA, SMNK	tef	
<i>Amphidraus</i>	n.sp. 2	.	.	+	INPA, SMNK	ge te	
<i>Amphidraus</i>	n.sp. 3	.	.	+	INPA, SMNK	ge te	
<i>Amyceae</i>	sp.	.	.	.	SMNK	ge veg	
<i>Amycus</i>	<i>flavicomis</i>	SIMON	.	.	INPA, SMNK		
<i>Amycus</i>	<i>spectabilis</i>	C.L.KOCH	.	.	MCN		
<i>Arachnomura</i>	n.sp. 1 prope <i>hieroglypha</i>	.	.	+	SMNK		
<i>Arachnomura</i>	n.sp. 2 prope <i>hieroglypha</i>	.	.	+	INPA, SMNK		
<i>Asaracus</i>	<i>semifimbriatus</i>	(SIMON)	.	.	MCN		
<i>Balmaceda</i>	n.sp. prope <i>anulipes</i>	.	.	+	INPA, SMNK	te	
<i>Bellota</i>	<i>violacea</i>	GALIANO	.	+	MNRJ, MACN		
<i>Breda</i>	cf. <i>variolosa</i>	SIMON	.	.	INPA; MCN		
<i>Breda</i>	n.sp. prope <i>spinimana</i>	.	.	+	INPA, SMNK	te	
cf. <i>Tariona</i>	sp. I	.	.	.	SMNK	f	
cf. <i>Tariona</i>	sp. II	.	.	.	INPA, SMNK	te	
cf. <i>Zygoballus</i>	sp.	.	.	.	SMNK	f	
<i>Chinoscopus</i>	n.sp. prope <i>flavus</i>	.	.	+	SMNK		

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<i>Chinoscopus</i>	<i>gracilis</i>	(TACZANOWSKI)	.	.	MACN		
<i>Chinoscopus</i>	<i>maculipes</i>	CRANE	.	.	MACN, MNRJ	f	
<i>Chira</i>	sp.	.	.	.	INPA, SMNK	te	
<i>Chirothecia</i>	sp.	.	.	.	MCN		
<i>Chloridusa</i>	sp.	.	.	.	MCN		
<i>Corcovetella</i>	n.sp. prope <i>aemulatrix</i>	.	+	.	INPA	ge	
<i>Coryphasia</i>	sp.	.	.	.	SMNK on loan	te	
<i>Corythalia</i>	cf. <i>electa</i>	(PECKHAM)	.	.	SMNK		
<i>Corythalia</i>	sp. I	.	.	.	SMNK, INPA	ge te	
<i>Corythalia</i>	sp. II	.	.	.	INPA		
<i>Corythalia</i>	sp. III	.	.	.	SMNK		
<i>Corythalia</i>	sp. IV	.	.	.	SMNK		
<i>Corythalia</i>	n.sp. prope <i>valida</i>	.	+	.	SMNK on loan		
Cytaeinae gen.	sp.	.	.	.	SMNK	te	
<i>Descanso</i>	<i>ventrosus</i>	GALIANO	.	+	MZSP, MACN		
<i>Encolpius</i>	<i>guaraniticus</i>	GALIANO	.	.	SMNK		
<i>Erica</i>	cf. <i>eugenia</i>	PECKHAM & PECKHAM	.	.	SMNK		
<i>Euophrys</i>	sp.	.	.	.	MCN		
<i>Eustromastix</i>	<i>falcatus</i>	GALIANO	.	.	MCN		
<i>Fissidentati</i> gen. prope <i>Balmaceda</i>	sp.	SIMON	.	.	SMNK, INPA	te	
<i>Fissidentati</i> gen. prope <i>Salticus</i>	sp.	.	.	.	SMNK	te	
<i>Fluda</i>	<i>opica</i>	(PECKHAM & PECKHAM)	.	.	MACN, MCN, SMNK		
<i>Fluda</i>	cf. <i>angulosa/nigritarsis</i>	.	.	.	SMNK		
<i>Freya</i>	cf. <i>rufohirta</i>	(SIMON)	.	.	INPA, SMNK		
<i>Freya</i>	cf. <i>perelegans</i>	SIMON	.	.	SMNK		
<i>Freya</i>	n.sp. prope <i>exulta</i>	SIMON	.	+	INPA, SMNK	ge te f	
<i>Freya</i>	<i>dureti</i>	GALIANO	.	pt	MACN, MNRJ		
<i>Frigga</i>	<i>kessleri</i>	(TACZANOWSKI)	.	.	SMNK??		
<i>Gypogyna</i>	<i>forceps</i>	SIMON	.	.	SMNK		
<i>Hypaeus</i>	<i>miles</i>	SIMON	.	.	INPA, SMNK	te	
<i>Hypaeus</i>	<i>triplagiatus</i>	SIMON	.	.	SMNK on loan		
<i>Itata</i>	<i>tipuloides</i>	SIMON	.	.	INPA	f	
<i>Lyssomanes</i>	<i>amazonicus</i>	PECKHAM, PECKHAM & WHEELER	.	.	INPA, SMNK		
<i>Lyssomanes</i>	<i>longipes</i>	(TACZANOWSKI)	.	.	INPA, SMNK	be	
<i>Lyssomanes</i>	n.sp. prope <i>nigrofimbriatus</i>	.	+	.	INPA		
<i>Lyssomanes</i>	n.sp. prope <i>taczanowskii</i>	.	.	.	INPA		
<i>Lyssomanes</i>	n.sp. prope <i>velox</i>	.	+	.	INPA		
<i>Lyssomanes</i>	<i>quadrinotatus</i>	SIMON	.	.	INPA		
<i>Lyssomanes</i>	aff. <i>tapuiramae</i>	GALIANO	.	.	MCN on loan		
<i>Lyssomanes</i>	aff. <i>unicolor</i>	(TACZANOWSKI)	.	.	MCN on loan		
<i>Lyssomanes</i>	<i>ceplaci</i>	GALIANO	.	.	SMNK		
<i>Mago</i>	<i>acutidens</i>	SIMON	.	.	INPA, SMNK		
<i>Mago</i>	<i>longidens</i>	SIMON	.	.	MCN		
<i>Mago</i>	n.sp. prope <i>fonsecai</i>	SOARES & CAMARGO	.	+	INPA		
<i>Mago</i>	<i>steindachneri</i>	(TACZANOWSKI)	.	.	SMNK		
<i>Mago</i>	sp.	.	.	.	SMNK, INPA	ge te	
Magoninae	sp. 1	.	.	.	SMNK	te	
Magoninae	sp. 2	.	.	.	SMNK	te	
<i>Martella</i>	<i>pasteuri</i>	GALIANO	.	+	MNRJ, MACN		
<i>Metaphidippus</i>	sp.	.	.	.	MCN		
<i>Myrmarachne</i>	<i>sumana</i>	GALIANO	.	+	INPA, MACN	te f	
<i>Myrmarachne</i>	n.sp. prope <i>sumana</i>	.	.	+	SMNK		
<i>Myrmarachne</i>	cf. <i>brasiliensis</i>	MELLO-LEITÃO	.	.	INPA	te	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
<i>Nagaina</i>	cf. <i>tricincta</i>	SIMON	.	.	SMNK		
<i>Noegus</i>	<i>comatulus</i>	SIMON	.	.	INPA	ge	
<i>Noegus</i>	sp. I	.	.	.	INPA, SMNK	te	
<i>Noegus</i>	sp. II	.	.	.	INPA, SMNK	f	
<i>Noegus</i>	sp. III	.	.	.	SMNK	f	
<i>Noegus</i>	<i>fuscimanus</i>	(TACZANOWSKI)	.	.	INPA	ge	
<i>Nycerella</i>	<i>aprica</i>	(PECKHAM & PECKHAM)	.	.	MNRJ, MACN	ge	
<i>Nycerella</i>	<i>melanopygia</i>	GALIANO	.	+	MACN, MNRJ	ge	
<i>Pachomius</i>	<i>sextus</i>	GALIANO	.	+	MZSP, MACN		
<i>Pachomius</i>	<i>dybowski</i>	(TACZANOWSKI)	.	.	MACN		
<i>Pensacola</i>	n.sp. prope <i>tuberculotibiata</i>		.	+	SMNK	te	
<i>Phiale</i>	cf. <i>crocea</i>	C.L.KOCH	.	.	SMNK	te	
Plexippeae	sp.	.	.	.	SMNK		
<i>Plexippus</i>	<i>paykulli</i>	(SAVIGNY & AUDOUIN)	.	.	INPA, SMNK		
Pluridentati	n.sp. 1	.	.	+	SMNK, INPA	ge	
n.gen. A							
Pluridentati	n.sp. 2	.	.	+	INPA	ge	
n.gen. A							
Pluridentati	n.sp.	.	.	+	SMNK, INPA	te	
n.gen. B							
Pluridentati	n.sp.	.	.	+	SMNK	ge	
n.gen. C							
<i>Psecas</i>	sp.	only photo	
<i>Rudra</i>	n.sp.	.	.	+	MCTP on loan		
Saiteae gen.	sp. A	.	.	.	SMNK, INPA	ge	
Saiteae gen.	sp. B	.	.	.	SMNK, INPA	ge	
Saiteae gen.	sp. C	.	.	.	SMNK	ge	
Saiteae gen.	sp. D	.	.	.	SMNK	ge	
Saiteae gen.	sp. E	.	.	.	SMNK, INPA	ge te	
<i>Sarinda</i>	cf. <i>cayennensis</i>	(TACZANOWSKI)	.	.	SMNK on loan		
<i>Sarinda</i>	cf. <i>longula</i>	(TACZANOWSKI)	.	.	SMNK	f	
<i>Scopocira</i>	sp.	.	.	.	MCN		
<i>Sidusa</i>	<i>angulitarsis</i>	SIMON	.	.	INPA	te	
<i>Stenodeza</i>	<i>acuminata</i>	SIMON	.	.	SMNK		
Synageleae gen.	sp.	.	.	.	SMNK		
prope <i>Semorina</i>							
<i>Synemosyna</i>	n.sp.	.	.	+	MCN, SMNK	te	
Thiodininae gen.	sp.	.	.	.	SMNK		
<i>Tullgrenella</i>	sp. 1	.	.	.	SMNK	te	
<i>Tullgrenella</i>	sp. 2	.	.	.	SMNK	te	
<i>Vinnius</i>	n.sp. prope <i>calcarifer</i>	.	.	+	SMNK on loan		
<i>Wedoquella</i>	n.sp. prope <i>denticulata</i>	.	.	+	SMNK	ge	
<i>Zygoballus</i>	sp.	.	.	.	SMNK		
Scytodidae							
<i>Scytodes</i>	<i>piroca</i>	RHEIMS & BRESCOVIT	.	.	INPA, IBSP, SMNK	ge	
<i>Scytodes</i>	<i>baibina</i>	RHEIMS & BRESCOVIT	pt	.	INPA, MCN, SMNK	ge veg	
<i>Scytodes</i>	<i>martiusi</i>	BRESCOVIT & HÖFER	.	+	INPA, IBSP, SMNK	ge	
<i>Scytodes</i>	<i>paarmanni</i>	BRESCOVIT & HÖFER	.	+	INPA, IBSP, MCN, SMNK	ge	
Segestriidae							
cf. <i>Ariadna</i>	n.sp.	.	.	+	INPA, SMNK on loan	te	
Selenopidae							
<i>Selenops</i>	<i>ducke</i>	CORRONCA	.	+	MCN	ge te	
<i>Selenops</i>	<i>kikay</i>	CORRONCA	.	.	MCN	te	
<i>Selenops</i>	<i>lavillai</i>	CORRONCA	.	.	SMNK	te	
Senoculidae							
<i>Senoculus</i>	sp.	.	.	.	MCN	ge te	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
Sparassidae							
<i>Olios</i>	sp.1	.	.	.	IBSP on loan	te	
<i>Olios</i>	sp.2	.	.	.	IBSP on loan	te	
<i>Olios</i>	sp.3	.	.	.	IBSP on loan	te	
<i>gen.?</i>	sp.1	.	.	.	IBSP on loan	ge te	
<i>gen.?</i>	sp.2	.	.	.	IBSP on loan	ge te	
<i>gen.?</i>	sp.3	.	.	.	IBSP on loan	f	
Sparianthinae	sp.1	.	.	.	IBSP on loan	ge	
Sparianthinae	sp.2	.	.	.	IBSP on loan	ge	
Symphytognathidae							
<i>Anapistula</i>	<i>secrata</i>	GERTSCH	.	.	MCN	ge qu	
<i>Symphytognatha</i>	sp.	.	.	.	MCN		
Synotaxidae							
<i>Synotaxus</i>	sp. 1	.	.	.	MCN		
Tetrablemmidae							
<i>Monoblemma</i>	<i>becki</i>	BRIGNOLI	.	+	SMNK		
Tetragnathidae							
<i>Azilia</i>	sp. 1	.	.	.	MCN		
<i>Chrysometa</i>	<i>flava</i>	(O. P.CAMBRIDGE)	.	.	GALIANO		
<i>Chrysometa</i>	<i>flavicans</i>	(CAPORIACCO)	.	.	GALIANO		
<i>Chrysometa</i>	<i>guttata</i>	(KEYSERLING)	.	.	GALIANO		
<i>Chrysometa</i>	<i>minuta</i>	(KEYSERLING)	.	.	GALIANO		
<i>Chrysometa</i>	n.sp.	.	.	+	SMNK on loan		
<i>Dolichognatha</i>	<i>ducke</i>	LISE	.	+	MCTP	veg	
<i>Glenognatha</i>	sp.	.	.	.	MCN on loan		
<i>Leucauge</i>	<i>argyra</i>	(WALCKENAER)	.	.	INPA	veg	
<i>Leucauge</i>	sp.	.	.	.	SMNK	lu be	no
<i>Mecynometa</i>	sp.	.	.	.	MCN	veg	
<i>Metabus</i>	sp.	.	.	.	MCN		
<i>Nephila</i>	<i>clavipes</i>	(LINNAEUS)	.	.	.	only photo	di
<i>Tetragnatha</i>	sp.	.	.	.	MCN	be	di
Theraphosidae							
<i>Acanthoscurria</i>	sp.	.	.	.	INPA	ge	no
<i>Avicularia</i>	sp.	.	.	.	INPA	te	no
<i>Cyriocosmus</i>	<i>elegans</i>	(SIMON)	.	.	SMNK	qu	
<i>Cyriocosmus</i>	<i>sellatus</i>	(SIMON)	.	.	MCN	ge te	
<i>Drytopelma</i>	<i>rondoni</i>	(LUCAS & BÜCHERL)	.	.	INPA	ge	no
<i>Epebopus</i>	cf. <i>murinus</i>	(WALCKENAER)	.	.	SMNK	m	no
<i>Epebopus</i>	<i>uatuman</i>	LUCAS, SILVA & BERTANI	.	.	INAP, SMNK	m	no
<i>Holothele</i>	sp.	.	.	.	SMNK		
<i>Tapinauchenius</i>	sp.	.	.	.	INPA	te	
<i>Theraphosa</i>	<i>blondi</i>	(LATREILLE)	.	.	INPA, SMNK	m	no
Theridiidae							
<i>Achaeearanea</i>	<i>schneirlai</i>	LEVI	.	.	SMNK	ge be	di
<i>Achaeearanea</i>	<i>trapezoidales</i>	(TACZANOWSKI)	.	.	SMNK	te	
<i>Achaeearanea</i>	<i>dalana</i>	BUCKUP & MARQUES	.	.	MCN		
<i>Achaeearanea</i>	<i>hieroglyphica</i>	(MELLO-LEITÃO)	.	.	MCN		
<i>Achaeearanea</i>	<i>hirta</i>	(TACZANOWSKI)	.	.	MCN on loan	f	
<i>Achaeearanea</i>	<i>nigrovittata</i>	(KEYSERLING)	.	.	MCN		
<i>Anelosimus</i>	<i>eximus</i>	(KEYSERLING)	.	.	MCN	be te	di
<i>Anelosimus</i>	<i>studiosus</i>	(HENTZ)	.	.	MCN on loan	f	
<i>Argyrodes</i>	<i>altus</i>	KEYSERLING	.	.	MCN		
<i>Argyrodes</i>	<i>amplifrons</i>	O. P.CAMBRIDGE	.	.	MCN on loan		
<i>Argyrodes</i>	<i>analiae</i>	GONZALES & CASTRO	.	.	MCN on loan		
<i>Argyrodes</i>	<i>attenuatus</i>	(O. P.CAMBRIDGE)	.	.	MCN	lu f	no
<i>Argyrodes</i>	<i>dracus</i>	(CHAMBERLIN & IVIE)	.	.	SMNK	te	

Family / Genus	Species	Author	ud	ti	collection	occurrence	da
<i>Argyrodus</i>	<i>duckensis</i>	GONZALES & CASTRO	+	.	MLP		
<i>Argyrodus</i>	<i>godmani</i>	EXLINE & LEVI	.	.	MCN on loan		
<i>Argyrodus</i>	<i>metallissimus</i>	(SOARES & CAMARGO)	.	.	MCN on loan		
<i>Argyrodus</i>	sp.	.	.	.	SMNK		
<i>Cerocida</i>	<i>ducke</i>	MARQUES & BUCKUP	.	+	INPA, MCN, SMNK	be	
<i>Chrosiothes</i>	<i>venturosus</i>	MARQUES & BUCKUP	.	+	INPA, MCN	f	
<i>Chryso</i>	<i>calima</i>	BUCKUP & MARQUES	.	.	MCN on loan		
<i>Dipoena</i>	<i>alta</i>	KEYSERLING	.	.	SMNK	ge f	
<i>Dipoena</i>	<i>atlantica</i>	CHICKERING	.	.	MCN	ge f	
<i>Dipoena</i>	<i>bryantae</i>	CHICKERING	.	.	MCN	ge f	
<i>Dipoena</i>	<i>conica</i>	(CHICKERING)	.	.	MCN	ge	
<i>Dipoena</i>	<i>cordiformis</i>	KEYSERLING	.	.	INPA, MCN, SMNK	ge	
<i>Dipoena</i>	<i>donaldi</i>	CHICKERING	.	.	MCN	ge f	
<i>Dipoena</i>	<i>duodecimguttata</i>	CHICKERING	.	.	MCN	ge	
<i>Dipoena</i>	<i>hortoni</i>	CHICKERING	.	.	MCN	ge	
<i>Dipoena</i>	<i>kuyuwini</i>	LEVI	.	.	MCN	ge	
<i>Dipoena</i>	<i>militaris</i>	CHICKERING	.	.	MCN	ge be	di
<i>Dipoena</i>	n.sp.	.	.	+	MCN	ge f	
<i>Dipoena</i>	<i>puertoricensis</i>	LEVI	.	.	MCN on loan	ge	
<i>Dipoena</i>	<i>tiro</i>	LEVI	.	.	INPA, SMNK	ge te	
<i>Echinotheridion</i>	<i>lirum</i>	MARQUES & BUCKUP	.	+	INPA, MCN		
<i>Episinus</i>	<i>erythropthalmus</i>	(SIMON)	.	.	MCN	f	
<i>Episinus</i>	<i>malachinus</i>	(SIMON)	.	.	MCN on loan		
<i>Episinus</i>	<i>salobrensis</i>	(SIMON)	.	.	MCN, SMNK	lu	no
<i>Euryops</i>	<i>taczanowskii</i>	(SIMON)	.	.	MCN on loan		
<i>Helvibis</i>	sp.	.	.	.	MCN, SMNK	lu	no
<i>Latrodectus</i>	sp.	.	.	.	SMNK	open sandy area	di
<i>Nesticodes</i>	<i>rufipes</i>	(LUCAS)	.	.	SMNK		
<i>Phoroncidia</i>	cf. <i>moyobamba</i>	LEVI	.	.	SMNK	be	di
<i>Spintharus</i>	<i>flavidus</i>	HENTZ	.	.	SMNK	f	
<i>Spintharus</i>	<i>hentzi</i>	LEVI	.	.	MCN	be f	di
<i>Tekellina</i>	<i>bella</i>	MARQUES & BUCKUP	.	+	INPA, MCN	te	
<i>Tekellina</i>	<i>crica</i>	MARQUES & BUCKUP	.	+	INPA, MCN	te	
<i>Theridion</i>	<i>crispulum</i>	SIMON	.	.	MCN on loan		
<i>Theridion</i>	<i>hispidum</i>	O. P.CAMBRIDGE	.	.	MCN on loan	f	
<i>Theridion</i>	sp.1	.	.	.	MCN on loan	te	
<i>Theridion</i>	sp.2	.	.	.	MCN on loan	m	
<i>Theridion</i>	sp.3	.	.	.	MCN on loan	m	
<i>Theridion</i>	sp.4	.	.	.	MCN on loan	m	
<i>Theridion</i>	sp.5	.	.	.	MCN on loan	m	
<i>Theridula</i>	<i>puebla</i>	LEVI	.	.	MCN		
<i>Thwaitesia</i>	<i>affinis</i>	O. P.CAMBRIDGE	.	.	SMNK	f te	
<i>Thwaitesia</i>	<i>bracteata</i>	(EXLINE)	.	.	MCN, SMNK	f	
<i>Thwaitesia</i>	<i>simoni</i>	(KEYSERLING)	.	.	MCN, SMNK	ge ld lu be te	no
<i>Tidarren</i>	sp.	.	.	.	MCN on loan		
Theridiosomatidae							
<i>Chthonos</i>	sp.	.	.	.	SMNK on loan	be	di
<i>Epeirotypus</i>	sp.	.	.	.	SMNK on loan		
<i>Naatlo</i>	sp.	.	.	.	SMNK on loan	ge ld lu	
<i>Theridiosoma</i>	sp.	.	.	.	MCN	qu	
Thomisidae							
<i>Aphantochilus</i>	<i>rogersi</i>	O. P.CAMBRIDGE	.	.	INPA, MCTP	m	di
<i>Deltoclitia</i>	sp.	.	.	.	MCN		
<i>Dietinae</i>	sp.	.	.	.	MCN		
<i>Epicadinus</i>	sp.	.	.	.	MCN	be f	di
<i>Majellula</i>	sp.	.	.	.	MCN	lu be teno	

Family / Genus	Species	Author	ud	tl	collection	occurrence	da
<i>Misumenops</i>	sp.	.	.	.	MCN	te	
<i>Onocolus</i>	sp.	.	.	.	MCN		
<i>Stephanopoides</i>	<i>simoni</i>	KEYSERLING	.	.	INPA, MCN	te	
<i>Strophius</i>	sp.	.	.	.	MCTP on loan		
<i>Synaema</i>	sp.	.	.	.	SMNK		
<i>Titidius</i>	<i>galbanatus</i>	(KEYSERLING)	.	.	MCN		
<i>Titidius</i>	<i>rubescens</i>	CAPORIACCO	.	.	INPA, SMNK		
<i>Tmarus</i>	sp.	.	.	.	MCN	lu be f	
<i>Tobias</i>	sp.	.	.	.	MCTP on loan		
Titanoeidae							
cf. <i>Goeldia</i>	sp.	.	.	.	IBSP on loan	ge	
Trechaleidae							
<i>Dossenus</i>	<i>marginatus</i>	SIMON	.	.	SMNK	te f	
<i>Paradossenus</i>	<i>longipes</i>	(TACZANOWSKI)	.	.	MCTP		
<i>Rhoicinus</i>	<i>urucu</i>	BRESCOVIT & OLIVEIRA	.	.	MCN, UA		
<i>Trechalea</i>	<i>amazonica</i>	F.O. P. CAMBRIDGE	.	.	INPA, MCN	te	no
<i>Trechalea</i>	<i>macconnelli</i>	POCOCK	.	.	INPA, SMNK	ge te	no
Uloboridae							
<i>Miagrammopes</i>	sp. 1	.	.	.	SMNK	lu be	no
<i>Miagrammopes</i>	sp. 2	.	.	.	SMNK	ge lu	no
<i>Miagrammopes</i>	sp.	.	.	.	INPA, SMNK	lu	di
<i>(Mumaia)</i>							
<i>Philoponella</i>	sp.1	.	.	.	MCN	m	
<i>Philoponella</i>	<i>vittata</i>	(SIMON)	.	.	SMNK	m	
<i>Uloborus</i>	sp.	.	.	.	MCN, SMNK		
<i>Zosis</i>	aff. <i>peruvianus</i>	.	.	.	SMNK	lu	no
<i>Zosis</i>	<i>geniculatus</i>	(OLIVER)	.	.	INPA, SMNK	ld	di
Zodariidae							
<i>Tenedos</i>	n.sp. 1	.	+	.	MCN, IBSP	qu ge pf ld	no
<i>Tenedos</i>	n.sp. 2	.	+	.	MCN, IBSP	qu ge pf ld	no
Zoridae							
<i>Odo</i>	sp.	.	+	.	IBSP on loan	te	

Table 2. Number of individuals and species collected by different methods (sampling intensity = ratio of individuals to species; all = all specimens including juveniles).

method	ground- electors	trunk funnel traps	pitfall traps	litter quadrat sampling	canopy fogging	Coddington's protocol	visual search in lower strata
nr. of traps/ samples	5 traps	3 traps	30 traps	20 samples	20 funnels	11 samples	> 100 excursions
time run/nr. of sampling events	12 months 1x	17 months 1x	4 weeks 1x	5x	2 trees 3x	1 day + 1 night	5 years intensive 20 years records
sampling intensity all / only adults	10.9 / 6.7	22.4 / 10.0	5.8 / 5.5	3.1 / -	2.9 / 1.6	3.2 / 3.4	66
all individuals	1649	3941	302	124	235	266	.
only adults	626	1503	177	.	81	88	appr. 2000
nr. of species observed (all)	136	178	52	40	80	82	.
nr. of species observed (adults)	93	152	32	32	50	26	appr. 300
nr. of species estimated (adults):							
Jackknife 1	135.4	214	.	.	.	40.5	.
Chao 2	175.6	342	.	.	.	42	.

3.2 Assemblage structure and guilds

Salticidae heavily dominated the samples from the ground electors (56 % of individuals and 23 % of species). All other families had less than 10 % of the individuals (tab. 3). Salticids were also abundant and species rich on the tree trunks with 21 % of individuals and 20 % of species (tab. 4).

Even in the continuously over one year run traps few species have been collected in high abundances and many species with few or even one specimen. A probably undescribed salticid species dominated the total capture of the three trunk funnels with >16 % (Saiteae gen. E sp.), an undescribed species of *Gephyroctenus* (Ctenidae) accounted for 7 % and adults of the the corinnid *Tupirinna rosae* BONALDO for 4 % of all individuals captured by this method. In ground electors the most abundant species was also an undescribed pluridentate salticid with 8 % (only adults), followed by a fissidentate salticid with 5 % (only adults) of all individuals. Four species of the genus *Ctenus* at least visually dominated the ground surface (GASNIER 1996, HÖFER et al. 1994b).

Most of the species captured and recorded on the ground were at least occasionally also captured in the trunk funnels. Not at last by fleeing from the frequent hunting raids of army ants (*Eciton burchelli*, *Labidus praedator*) (GASNIER et al. 1995, VIEIRA & HÖFER 1994) many spiders move actively to the trunk region of the trees. Although there are certainly real trunk inhabiting species in many families (e.g. *Alpaida septemmammata* and *Alpaida tabula* in Araneidae, *Gephyroctenus* sp. in Ctenidae, Corinnidae spp., Salticidae spp.), in our matrix only Selenopidae are marked as exclusively to be found on trunks.

Table 3. Structure of the ground spider assemblage sampled by ground electors.

Family	Ind.	% of all	Species	% of species
Salticidae	905	56.2	27	23.3
Corinnidae	86	5.3	6	5.2
Pholcidae	76	4.7	5	4.3
Oonopidae	55	3.4	10	8.6
Ctenidae	53	3.3	3	2.6
Araneidae	53	3.3	5	4.3
Mygalomorphae	48	3.0	12	10.3
Zodariidae	38	2.4	1	0.9
Theridiidae	34	2.1	9	7.8
Gnaphosidae	29	1.8	2	1.7
Linyphiidae	29	1.8	1	0.9
Ochyroceratidae	25	1.6	3	2.6
Sparassidae	25	1.6	2	1.7
Pisauridae	13	0.8	1	0.9
Theridiosomatidae	13	0.8	2	1.7
Thomisidae	13	0.8	2	1.7
Scytodidae	12	0.7	2	1.7
Oxyopidae	11	0.7	1	0.9
Palpimanidae	6	0.4	1	0.9
Symphytognathidae	6	0.4	1	0.9
Caponiidae	5	0.3	2	1.7
Mysmenidae	5	0.3	2	1.7
Anapidae	2	0.1	1	0.9
Anyphaenidae	2	0.1	2	1.7
Lycosidae	2	0.1	2	1.7
Senoculidae	2	0.1	1	0.9
Uloboridae	2	0.1	2	1.7
Selenopidae	1	0.1	1	0.9

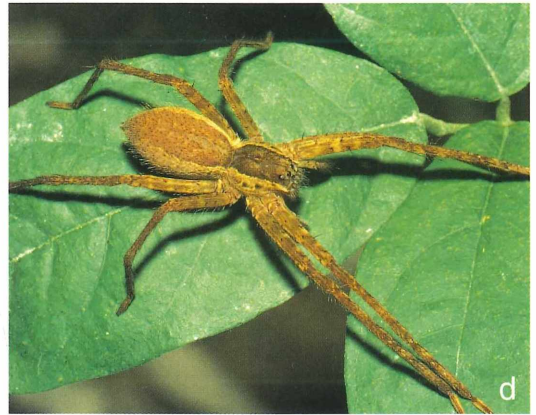


Plate 1. a) *Thaumasia* sp. (Pisauridae), a representative of the "ground ambusher" guild.

b) *Nops* sp. (Caponiidae), a representative of the "litter stalker" guild.

c) *Otiotrops hoeferi* (Palpimanidae), another representative of the "litter stalker" guild.

d) *Cupiennius celerrimus* (Ctenidae), a "nocturnal aerial ambusher".

e) *Olios* sp. (Sparassidae), another representative of the "nocturnal aerial ambusher" guild.

f) *Scytodes* sp. (Scytodidae), a spitting spider in its retreat. These spiders hunt stalking around and were included in the guild of "nocturnal aerial runners".



a



c



e



b



d



f

Plate 2. a) *Noegus* sp. (Salticidae), a representative of the "nocturnal aerial runner" guild.

b) *Deinopis* sp. (Deinopidae), although phylogenetically considered orb-weavers, these spiders hunt by using a very special castrating net held by the forelegs; they belong to the "nocturnal ground weaver" guild.

c) *Dubiepeira dubitata* (SOARES & CAMARGO) (Araneidae), an "aerial orb weaver".

d) *Cyclosa* sp., another "aerial orb weaver".

e) *Architis* sp. (Pisauridae), a representative of the "sedentary sheet weavers".

f) *Mesabolivar aurantiacus* (MELLO-LEITÃO) (Pholcidae), a "sedentary sheet weaver".

3.2.1 Ecological characterization of the families

For many families we followed the characterization of UETZ et al. (1999), because it reflects common arachnological knowledge and we had no differing observations from the tropical species (tab. 5). In some cases, however, characterization of a family is totally different, due to the representation of the family by a single species or genus with a different natural history, e.g. *Aglaoctenus* for Lycosidae and *Architis* for Pisauridae, both web-building representatives of families with no web-building species in temperate regions. For the same reason two families were splitted in their ecological characterization (Dipluridae and Pisauridae; tab. 5).

Table 4. Structure of the trunk spider assemblage sampled by trunk funnel traps.

Family	Ind.	% of all	species	% of species
Salticidae	836	21.2	38	25.3
Idiopidae	539	13.7	1	0.7
Corinnidae	505	12.8	18	12.0
Ctenidae	427	10.8	8	5.3
Pisauridae	365	9.3	5	3.3
Oonopidae	255	6.5	5	3.3
Pholcidae	251	6.4	4	2.7
Gnaphosidae	84	2.1	5	3.3
Sparassidae	84	2.1	5	3.3
Dipluridae	61	1.5	2	1.3
Mimetidae	55	1.4	1	0.7
Segestriidae	53	1.3	1	0.7
Scytodidae	48	1.2	2	1.3
Selenopidae	48	1.2	1	0.7
Theridiidae	45	1.1	8	5.3
Ochyroceratidae	43	1.1	2	1.3
Caponiidae	42	1.1	2	1.3
Anyphaenidae	36	0.9	8	5.3
Liocranidae	31	0.8	1	0.7
Araneidae	23	0.6	7	4.7
Palpimanidae	13	0.3	1	0.7
Deinopidae	11	0.3	1	0.7
Hersiliidae	10	0.2	1	0.7
Theraphosidae	9	0.2	2	1.3
Thomisidae	8	0.2	5	3.3
Trechaleidae	7	0.2	2	1.3
Linyphiidae	6	0.1	1	0.7
Miturgidae	3	0.1	1	0.7
Oxyopidae	3	0.1	1	0.7
Mygalomorphae	3	0.1	3	2.0
Senoculidae	2	0.05	1	0.7
Uloboridae	2	0.05	2	1.3
Zoridae	2	0.05	1	0.7
Hahniidae	1	0.03	1	0.7
Theridiosomatidae	1	0.03	1	0.7
Zodariidae	1	0.03	1	0.7
Lycosidae	1	0.03	1	0.7
Anapidae	1	0.03	1	0.7

Our tropical assemblage includes spiders in 34 families not occurring in North America and thus not included in UETZ et al.'s analysis. This was one of the main reasons to repeat their analysis with our database. Characterization of these families was based primarily on own observations and the representation of the species in our ground, trunk and canopy samples, completed by the rather scarce informations in the literature on tropical spiders (SILVA & CODDINGTON 1996). For many species we had enough observations on presence in different strata, activity or hunting manner to classify their families: Anyphaenidae (pers. obs. ADB), Ctenidae (part. *Ctenus*: GASNIER 1996, GASNIER & HÖFER 2001, HÖFER et al. 1994b; and *Phoneutria*: TORRES-SANCHEZ 2000), Dipluridae, Paratropididae and Pholcidae (pers. obs. HH), Pisauridae (AZEVEDO 2000, HÖFER & BRESICOVIT 2000) and Trechaleidae (pers. obs.). However, for many other families we still know very few on their natural history, but deduced informations from their representation in the different traps (Caponiidae, Corinnidae, Ochyroceratidae, Oonopidae, Palpimanidae, Scytodidae, Zodariidae). Other representatives were so rare in traps and never observed alive, that classification has to be regarded as provisional (most mygalomorphs, Gnaphosidae, Miturgidae, Prodidomidae, Symphytognathidae, Tetralemmidae, Titanocidae). In the very diverse and well known families Araneidae, Salticidae and Theridiidae and the surprisingly diverse and abundant family Corinnidae an ecological classification is a rather problematic generalization, which certainly does not reflect the diverse natural history strategies of the species included. The family Ctenidae includes real ground spiders like *Ctenus* and *Centroctenus*, the last one living in burrows, but also species living on trunks, twigs and branches like *Enoploctenus*, *Gephyroctenus* and on foliage like *Cupiennius* and juvenile *Phoneutria*. It was therefore difficult to decide whether this family should be splitted or treated as a whole (which we did), due to their uniform hunting manner. Based on our observations at night we consider most of the species of the tropical assemblage nocturnal, but we are aware of the lack of data on diel activity of spiders.

3.2.2 Guild classification analysis

Summarizing the dendrogram in figure 1 we propose 12 guilds for the tropical spider assemblage. The cluster analysis shows a clear separation in hunting and web-building spiders. Within the hunters ground living spiders are separated from spiders hunting in the vegetation above ground. Within the ground hunters a first guild is herein called "ground ambushers" and includes sedentary spiders, e.g. the burrowing mygalomorphs (Actinopodidae, Barychelidae, Ctenizidae, Idiopidae, Nemesiidae) and spiders with frequent site changes like pisaurids of the genera *Ancylometes* and *Thaumasia* (Plate 1 a), all being nocturnal hunters.

Table 5. Matrix for the cluster analysis of spider guilds. web use: 0-none, 1-hunt on web, 2-hunt off web; plant use: 0-none, 1-on foliage, 2-between plants ; site tenacity: 0-sedentary, 1-frequent site change, 2-mobile; other columns: 0 - absence and 1 - presence of ecological characteristic.

Family	included genera	web type				hunting manner				stratum				plant use		site tenacity		diurnal		nocturnal	
		Web	Web use	sheet	space	orb	ambush	stalk	pursue	burrow	ground	trunk	vegetation	plant use	site tenacity	diurnal	nocturnal				
Actinopidae	<i>Actinopus</i>	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	
Anapidae	<i>Anapis, Pseudanapis</i>	1	1	0	0	1	0	0	0	0	1	0	0	1	1	0	1	1	0	0	
Anyphaenidae	various	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1	0	1	
Araneidae	many	1	1	0	0	1	0	0	0	0	1	1	2	1	1	1	1	1	1	1	
Barychelidae	<i>Strophaeus</i>	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	
Caponiidae	<i>Nops</i>	0	0	0	0	0	0	0	1	0	0	1	0	2	0	0	0	0	0	1	
Clubionidae	<i>Clubiona, Elaver</i>	0	0	0	0	0	0	0	1	0	0	1	1	2	0	0	1	2	0	1	
Corinnidae	various	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1	1	
Ctenidae	various	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	0	1	1	
Ctenizidae	<i>Urimidia</i>	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	
Cyrtacueniidae	various	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	1	
Deinopidae	<i>Deinopis</i>	1	1	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	
Dictynidae	<i>Dictyna, Thallumetus</i>	1	1	0	1	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	
Dipluridae 1	<i>Masteria</i>	0	0	0	0	0	0	0	1	0	0	1	0	0	2	0	0	1	0	1	
Dipluridae 2	<i>Diplura, Linothele</i>	1	1	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	1	
Gnaphosidae	various	0	0	0	0	0	0	0	1	0	1	0	0	2	0	0	1	0	0	1	
Hahniidae	gen.?	1	2	1	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	1	
Hersiliidae	<i>Tama</i>	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	1	1	0	1	
Idiopidae	<i>Idiops</i>	0	0	0	0	0	1	0	0	1	1	0	0	1	0	1	0	1	0	1	
Linyphiidae	various	1	2	0	1	0	0	0	0	0	1	0	0	1	1	0	1	1	0	1	
Liocranidae	<i>Orthobula</i>	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	1	0	0	
Lycosidae	<i>Aglaoctenus</i>	1	1	1	0	0	0	0	0	0	0	0	1	2	0	1	0	1	0	0	
Microstigmatidae	n.gen.	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	1	0	0	1	
Mimetidae	various	0	0	0	0	0	0	0	1	0	0	1	1	2	0	1	1	1	0	1	
Miturgidae	<i>Teminius</i>	0	0	0	0	0	0	0	0	0	0	1	1	2	1	1	2	1	0	1	
Mysmenidae	<i>Microdipoena, Mysmenopsis</i>	1	1	0	0	1	0	0	1	0	1	0	0	2	1	0	2	1	0	0	
Nemesiidae	<i>Neodiplothele</i>	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	
Ochyroceratidae	various	1	1	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	
Oonopidae	various	0	0	0	0	0	0	0	1	0	1	0	0	2	0	1	0	2	0	1	
Oxyopidae	various	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	1	0	0	
Palpimanidae	<i>Fernandezina, Otiotrops</i>	0	0	0	0	0	0	0	1	0	1	0	0	2	1	0	2	1	0	1	
Paratropididae	<i>Paratropis</i>	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	1	
Philodromidae	<i>Paracleonemis</i>	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	0	0	
Pholcidae	various	1	1	1	0	0	0	0	0	0	1	1	1	1	0	1	1	0	1	0	
Pisauridae 1	<i>Ancylometes, Thaumasia</i>	0	0	0	0	0	1	0	0	0	1	1	1	0	1	0	1	0	1	1	

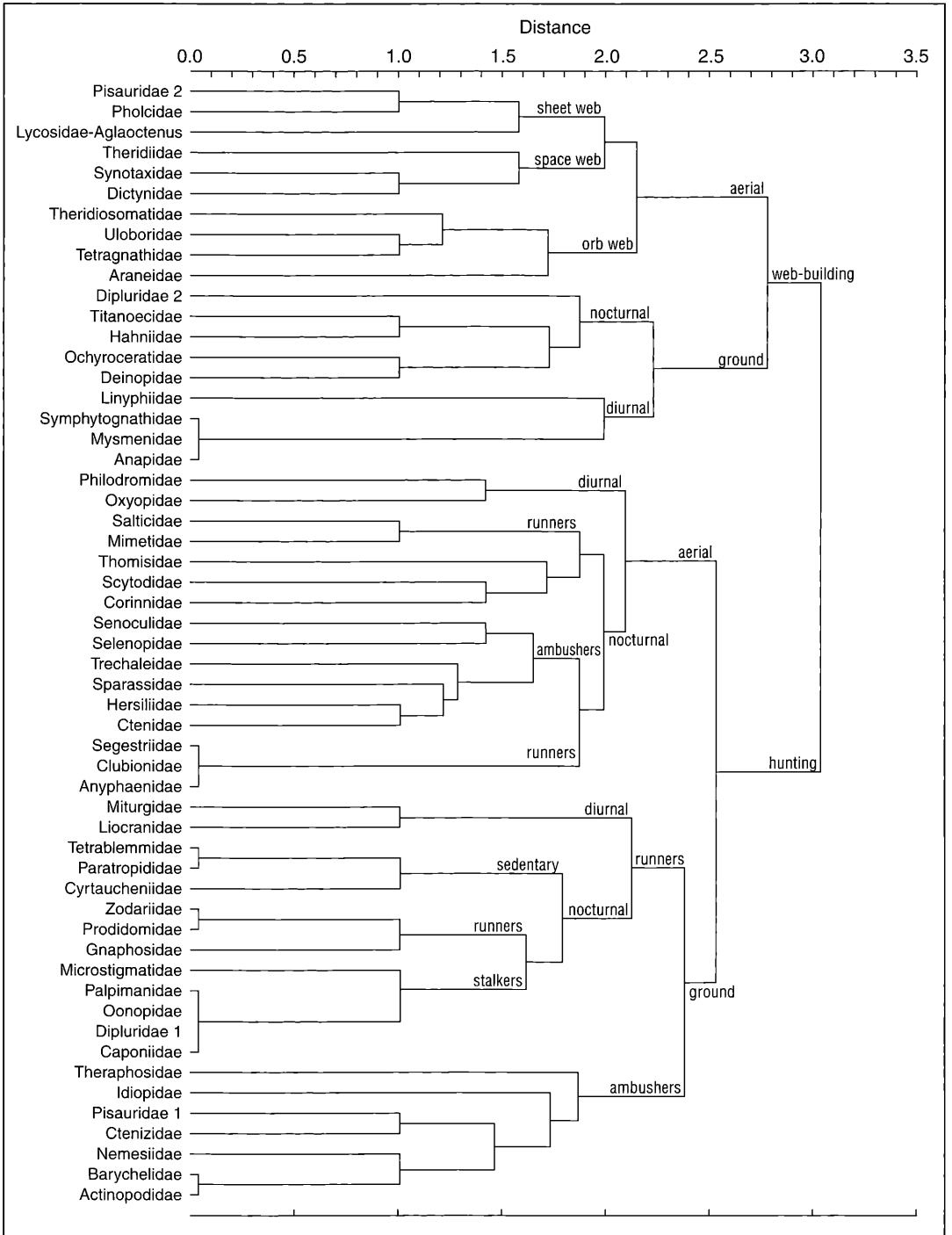


Figure 1. Guild classification dendrogram for 53 spider families resulting from a cluster analysis of the matrix in table 5 by the unweighted pair-group average method.

4. Discussion

As pointed out by CODDINGTON et al. (1991), COLWELL & CODDINGTON (1994) and TOTI et al. (2000) we need quick and accurate sampling protocols and species richness estimators to evaluate species numbers in natural and disturbed areas to be able to evaluate and hopefully decrease species losses. Many estimators have been developed and proposed in the last years, and been tested with a few theoretic and real data sets (COLWELL & CODDINGTON 1994, TOTI et al. 2000). However, even in well known North-American faunas, for which identification of at least adults is possible, a final evaluation of the performance of the estimators is difficult, because the observed species accumulation curves do not reach asymptotes, which means that the actual species number of a site is rarely known. This is especially true for tropical faunas, where many species are not at all or not adequately described and even adults cannot be easily identified. Consequently comparisons and calculations are done on morphospecies level, which is a very labour intensive task when the number of samples increases. Without character matrices or drawings the comparison of samples from different researchers in different collections is impossible and this hinders evaluation of beta and gamma diversity. Therefore we started joint effort in building a database of Amazonian spiders based on our species list from Reserva Ducke which will be amplified to central Amazonian spiders.

The low richness estimates, even from the methods with high sampling intensity show the method dependence of the results. Our sampling with CODDINGTON's protocol which should overcome this problem on the other hand was not sufficient. Method dependent species numbers are not only caused by unsatisfiable efficiency of the method itself, but also by the restricted occurrence of many species in different strata or microhabitats. Our personal estimate for the spider assemblage of the studied area (10 hectares) is 550 - 600 species.

Species-to-genera-ratios from our trap samples are relatively high when compared with North American spider fauna (CODDINGTON et al. 1996, EDWARDS 1993), where they were below 1.6 for single collection sets and only reached values above 2.0 for larger areas. The total number of species, so far recorded from the tropical site Reserva Ducke is higher than in temperate spider assemblages in North America (hardwood forest: 89 species – CODDINGTON et al. 1996) and Europe (beech forest: 95 species, DUMPERT & PLATEN 1985, spruce forest: 76 species – HÖFER 1989), which is not surprising. It is within the range of the few comparably sampled Neotropical sites: Cónдор montane forest: 228 species (SILVA 1992), Pakitza: 324 (one forest type), 498 species (several forest types)(SILVA & CODDINGTON 1996), Cuzco Amazonico (probably two

forest types) approximately 440 species (SILVA 1996), Samiria inundation forest 1140 morphospecies (SILVA 1996), all in Peru. Our own collections of spiders with CODDINGTON's sampling protocol in Bolivian lowland forest islands in savanna (3 days and nights) resulted in 189 morphospecies (HÖFER & BRESCOVIT 1994). Trap sampling in an Amazonian inundation forest resulted in 210 species (HÖFER 1997).

Distribution of species among families is rather similar compared to other Neotropical assemblages (HÖFER 1997, SILVA 1996).

As was already pointed out by several authors (CODDINGTON et al. 1996, EDWARDS 1993) each method is sampling a different array of species and not one can be used as a single universal sampling method for species estimation. Sampling protocols, like the one proposed by CODDINGTON et al. (1991) are recommendable, especially when completed by methods accessing the species rich litter fauna. They are better suited for species estimation because they produce a high number of single samples, but the necessary effort in the field for a suitable number of samples is high, and if not repeated, gives only a snapshot of the species richness. Continuously run traps may overcome this weakness and sample also more seasonally restricted species, but have other restrictions. Trunk funnel traps showed the highest species capture in the studied tropical assemblage and have a relatively high portion of adults, which facilitates identification. In combination with litter samples and ground eclector samples they would give a good base for the real species richness of an area which can be visited repeatedly over a longer period. However the cross-comparison of all morpho-species between all single samples of these traps is especially difficult and labour intensive for tropical faunas.

The dominance of the active salticid hunters and the hunting spiders in general (80 % of all individuals in ground eclectors and 92 % in trunk funnel traps) is certainly biased by the activity dependence of these two trap types, but is also a characteristic of tropical spider assemblages (JOCQUÉ 1984), mainly resulting from the rarity of the species rich and abundant linyphiids in temperate forests.

Guild classification not surprisingly resembles much the one found by UETZ et al. (1999) with the most distinctive ecological characteristic of web use, however followed by a second classification step into ground living spiders and spiders active in higher strata (called aerial spiders), which was not so obvious in UETZ et al's analysis of the North American assemblage. The classification in ground and aerial spiders however appeared strongly in the treatment of another North American spider assemblage (CODDINGTON et al. 1996) and is certainly pushed by the separation of ground and aerial sampling methods. Further subdivisions of the hunting spider cluster as well as the web-

building spider cluster appeared through differences in foraging manner and diel activity. Many spiders in Amazonian terra firme forests were observed to be nocturnal, a supposed effect of the high diurnal predation pressure (CODDINGTON et al. 1996). This hypothesis is also strengthened by our observations on other visual predation preventing strategies like ant mimicry, mimetic form and colour of the body and the frequency of retreats and burrows (HÖFER & BECK 1996), together with the already recognized immense diversity of diurnal predators like lizards and understory birds in these tropical habitats (see GENTRY 1990).

Due to the higher diversity of the tropical assemblage, becoming obvious in the higher number of families put in the analysis, more than the 6 - 8 clusters of UETZ et al. (1999) seem reasonable at this time. Additional guilds are defined by the main stratum and the diel activity, both characters supposed to be of importance for the use of the prey resources. There is no doubt that the allocation of some families has still to be confirmed or changed, due to the lack of knowledge of their natural history or due to the diversity of lifestyles represented by the different species. The latter is the case in ctenids which are inside the foliage cluster due to the fact that at least the *Phoneutria* species live most of their time in the vegetation. However the most abundant representatives, the *Ctenus* species are characteristic ground living spiders. The family could equally well be included in the ground ambusher guild or be splitted. The usefulness and applicability of our guild classification for studies of tropical spider assemblages has now to be tested.

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5. Literature

- APOLINÁRIO, F. B. (1993): Composição faunística e hábitos de nidificação de térmitas (Insecta: Isoptera) em floresta de terra firme da Amazônia Central. – 72 pp.; Master thesis, INPA/FUA, Manaus.
- AZEVEDO, C. S. de (2000): Ecologia de *Ancylometes gigas* (PICKARD-CAMBRIDGE, 1897) (Araneae: Pisauridae), uma aranha errante que vive próximo a corpos de água em uma floresta tropical úmida. – 44 pp.; Master thesis, INPA/FUA, Manaus.
- BECK, L. (1971): Bodenzoologische Gliederung und Charakterisierung des amazonischen Regenwaldes. – *Amazoniana*, **3**: 69-132.
- CODDINGTON, J., GRISWOLD, C. E., SILVA DÁVILA, D., PENARANDA, E. & LARCHER, S. F. (1991): Designing and testing sampling protocols to estimate biodiversity in tropical ecosystems. – In: DUDLEY, E. C. (ed.): Proceedings of the Fourth International Congress of Systematic and Evolutionary Biology: 44-60; Portland, OR (Dioscorides Press).
- CODDINGTON, J. A., YOUNG, L. H. & COYLE, F. A. (1996): Estimating spider species richness in a Southern Appalachian cove hardwood forest. – *J. Arachnol.*, **24**: 11-128.
- COLWELL, R. K. & CODDINGTON, J. A. (1994): Estimating terrestrial biodiversity through extrapolation. – *Phil. Trans. Royal Soc. (Ser. B)*, **345**: 101-118.
- DUMPERT, K. & PLATEN, R. (1985): Zur Biologie eines Buchenwaldbodens 4. Die Spinnenfauna. – *Carolinea*, **42**: 75-106.
- EDWARDS, R. L. (1993): Can the species richness of spiders be determined. – *Psyche*, **100**: 185-208.
- GASNIER, T. R. (1996): Ecologia comparada de quatro espécies de aranhas do gênero *Ctenus* (Walckenaer) (Araneae, Ctenidae) em uma floresta na Amazônia Central: bases para um modelo integrado de coexistência. 76 pp., Ph.D. thesis, INPA/FUA, Manaus.
- GASNIER, T. R., HÖFER, H. (2001): Patterns of abundance of four species of wandering spiders (Ctenidae: *Ctenus*) in a forest in central Amazonia. – *J. Arachnol.*, **29**: 95-103.
- GASNIER, T. R., HÖFER, H. & BRESCOVIT, A. D. (1995): Factors affecting the "activity-density" of spiders on tree trunks in an Amazonian rainforest. – *Ecotropica*, **1** (2): 69-77.
- GENTRY, A. H. (1990): Four Neotropical rainforests. – New Haven, London (Yale University Press).
- HARADA, A. Y. & ADIS, J. (1997): The ant fauna of tree canopies in Central Amazonia: a first assessment. – In: STORK, N. E., ADIS, J., and DIDHAM, R. K. (eds): Canopy arthropods: 382-400; London (Chapman & Hall).
- HERO, J. - M. (1990): An illustrated key to tadpoles occurring in the Central Amazon rainforest, Manaus, Amazonas, Brasil. – *Amazoniana*, **11**(2): 201-262.
- HÖFER, H. (1989): Beiträge zur Wirbellosenfauna der Ulmer Region: I. Spinnen (Arachnida: Araneae). – *Mitt. Ver. Naturwiss. Math. Ulm/Donau*, **35**: 157-176.
- HÖFER, H. (1990): The spider community (Araneae) of a Central Amazonian blackwater inundation forest (Igapó). – *Acta Zool. Fennica*, **190**: 173-179.
- HÖFER, H. (1997): The spider communities. – In: JUNK, W. J. (ed.): The central Amazonian river floodplains. Ecology of a pulsing system. *Ecological Studies*, **126**: 373-383; Berlin (Springer-Verlag).
- HÖFER, H. & BECK, L. (1995): Die Spinnentierfauna des Regenwaldreservats "Reserva Ducke" in Zentralamazonien I. – *Natur und Museum*, **125** (12): 389-401.

- HÖFER, H. & BECK, L. (1996): Die Spinnentierfauna des Regenwaldreservats "Reserva Ducke" in Zentralamazonien II. – Natur und Museum, **126** (3): 69-85.
- HÖFER, H. & BRESCOVIT, A. D. (1994): Ergebnisse der Bolivien-Expedition des Staatlichen Museums für Naturkunde Karlsruhe: Spinnen (Araneae). – Andrias, **13**: 99-112.
- HÖFER, H. & BRESCOVIT, A. D. (2000): A revision of the Neotropical spider genus *Ancylometes* BERTKAU (Araneae: Pisauridae). Insect Systematics & Evolution, **31**: 323-360.
- HÖFER, H., BRESCOVIT, A. D., ADIS, J. & PAARMANN, W. (1994a): The spider fauna of Neotropical tree canopies in Central Amazonia. First Results. – Stud. Neotrop. Fauna Environm., **29** (1):23-32.
- HÖFER, H., BRESCOVIT, A. D. & GASNIER, T. R. (1994b): The wandering spiders of the genus *Ctenus* (Ctenidae, Araneae) of Reserva Ducke, a rainforest reserve in central Amazonia. – Andrias, **13**: 81-98.
- HÖFER, H., MARTIUS, C. & BECK, L. (1996): Decomposition in an Amazonian rain forest after experimental litter addition in small plots. – Pedobiologia, **40**: 570-576.
- JAKSČ, E. M. & MEDEL, R. G. (1990): Objective recognition of guilds: Testing for statistically significant species clusters. – Oecologia, **82**: 87-92.
- JOCQUE, R. (1984): Considerations concernant l'abondance relative des araignées errantes et des araignées à toile vivant au niveau du sol. – Revue Arachnol., **5** (4):193-204.
- LOURENÇO, W. R. (1998): Synopsis of the Scorpion fauna of the Manaus region, Amazonas State, Brazil, with description of two new species. – Amazoniana, **10**(3): 327-338.
- MAHNERT, V. & ADIS, J. (1985): On the occurrence and habitat of pseudoscorpions (Arachnida) from Amazonian forest of Brazil. – Stud. Neotrop. Fauna Environm., **20**: 211-215.
- PENNY, N. D. & ARIAS, J. R. (1982): Insects of an Amazon forest. – 269 pp.; New York (Columbia University Press).
- RIBEIRO, J. E. L. da S., HOPKINS, M. J. G., VICENTINI, A., SOTHERS, C. A., COSTA, M. A. da S., BRITO, J. M. de, SOUZA, M. A. D. de, MARTINS, L. H. P., LOHMANN, L. G., ASSUNÇÃO, P. A. C. L., PEREIRA, E. da C., SILVA, C. F. da, MESQUITA, M. R. & PROCÓPIA, L. C. (1999): Flora da Reserva Ducke: Guia de identificação das plantas vasculares de uma floresta de terra-firme na Amazônia Central. – 816 pp.; Manaus (INPA, DFDI).
- SILVA, D. (1992): Observations on the diversity and distribution of the spiders of Peruvian montane forests. – Mem. Mus. Hist. Nat. U.N.M.S.M. (Lima), **21**: 31-37.
- SILVA, D. (1996): Species composition and community structure of peruvian rainforest spiders: a case study from a seasonally inundated forest along the Samiria river. – Rev. Suisse Zool., Vol. hors serie: 597-610.
- SILVA, D. & CODDINGTON, J. A. (1996): Spiders of Pakitza (Madre de Dios, Perú): Species richness and notes on community structure. – In: WILSON, D. E. & SANDOVAL, A. (eds.): Manu. The Biodiversity of Southeastern Peru: 253-311; Washington (Smithsonian Institution).
- SUNDERLAND, K. D. & GREENSTONE, M. H. (1999): Summary and future directions for research on spiders in agroecosystems. – J. Arachnol., **27**: 397-400.
- TORRES-SANCHEZ, M. P. (2000): Padrões espaciais de abundância, ciclo reprodutivo e variação de tamanho de adultos de *Phoneutria fera* PERTY e *Phoneutria reidyi* F. O. PICKARD-CAMBRIDGE (Araneae, Ctenidae) na Reserva Florestal ADOLPHO DUCKE, Amazonas, Brasil. – 89 pp.; Master thesis, INPA, UA, Manaus.
- TOTI, D. S., COYLE, F. A. & MILLER, J. A. (2000): A structured inventory of Appalachian grass bald and heath bald spider assemblages and a test of species richness estimator performance. – J. Arachnol., **28**: 329-345.
- UETZ, G. W., HALAJ, J. & CADY, A. B. (1999): Guild structure of spiders in major crops. – J. Arachnol., **27**: 270-280.
- VIEIRA, R. S. & HÖFER, H. (1994): Prey spectrum of two army ant species in central Amazonia, with special attention on their effect on spider populations. – Andrias, **13**: 189-198.
- VIEIRA, R. S. & HÖFER, H. (1998): Efeito do forrageamento de *Eciton burchelli* (Hymenoptera, Formicidae) sobre a araneofauna de liteira em uma floresta tropical de terra firme na Amazônia Central. – Acta Amazonica, **28** (3): 345-351.
- WILLIS, E. O. 1977 Lista preliminar das aves da parte noroeste e áreas vizinhas da Reserva Ducke Amazonas Brasil. – Rev. Bras. Biol., **37**: 585-601.