



ECOSYSTEMS

Insect galls from Amazon rainforest areas in Rondônia (Brazil)

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Abstract: This study aimed at survey insect galls of an Amazon rainforest area in Rondônia, Brazil. We found 152 gall morphotypes in 103 plant species. Fabaceae were the host with the greatest gall richness. Leaves were the most galled organ. Globose and glabrous galls were the most frequent. Cecidomyiidae were responsible for most of the galls. This is the first record of 110 galls morphotypes and 23 host plants species in this biome. Ten gallers are endemic in Brazil. Five genera of Cecidomyiidae were first recorded in Rondônia as well as *Schismatodiplosis lantanae* Rübsaamen, 1908.

Key words: Amazon rainforest, Cecidomyiidae, insect-plant interaction, galling insects, gall richness.

INTRODUCTION

The insect galls are abnormal growths of plant tissue induced by insects, within which they develop, finding shelter against adverse environmental conditions, protection against predators and parasitoids, and food source (Mani 1964). The galling insects present high specificity in relation to their host plant, being usually monophagous. In addition, each galling species produces a morphologically and structurally unique gall in its host plant, so that the gall is considered as the extended phenotype of the galler (Weis et al. 1988, Stone & Schonrogge 2003, Carneiro et al. 2009).

The Neotropical Region presents a high diversity of galling insects, but its taxonomic knowledge is still very scarce (Gonçalves-Alvim & Fernandes 2001). In Brazil, some ecological studies indicate that the greatest diversity of Cecidomyiidae species is found in Amazon rainforest, the largest Brazilian phytogeographic domain, but only 2% of these species are known for this biome (Julião G.R., unpublished data).

Most of the species known in the Brazilian territory were collected in Atlantic Forest and Cerrado areas, with about 80% and 14.5% of the total of the species registered to Brazil, respectively (Proença B. & Maia V.C., unpublished data).

So far, only five inventories with host plants data, characterization of the galls' morphotypes, records of inducers and associated fauna have been carried out in areas of the Amazon rainforest. One of them was performed in the state of Amazonas (Almada & Fernandes 2011) and the other four in Pará (Maia 2011, Silva et al. 2011, Araújo et al. 2012, Carvalho & Mota 2018). Data on galling insects and their host plants remain unknown for the other Brazilian states which include this phytogeographic domain, as the state of Rondônia. This gap impairs the knowledge of the diversity of these insects, as well as studies on the biogeography and geographic distribution of the same.

In this context of lacking information, the main objective of this work is to survey and characterize the insect galls of an Amazon

rainforest area in Rondônia, contributing to the knowledge of the galls in this phytogeographic domain. The specific objectives were: i) record the galling inducers and associated fauna; ii) verify the average of gall morphotypes per host plant species; iii) indicate the new records of host plants and gall morphotypes in the Amazon rainforest area; iv) evaluate the gall richness; v) analyze the gall mige (Cecidomyiidae) endemism.

MATERIALS AND METHODS

The field works were performed in three municipalities of Rondônia: Campo Novo de Rondônia, Cacaulândia and Monte Negro, all inserted in Amazon rainforest domain, as part of Sisbiota Diptera project. The field works lasted 15 days each, with eight hours of work per day, occurring in October 2011 (in the spring, between the dry and wet seasons) and May 2012 (in the fall, between the wet and dry seasons). Seven trails were investigated in three municipalities. Three in Campo Novo de Rondônia: i) Fazenda Amorim (10°40'6"S, 63°29'0"W); ii) Marimondo (10°5'26.0"S 63°28'15.5"W) and iii) Point 03 (10°35'26.0"S 63°28'15.5"W). Three in Monte Negro: vi) Cachoeira (10°13'43"S 63°14'00"W); v) Line 25 Sector Chacareiro (10°16'21.4"S, 63°20'45.4"W) and vi) Line C 20 (10°18'29.0"S 63°21'13.8"W). And one in Cacaulândia: vii) Fazenda do Cabeça (10°17'56.5"S 63°14'12"W).

Along each trail, aerial organs of herbaceous, shrubby and arboreal plants were surveyed for insect galls up to two meters in height. All galls were photographed in the field and characterized by plant organ of occurrence, shape, color, presence or absence of trichomes, and number of internal chamber. Each morphotype was individually conditioned in plastic bags and labeled with information about the collection site, and number of the host plant. Branches (whenever possible with

flowers and fruits) were removed from each host plant, and pressed in the field for preparation of exsiccates. Each host plant received an identical label to its corresponding gall. The terminology of gall shapes followed Isaías et al. (2013).

Both galls and host plants were transported to the Laboratório de Diptera in Museu Nacional/UFRJ, Rio de Janeiro State, Brazil. For each gall morphotype, part of the samples was dissected to observe the number of internal chambers and remove immature insects, and the remaining part was conditioned in closed transparent plastic pots for rearing the adults, including inducers, parasitoids, predators and inquilines. The rearing pots were checked every day for newly emerged adults. All insects obtained were transferred to microvials with 70% ethanol. The gall midges (Cecidomyiidae) were mounted in microscopy slides, following the methodology outlined by Gagné (1994). The excedent specimens remained in 70% ethanol. The Cecidomyiidae were identified to genus level using the keys of Gagné (1994) and to species based on original descriptions. Adults of microhymenoptera and Coleoptera were identified by Dr. Maria Antonieta P. Azevedo and Dr. Sérgio Antônio Vanin, respectively. The Coleoptera specimens were deposited in the Entomological Collection of the Museu de Zoologia da Universidade de São Paulo (MZSP) and the microhymenoptera in the Entomological collection of Museu Nacional/UFRJ (MNRJ).

Analysis and data comparison

The average of gall morphotypes per host plant species was calculated using simple arithmetic mean. Data obtained about the host plant families, genera and species, as well as the total and average of morphotypes found were compared to other inventories in the Amazon rainforest area. We searched for previous records of galls in each host plant genus and

species verified in this study. We only compared the gall morphotypes for the host plants identified at species level. It was considered as new records to the Amazon rainforest the host plant species and gall morphotypes that was not recorded before in the other inventories in this phytogeographic domain.

All botanical species names, including the genera, were conferred at Flora and Funga do Brasil website (2019) to verify possible synonyms that could cause the data misinterpretation, such as the indication of first record of some of the galls to this phytogeographic domain.

Endemism analysis and galling species richness

The host plant endemism was based on data of Flora and Funga do Brasil website (2019). The galling species were considered endemic when associated exclusively with endemic host plants.

The relationship between galling species richness and plant family size was evaluated. According to plant size hypothesis, gallers are richer in species on plants from taxa also richer in species (Fernandes 1992). To model the relationships between galling species richness and plants size, we use zero-altered poisson models and zero-altered negative binomial models following the routine of the package “msne” and the “gamlss” (Hilbe 2014). The response variable (galling species richness on plant galled) is a count and cannot obtain the value zero. We refer to the variable as being zero truncated (Hilbe 2014). But the analyses were not able to deal with the variance heterogeneity. Because the residues did not behave well we use the non-parametric Spearman correlation test (Sprent & Smeeton 2007) to determine relationships between galling species richness and plant family size. Statistical analysis was conducted using the R statistical package (R Core Team 2017).

RESULTS

We found 103 host plant species, distributed in 69 genera and 35 families, hosting 152 insect galls morphotypes. The number of host plant families, genera and species, as well as the number of the gall morphotypes are shown in Table I. Fabaceae (n=43), Bignoniaceae (n=33) and Sapindaceae (n=7) presented the highest richness of galls. Among the plant genera, *Adenocalymma* Mart. ex Meisn. (Bignoniaceae), *Bauhinia* L., *Machaerium* Pers., and *Inga* Mill. (Fabaceae) presented the highest number of galled species with eight, five, five and four host species, respectively. *Bauhinia unguolata* L. (Fabaceae) and *Vismia guianensis* (Aubl.) Choisy (Hypericaceae) were the superhost species presenting nine and five distinct morphotypes, respectively.

Thirty-four genera and 23 species of plants were recorded for the first time hosting galls in the Amazon rainforest areas. All host plants are native, except *Lantana camara* L. (Verbenaceae), which is naturalized. Among native plants, seven species are endemic to Brazil: *Adenocalymma coriaceum* A.DC. (Bignoniaceae), *Adenocalymma magnificum* Mart. ex DC. (Bignoniaceae), *Casimirella ampla* (Miers) R.A.Howard (Icacinaceae), *Croton cf. spruceanus* Benth. (Euphorbiaceae), *Hymenolobium excelsum* Ducke (Fabaceae), *Myrcia splendens* (Sw.) DC. (Myrtaceae) and *Platymiscium filipes* Benth. (Fabaceae). Each species presented only one gall morphotype, except *Myrcia splendens* with two morphotypes and *A. coriaceum* with three morphotypes, totalizing ten endemic galler species. The galling species richness increases positively with the plant family size (Spearman: $r = 0.78$; $S = 1565.6$, $p < 0.001$; Figure 1).

The galled plant organs were leaves (80.9%), stems (15.7%), tendrils (3.9%) and buds (3.2%). No galls were found on fruits and flowers,

Table I. Distribution of insect gall morphotypes per host plant families in Rondônia, Brazil, with number and percentage of galled plant genera and species.

Host plant families	Number and percentage of galled genera	Number and percentage of galled species	Number and percentage of gall morphotypes
Annonaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Bignoniaceae	8 (11.5%)	19 (18.4%)	33 (21.7%)
Burseraceae	1 (1.4%)	1 (0.95%)	2 (1.3%)
Cannabaceae	1 (1.4%)	1 (0.95%)	3 (1.9%)
Celastraceae	4 (5.7%)	4 (3.8%)	5 (3.2%)
Chrysobalanaceae	2 (2.8%)	2 (1.9%)	2 (1.3%)
Clusiaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Combretaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Dichapetalaceae	1 (1.4%)	2 (1.9%)	2 (1.3%)
Dilleniaceae	2 (2.8%)	2 (1.9%)	3 (1.9%)
Elaeocarpaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Euphorbiaceae	2 (2.8%)	2 (1.9%)	2 (1.3%)
Fabaceae	16 (23.1%)	29 (28.1%)	43 (28.2%)
Hypericaceae	1 (1.4%)	1 (0.95%)	5 (3.2%)
Icacinaceae	1 (1.4%)	3 (2.9%)	3 (1.9%)
Lamiaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Lauraceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Lecythidaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Malpighiaceae	2 (2.8%)	4 (3.8%)	5 (3.2%)
Melastomataceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Meliaceae	2 (2.8%)	2 (1.9%)	4 (2.6%)
Menispermaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Myrtaceae	1 (1.4%)	1 (0.95%)	2 (1.3%)
Nyctaginaceae	1 (1.4%)	1 (0.95%)	2 (1.3%)
Olacaceae	1 (1.4%)	2 (1.9%)	2 (1.3%)
Phyllanthaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Piperaceae	1 (1.4%)	2 (1.9%)	3 (1.9%)
Rubiaceae	2 (2.8%)	2 (1.9%)	3 (1.9%)
Rutaceae	1 (1.4%)	1 (0.95%)	3 (1.9%)
Salicaceae	1 (1.4%)	2 (1.9%)	4 (2.6%)
Sapindaceae	4 (5.7%)	6 (5.8%)	7 (4.6%)
Siparunaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Urticaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Verbenaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Violaceae	1 (1.4%)	1 (0.95%)	1 (0.6%)
Total	69	103	152

although such organs have been investigated. The average number of morphotypes per host plant species was 1.4. In Table II, we compared the results of this study to the data obtained by other authors in the Amazon rainforest. The most frequent gall morphotypes were: globoid (n=59), fusiform (n=25), lenticular (n=19), conical (n=17), oval (n=16) and marginal leaf roll (n=13). The number of glabrous galls (n=116) was much higher than that of hairy (n=36). Most galls presented only one internal chamber (83.5%).

We recorded 110 new gall morphotypes. The predominant color of the galls was green (n=108), but we also found brown (n=58), yellow (n=8) and reddish (n=2) morphotypes. The majority of the galls were induced in only one organ of the host plant, except three morphotypes induced by gall midge (Cecidomyiidae): one on stem, petiole and tendril of *Tanaecium pyramidatum* (Rich.) L. Lohmann (Bignoniaceae); other on stem and leaf of *Callichlamys latifolia* (Rich.) K. Schum (Bignoniaceae); and the third on stem and leaf of *Vismia guianensis* (Hypecariaceae).

The Cecidomyiidae (Diptera) induced most galls, being responsible for 60 morphotypes, followed by Lepidoptera (n=4), Hemiptera (n=1) and Coleoptera (Curculionidae: Baridinae) (n=1).



Figure 1. Relation between the galling species richness and the plant family size. Spearman: $r = 0.78$; $S = 1565.6$, $p < 0.001$.

The inducers of 86 morphotypes could not be determined.

The characterization of the galls, regarding the organ of occurrence, shape, color, indumentum, number of internal chamber and inducing insect is shown in Table III.

In addition to the gallers, other arthropods were found in 16 gall morphotypes, acting as parasitoids, successors and inquilines. Among these, the parasitoids were the most frequent group, occurring in 11 gall morphotypes, and represented exclusively by microhymenoptera. The successors, however, made up the most diversified guild, composed of Thysanoptera, Formicidae (Hymenoptera) and Hemiptera each occurring in one morphotype. The inquilines were the less frequent, occurring only in one morphotype and being represented only by Cecidomyiidae (Diptera).

The Cecidomyiidae were identified at family level (42 morphospecies), tribe (one morphospecies of Clinodiplosini), genera (15 species, being 12 gallers, one inquiline, and one predator) and species (*Schismatodiplosis lantanae* Rübsaamen, 1908 and *Clinodiplosis cecropiae* Proença & Maia, 2020). The following genera were represented: *Clinodiplosis* Kieffer, 1895 (three galling species), *Diadiplosis* Felt, 1911 (one predator), *Epihormomyia* Felt 1915 (one galling species), *Lopesia* Rübsaamen, 1908 (three galling species), *Mycodiplosis* Rübsaamen, 1895 (one inquiline species), *Neolasioptera* Kieffer, 1894 (six galling species) and *Schismatodiplosis* Rübsaamen, 1908 (one galling species).

In the first field work, in 2011, we collected a higher number of galls (n=106) than in the second one, in 2012, (n=70). Monte Negro was the locality with the highest number of galls (n= 91), followed by Campo Novo de Rondônia (n= 52) and Cacaúlândia (n= 37).

Table II. Comparison between the results of this study and others in Amazon rainforest areas. Data on number of gall morphotypes, host plant species and families, average of gall; botanic families with the highest richness of gall; and botanic genera super-hosts of galls are showed.

Localities	Number of gall morphotypes	Host families	Host species	Average of gall morphotypes/ Host plants	Botanic families with the highest richness of gall	Super-hots botanic genera	References
Rondônia	152	35	103	1.4	Fabaceae Bignoniaceae Sapindaceae	<i>Bauhinia</i> <i>Adenocalymma</i>	This study
Platô Bacaba (Pará)	76	22	38	2	Fabaceae Chrysobalanaceae Burseraceae	<i>Inga</i> <i>Protium</i>	Maia (2011)
Amazônia Oriental (Pará)	309	45	255	1.2	Burseraceae Fabaceae Melastomataceae	<i>Protium</i> <i>Inga</i>	Almada & Fernandes (2011)
Amazônia Central (Manaus)	27	30	27	1	Burseraceae Rubiaceae	-	Silva et al. (2011)
Trombetas (Pará)	112	33	65	1.7	Fabaceae Bignoniaceae Sapotaceae	<i>Adenocalymma</i> <i>Pouteria</i>	Araújo et. al. (2012)
Floresta Nacional de Saracá Taquera (Oriximiná, Para)	194	-	116	1.6	Bignoniaceae Sapotaceae Burseraceae	<i>Adenocalymma</i> <i>Pouteria</i>	Araújo & Espírito-Santo Filho (2012)
Santarém (Pará)	27	11	21	1.3	Fabaceae Myrtaceae Anacardiaceae	<i>Myrcia</i> <i>Copaifera</i>	Carvalho & Mota (2018)

Gall characterization

Annonaceae (n= 1)

Xylopi sp. L. (native genus) (n= 1)

Gall (Fig. 2): on leaf, lenticular, green, with small trichomes, and one-chambered. Galler: Cecidomyiidae. Associated fauna: Hymenoptera (parasitoid). Ectoparasitoid larvae obtained. Localities: Cacaúlândia (Fazenda do Cabeça); Monte Negro (Sector Chacareiro-Line 25). Collected in October 2011. Comments: One *Xylopi* species was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011).

Bignoniaceae (n= 18)

Adenocalymma sp. 1 Mart. ex Meisn. emend L.G. Lohmann (native genus) (n= 1)

Gall (Fig. 3): on leaf, marginal roll, light green, glabrous and one-chambered. Galler: indeterminate. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011.

Adenocalymma sp.2 (n= 1)

Gall (Fig. 4): on leaf vein, vermiform, green and glabrous. Galler: *Neolasioptera* sp. (Cecidomyiidae, Lasiopteridi, Alycaulini). Adults obtained. Locality: Cacaúlândia (Fazenda do cabeça). Collected in May 2012.

Adenocalymma sp.3 (n= 2)

Table III. Gall characterization (shape, color, number of internal chamber, trichomes, galled plant organ, and inducing insects) in Amazon rainforest areas, in three municipalities of Rondônia (Brazil).

Host plants			Gall morphotype					
Families	Species	Galled organ	Shape	Color	Trichome	Internal chamber	Galler	Figs.
Annonaceae	<i>Xylopi</i> sp.	Leaf	Lenticular	Green	Present	One-chambered	Cecidomyiidae	2
Bignoniaceae	<i>Adenocalymma</i> sp.1	Leaf	Margin roll	Light green	Absent	One-chambered	Indeterminate	3
	<i>Adenocalymma</i> sp.2	Leaf vein	Vermiform	Green	Absent	-	<i>Neolasioptera</i> sp.	4
	<i>Adenocalymma</i> sp.3	Tendrill	Oval	Brown	Absent	One-chambered	Cecidomyiidae	5
		Stem	Fusiform	Brown	Absent	-	Indeterminate	6
	<i>Adenocalymma</i> sp.4	Leaf	Globoid	Green	Absent	One-chambered	Indeterminate	7
	<i>Adenocalymma coriaceum</i>	Leaf	Conical	Light green	Present	One-chambered	Cecidomyiidae	8
		Leaf	Conical	Green	Absent	One-chambered	Cecidomyiidae	9
		Leaf	Globoid	Light green	Present	One-chambered	Cecidomyiidae	10
	<i>Adenocalymma longilineum</i>	Stem	Globoid	Brownish green	Absent	One-chambered	Indeterminate	11
		Leaf vein	Fusiform	Brownish green	Absent	One-chambered	Cecidomyiidae	12
	<i>Adenocalymma magnificum</i>	Leaf	Globoid	Brownish green	Absent	One-chambered	Indeterminate	13
		Leaf vein	Oval	Green/Brown	Absent	Multi-chambered	<i>Neolasioptera</i> sp.	14
	<i>Adenocalymma schomburgkii</i>	Leaf	Globoid	Brown	Present	One-chambered	Coleoptera	15
	<i>Anemopaegma floridum</i>	Leaf vein	Fusiform	Light green	Absent	One-chambered	<i>Clinodiplosis</i> sp.	16
		Leaf	Margin roll	Green	Absent	One-chambered	Indeterminate	17
	<i>Bignonia</i> sp.	Leaf vein	Spiraled	Green	Absent	One-chambered	Lepidoptera	18
		Leaf petiole	Oval	Brown	Absent	One-chambered	Indeterminate	19
		Stem	Globoid	Brown	Absent	-	Indeterminate	20
	<i>Bignonia nocturna</i>	Leaf vein	Fusiform	Green/Brown	Absent	One-chambered	Cecidomyiidae	21
Leaf petiole		Oval	Green	Absent	One-chambered	Indeterminate	22	
Bignoniaceae	<i>Bignonia nocturna</i>	Stem	Globoid	Brown	Absent	One-chambered	<i>Neolasioptera</i> sp.	23
	<i>Bignonia prieurii</i>	Leaf vein	Fusiform	Brown	Absent	One-chambered	Indeterminate	24
		Leaf	Globoid	Green/Brown	Absent	One-chambered	Indeterminate	25
	<i>Callichlamys</i> sp.	Leaf	Margin roll	Light green	Absent	One-chambered	Indeterminate	26
	<i>Callichlamys latifolia</i>	Leaf vein and stem	Oval	Light green	Absent	One-chambered	Cecidomyiidae	27
								28
	<i>Fridericia</i> sp.1	Leaf	Fusiform	Green	Absent	One-chambered	Cecidomyiidae	29
	<i>Fridericia</i> sp.2	Leaf	Cylindrical	Brown	Present	One-chambered	Indeterminate	30
	<i>Manaosella cordifolia</i>	Tendrill	Globoid	Brownish green	Absent	One-chambered	Indeterminate	31
	<i>Stizophyllum riparium</i>	Tendrill	Fusiform	Brown	Absent	-	Indeterminate	32
		Bud	Oval	Green	Present	-	Clinodiplosini	33
	<i>Tanaecium pyramidatum</i>	Leaf vein, tendrill, petiole and stem	Fusiform	Green	Absent	One-chambered	Cecidomyiidae	34-37
		Leaf vein	Globoid	Green	Absent	One-chambered	Indeterminate	38
		Stem	Globoid	Green	Absent	One-chambered	Indeterminate	39

Table III. Continuation.

Burseraceae	<i>Protium unifoliolatum</i>	Leaf	Globoid	Green	Present	One-chambered	Cecidomyiidae	40
		Leaf	Margin roll	Brownish green	Absent	One-chambered	Indeterminate	41
Cannabaceae	<i>Celtis iguanaea</i>	Leaf	Conical	Brown	Absent	One-chambered	Indeterminate	42
		Bud and spine	Globoid	Green/Brown	Absent	One-chambered	Cecidomyiidae	43 44
		Leaf	Lenticular	Light green	Present	One-chambered	Indeterminate	45
Celastraceae	<i>Hippocratea</i> sp.	Leaf	Lenticular	Green/Black	Absent	One-chambered	Indeterminate	46
	<i>Prionostemma asperum</i>	Leaf	Lenticular	Green	Absent	One-chambered	Indeterminate	47
Celastraceae	<i>Salacia</i> sp.	Leaf	Globoid	Brown	Absent	Multi-chambered	Indeterminate	48
	<i>Salacia</i> sp.	Leaf	Globoid	Light green	Absent	One-chambered	Cecidomyiidae	49
	<i>Tontelea</i> sp.	Leaf	Conical	Green	Absent	One-chambered	<i>Lopesia</i> sp. nov.	50
Chrysobalanaceae	<i>Couepia</i> sp.	Leaf	Globoid	Brown	Present	One-chambered	<i>Lopesia</i> sp.	51
	<i>Licania</i> sp.	Leaf	Margin roll	Light green	Present	One-chambered	Cecidomyiidae	52
Clusiaceae	<i>Symphonia globulifera</i>	Leaf	Margin roll	Green	Absent	One-chambered	Indeterminate	53
Combretaceae	<i>Combretum fruticosum</i>	Leaf	Conical	Green	Absent	One-chambered	Indeterminate	54
Dichapetalaceae	<i>Dichapetalum</i> sp.	Leaf	Globoid	Green	Absent	One-chambered	Indeterminate	55
	<i>Dichapetalum pedunculatum</i>	Leaf	Globoid	Green	Absent	One-chambered	Cecidomyiidae	56
Dilleniaceae	<i>Davilla rugosa</i>	Leaf	Globoid	Green	Present	One-chambered	Lepidoptera	57
		Leaf	Lenticular	Green	Present	One-chambered	Cecidomyiidae	58
	<i>Doliocarpus dentatus</i>	Leaf	Globoid	Brown	Present	One-chambered	Indeterminate	59
Elaeocarpaceae	<i>Sloanea</i> sp.	Leaf petiole	Globoid	Green	Absent	One-chambered	Indeterminate	60
Euphorbiaceae	<i>Croton</i> cf. <i>spruceanus</i>	Stem	Fusiform	Green	Absent	One-chambered	Lepidoptera	61
	<i>Hevea</i> sp.	Leaf	Globoid	Green	Absent	-	Indeterminate	62
Fabaceae	<i>Abarema</i> sp.	Leaf	Margin roll	Light green	Absent	One-chambered	Indeterminate	63
	<i>Anadenanthera peregrina</i>	Stem	Fusiform	Brown	Absent	Multi-chambered	Indeterminate	64
	<i>Andira surinamensis</i>	Leaf	Lenticular	Green	Absent	One-chambered	Indeterminate	65
		Leaf vein	Oval	Yellow	Absent	-	Indeterminate	66
Hypericaceae	<i>Vismia guianensis</i>	Leaf vein	Oval	Green	Absent	One-chambered	Indeterminate	108
		Leaf	Margin roll	Green	Absent	One-chambered	Indeterminate	109
		Leaf	Margin roll	Green	Absent	One-chambered	Cecidomyiidae	110
Icacinaceae	<i>Casimirella</i> sp.	Leaf	Globoid	Green	Absent	One-chambered	Cecidomyiidae	111
	<i>Casimirella</i> sp.2	Leaf	Conical	Green	Absent	-	Indeterminate	112
	<i>Casimirella ampla</i>	Leaf	Conical	Green	Absent	One-chambered	Cecidomyiidae	113
Lamiaceae	<i>Aegiphila</i> sp.	Leaf	Cylindrical	Green/Yellow	Present	One-chambered	Indeterminate	114
Lauraceae	<i>Aniba</i> sp.	Leaf	Globoid	Brown	Absent	One-chambered	Indeterminate	115
Lecythidaceae	<i>Eschweilera coriacea</i>	Leaf	Margin roll	Green	Absent	One-chambered	Cecidomyiidae	116

Table III. Continuation.

Malpighiaceae	<i>Byrsonima</i> sp. 1	Leaf vein and petiole	Fusiform	Brown	Absent	One-chambered	Cecidomyiidae	117
		Leaf vein	Fusiform	Green	Absent	-	Indeterminate	118
	<i>Byrsonima</i> sp.2	Leaf petiole	Fusiform	Brown	Absent	Multi-chambered	Indeterminate	119
	<i>Byrsonima</i> sp.3	Stem and leaf petiole	Fusiform	Brown	Absent	-	Indeterminate	120
	<i>Mascagnia</i> sp.	Leaf	Lenticular	Brown/Green	Absent	One-chambered	Indeterminate	121
Melastomataceae	Not determined	Leaf vein	Globoid	Green	Absent	One-chambered	Indeterminate	122
Meliaceae	<i>Guarea guidonia</i>	Leaf	Globoid	Brown	Present	One-chambered	Cecidomyiidae	123
		Leaf	Globoid	Brown	Absent	One-chambered	Indeterminate	124
	<i>Trichilia</i> sp.	Leaf and stem	Globoid	Brown	Absent	One-chambered	Cecidomyiidae	125-126
		Leaf	Conical	Green	Absent	One-chambered	Cecidomyiidae	127
Menispermaceae	<i>Cissampelos</i> sp.	Bud	Globoid	Brown	Absent	-	Cecidomyiidae	128
Myrtaceae	<i>Myrcia splendens</i>	Leaf	Globoid	Brown	Absent	One-chambered	Indeterminate	129
		Leaf	Group of rolling leaves	Green	Absent	-	Cecidomyiidae	130
Nyctaginaceae	<i>Neea</i> sp.	Stem	Fusiform	Brown	Absent	One-chambered	Indeterminate	131
		Leaf	Globoid	Brown	Present	One-chambered	Indeterminate	132
Olacaceae	<i>Heisteria acuminata</i>	Leaf	Conical	Green	Absent	One-chambered	Indeterminate	133
	<i>Heisteria barbata</i>	Leaf vein	Fusiform	Green	Absent	One-chambered	Indeterminate	134
Phyllanthaceae	<i>Phyllanthus</i> cf. <i>juglandifolius</i>	Leaf	Margin roll	Green	Absent	One-chambered	<i>Clinodiplosis</i> sp.	135
Piperaceae	<i>Piper</i> sp.	Leaf vein	Globoid	Green	Present	One-chambered	Cecidomyiidae	136
	<i>Piper aduncum</i>	Leaf	Cylindrical	Green	Present	One-chambered	Cecidomyiidae	137
		Bud	Conical	Green	Present	One-chambered	<i>Neolasioptera</i> sp.	138
Rubiaceae	<i>Psychotria</i> sp.	Leaf	Globoid	Green	Absent	One-chambered	Indeterminate	139
	<i>Uncaria guianensis</i>	Leaf	Globoid	Brownish green	Absent	One-chambered	Indeterminate	140
		Leaf	Lenticular	Brown/Green	Absent	One-chambered	Cecidomyiidae	141
Rutaceae	<i>Metrodorea flavida</i>	Leaf	Conical	Green	Absent	-	Indeterminate	142
		Leaf	Lenticular	Green	Absent	One-chambered	Cecidomyiidae	143
		Tendrils	Oval	Brown	Absent	One-chambered	Indeterminate	144
Salicaceae	<i>Casearia</i> sp.	Leaf vein	Globoid	Green	Present	One-chambered	Indeterminate	145
	<i>Casearia fasciculata</i>	Leaf	Lenticular	Brown/Green	Absent	One-chambered	Indeterminate	146
		Stem	Claviform	Brown	Absent	One-chambered	Indeterminate	147
		Leaf vein	Fusiform	Green	Absent	One-chambered	Indeterminate	148
Sapindaceae	<i>Allophylus glabratus</i>	Leaf	Globoid	Light green	Absent	One-chambered	Indeterminate	149
		Leaf	Lenticular	Green	Absent	One-chambered	Cecidomyiidae	150
	<i>Paullinia</i> sp.	Leaf	Lenticular	Brown/Green	Absent	One-chambered	Cecidomyiidae	151
	<i>Paullinia pinnata</i>	Leaf vein	Amorphous	Green	Absent	-	Indeterminate	152

Table III. Continuation.

	<i>Serjania</i> sp.	Leaf vein	Fusiform	Green	Absent	One-chambered	Indeterminate	153
	<i>Serjania</i> cf. <i>ovalifolia</i>	Leaf	Cylindrical	Yellowish green	Present	One-chambered	Indeterminate	154
	<i>Vouarana guianensis</i>	Leaf	Margin roll	Green	Absent	One-chambered	Indeterminate	155
Siparunaceae	<i>Siparuna guianensis</i>	Leaf	Globoid	Brown	Absent	One-chambered	Indeterminate	156
Urticaceae	<i>Cecropia</i> sp.	Stem	Globoid	Brown/Green	Absent	One-chambered	<i>Clinodiplosis cecropiae</i>	157
Verbenaceae	<i>Lantana camara</i>	Leaf	Globoid	Green	Present	One-chambered	<i>Schimatodiplosis lantanae</i>	158
Violaceae	<i>Rinorea carpus ulei</i>	Leaf vein	Fusiform	Green	Absent	One-chambered	<i>Neolasioptera</i> sp.	159

Gall (Fig. 5): on tendril, oval, brown, glabrous and one-chambered. Galler: Cecidomyiidae. Adults obtained. Associated fauna: Hymenoptera (parasitoid). Locality: Monte Negro (Cachoeira). Collected in May 2012.

Gall (Fig. 6): on stem, fusiform, brown and glabrous. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Adenocalymma sp.4 (n= 1)

Gall (Fig. 7): on leaf, globoid, irregular, green, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comments: *Adenocalymma* species were previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011), Araújo et al. (2012), Araújo & Espírito-Santo Filho (2012) and Maia (2011).

Adenocalymma coriaceum A.DC. (endemic in Brazil) (n=3)

Gall (Fig. 8): on leaf, conical, light green, with small white trichomes, with concavity on the apex and one-chambered. Galler: Cecidomyiidae. Exuviae and adults obtained. Associated fauna: Hymenoptera (parasitoid). Larvae obtained. Localities: Monte Negro (Cachoeira) and Campo Novo de Rondônia (Marimbondo's trail). Collected in October 2011 and May 2012.

Gall (Fig. 9): on leaf, conical, green, glabrous, with concavity on the apex and one-chambered. Galler: Cecidomyiidae. Exuviae and adults

obtained. Locality: Monte Negro (Cachoeira). Collected in October 2011 and May 2012.

Gall (Fig. 10): on leaf, globoid, light green, with small white trichomes and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

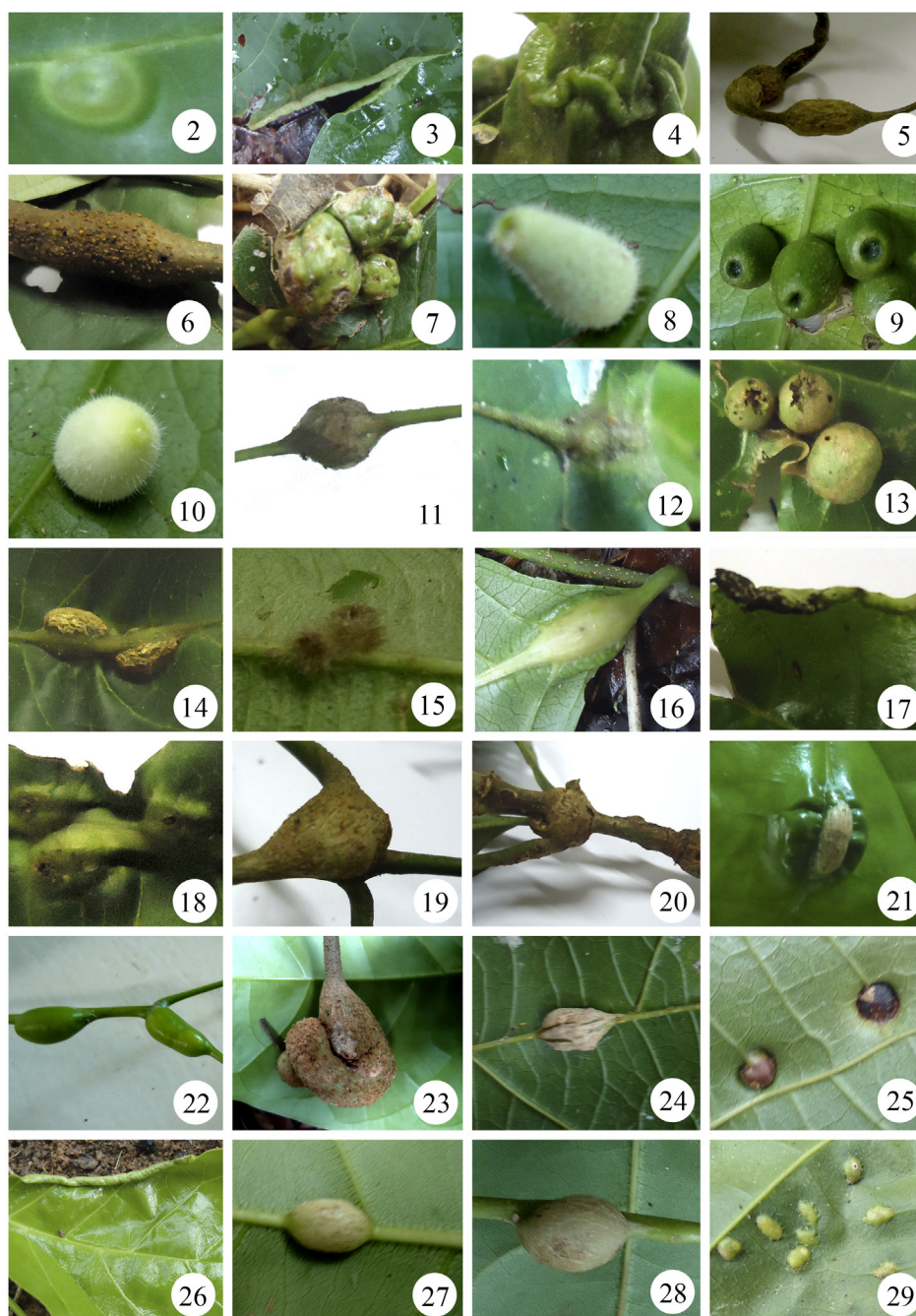
Comments: First record of *Adenocalymma coriaceum* hosting an insect gall in Amazon rainforest areas.

Adenocalymma longilineum (A.Samp.) L.G.Lohmann (native species) (n=3)

Gall (Fig. 11): on stem, globoid, brownish green, glabrous, and one-chambered. Galler: indeterminate. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Gall (Fig. 12): on leaf vein, fusiform, brownish green, causing leaf rolls, glabrous, and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Gall (Fig. 13): on leaf, globoid, brownish green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.



Figures 2-29. Insect galls from Amazon rainforest area in Rondônia (Brazil). 2) *Xylopi* sp.: lenticular leaf gall. 3) *Adenocalymma* sp.: marginal leaf roll gall. 4) *Adenocalymma* sp.2: vermiform leaf vein gall. 5-6) *Adenocalymma* sp.3: 5) oval tendril gall; 6) fusiform stem gall. 7) *Adenocalymma* sp.4: globoid leaf gall. 8-10) *Adenocalymma coriaceum*: 8) conical and hairy leaf gall; 9) conical and glabrous leaf gall; 10) globoid leaf gall. 11-13) *Adenocalymma longilineum*: 11) globoid stem gall; 12) leaf vein gall; 13) globoid leaf gall. 14) *Adenocalymma magnificum*: leaf vein gall. 15) *Adenocalymma schomburgkii*: globoid leaf gall. 16-17) *Anemopaegma floridum*: 16) fusiform leaf vein gall; 17) marginal leaf roll gall. 18-20) *Bignonia*: 18) leaf vein gall; 19) petiole gall; 20) globoid stem gall. 21-23) *Bignonia nocturna*: 21) leaf vein gall; 22) petiole gall; 23) globoid stem gall. 24-25) *Bignonia prieurii*: 24) leaf vein gall; 25) globoid leaf gall. 26) *Callichlamys* sp.: marginal leaf roll gall. 27-28) *Callichlamys latifolia*: oval gall. 27) on leaf vein; 28) on stem. 29) *Fridericia* sp.1: 29) fusiform leaf gall.

Comments: *Adenocalymma longilineum* was previously recorded by Almada & Fernandes (2011) hosting spherical, green and glabrous leaf galls induced by Cecidomyiidae on Amazon rainforest areas. However in this work the host plant species name is signed as its synonym *Memora longilinea* A. Samp.

Adenocalymma magnificum Mart. ex DC. (n= 1) (endemic in Brazil)

Gall (Fig. 14): on leaf vein, oval, with rough surface, green and brown, glabrous and multi-chambered. Galler: *Neolasioptera* sp. (Cecidomyiidae, Lasiopteridi, Alycaulini). Larvae and adults obtained. Associated fauna: Hymenoptera (parasitoid). Larvae, pupae and adults obtained. Locality: Monte Negro (Cachoeira). Collected in May 2012. Comments: The host plant and the gall morphotype were previously recorded on Amazon rainforest areas by Almada & Fernandes (2011) and Maia (2011), respectively. However in both studies the host plant name is signed as its synonym *Memora magnifica* (Mart. ex DC.) Bureau.

Adenocalymma schomburgkii (DC.) L. Lohmann (n= 1) (native species)

Gall (Fig. 15): on leaf, globoid, brown, hairy and one-chambered. Galler: Coleoptera. Adult obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012. Comments: First record of this gall in Amazon rainforest area. Almada & Fernandes (2011) previously recorded a gall induced by Cecidomyiidae in this host plant, but signed the plant as its synonym *Memora schomburgkii* (DC.) Miers.

Anemopaegma floridum Mart. ex DC. (n= 3) (native species)

Gall (Fig. 16): on leaf central vein, fusiform, light green, glabrous and one-chambered. Galler: *Clinodiplosis* sp. (Cecidomyiidi: Clinodiplosini). Larva and pupae obtained. Associated fauna: Hymenoptera (parasitoid). Larva obtained.

Localities: Cacaúlândia (Fazenda do Cabeça); Monte Negro (Cachoeira); Campo Novo de Rondônia (Point 03). Collected in October 2011 and May 2012.

Gall (Fig. 17): on leaf, marginal roll, green, glabrous and one-chambered. Galler: indeterminate. Locality: Cacaúlândia (Fazenda do cabeça). Collected in May 2012.

Comments: First record of *Anemopaegma* hosting insect gall in Amazon rainforest areas.

Bignonia L. sp. (n= 3) (native genus)

Gall (Fig. 18): on leaf vein, spiraled, green, glabrous and one-chambered. Galler: Lepidoptera. Larvae obtained. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Gall (Fig. 19): on leaf petiole, oval, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Gall (Fig. 20): on stem, globoid, brown and glabrous. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012. Comments: first record of this gall morphotype in Amazon rainforest areas.

Bignonia nocturna (Barb. Rodr.) L. Lohmann (native species) (n= 3)

Gall (Fig. 21): on leaf central vein, fusiform, green on the abaxial surface and brown on the adaxial portion, glabrous and one-chambered. Galler: Cecidomyiidae. Larva obtained. Associated fauna: Hymenoptera (parasitoid). Endoparasitoid larva obtained. Localities: Campo Novo de Rondônia (Point 03) and Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Gall (Fig. 22): on leaf petiole, oval, green, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 23): on stem, globoid, brown, glabrous and one-chambered. Galler: *Neolasioptera* sp. (Cecidomyiidae, Lasiopteridi,

Alycaulini). Adult obtained. Associated fauna: Hymenoptera (parasitoid). Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Bignonia prieurii DC. (native species) (n=2)

Gall (Fig. 24): on leaf vein, fusiform, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 25): on leaf, globoid, project on leaf surfaces, dark green or brown, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comments: First record of *Bignonia* hosting insect galls in Amazon rainforest areas.

Callichlamys sp. (native genus) (n= 1)

Gall (Fig. 26): on leaf, marginal roll, light green, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Callichlamys latifolia (Rich.) K. Schum (native species) (n= 1)

Gall (Figs. 27 and 28): on central leaf vein and stem, oval, light green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Associated fauna: Hymenoptera (parasitoid). Larvae obtained. Lepidoptera. Larvae obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011.

Comment: First record of *Callichlamys* hosting insect galls in Amazon rainforest areas.

Fridericia sp.1 Mart. (native genus) (n=1)

Gall (Fig. 29): on leaf, fusiform, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Fridericia Mart. sp.2 (native genus) (n=1)

Gall (Fig. 30): on leaf, cylindrical, brown, hairy and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012.

Comments: Previous record of *Fridericia* hosting insect galls in Amazon rainforest by Maia (2011). However, in this study the authors used the synonym name of this plant, *Arrabidaea* instead of, *Fridericia* which is the currently genus name.

Manaosella cordifolia (DC.) A. H. Gentry (n= 1) (native genus)

Gall (Fig. 31): on tendril, globoid, brownish green, glabrous and one-chambered. Galler: indeterminate. Localities: Cacaúlândia (Fazenda do Cabeça) and Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comments: First record of *Manaosella* hosting insect galls in Amazon rainforest area.

Stizophyllum riparium (Kunth) Sandwith (n= 2) (native genus)

Gall (Fig. 32): on tendril, fusiform, brown and glabrous. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

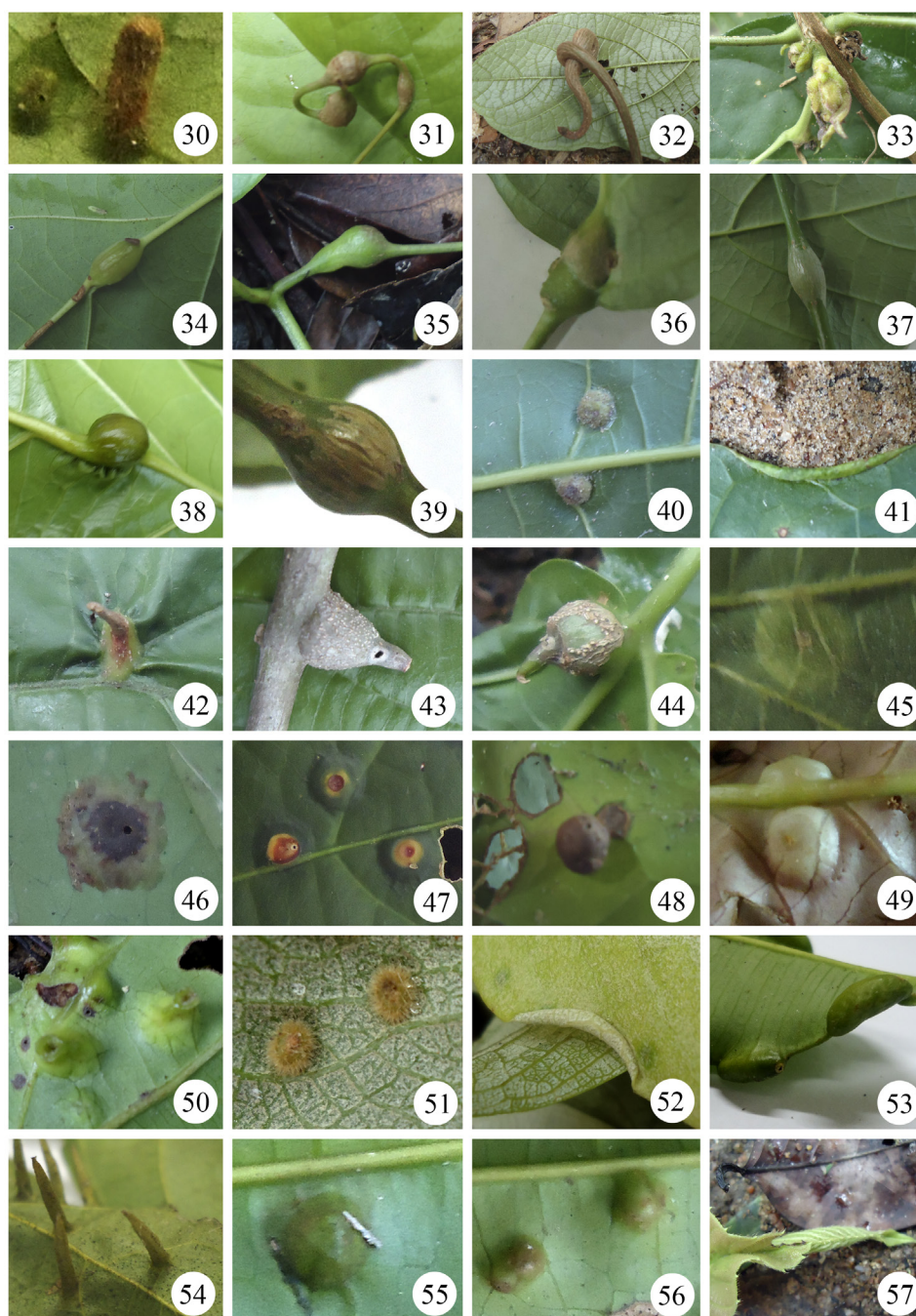
Gall (Fig. 33): on bud, oval, green and with small trichomes. (Figure 29). Galler: Clinodiplosini (Cecidomyiidi). Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25).

Comments: First record of *Stizophyllum* hosting insect galls in Amazon rainforest areas.

Tanaecium pyramidatum (Rich.) L. Lohmann (n= 3) (native genus)

Gall (Figs. 34, 35, 36 and 37): on petiole, central leaf vein, petiole tendril, and stem gall, fusiform, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Associated fauna: Hymenoptera (parasitoid). Larvae obtained. Localities: Cacaúlândia (Fazenda do Cabeça) and Monte Negro (Cachoeira and Sector Chacareiro: Line 25). Collected in October 2011.

Gall (Fig. 38): on leaf central vein, globoid, green, glabrous and one-chambered. Galler: indeterminate. Localities: Cacaúlândia (Fazenda do Cabeça) and Monte Negro (Cachoeira). Collected in October 2011.



Figures 30-57. Insect galls from Amazon rainforest area in Rondônia (Brazil). 30) *Fridericia* sp.1: cylindrical leaf gall. 31) *Manaosella cordifolia*: globoid tendril gall. 32-33) *Stizophyllum riparium*: 32) fusiform tendril gall; 33) oval bud gall. 34-39) *Tanaecium pyramidatum*: 34) fusiform leaf central vein gall; 35) fusiform tendril gall; 36) leaf petiole gall; 37) fusiform stem gall. 38) globoid leaf central vein gall. 39) globoid stem gall. 40-41) *Protium unifoliolatum*: 40) globoid leaf gall; 41) marginal leaf roll. 42-45) *Celtis iguanaea*: 42) conical leaf gall; 43) globoid bud and spine gall; 44) globoid spine gall; 45) lenticular gall. 46) *Hippocratea*: lenticular gall. 47) *Prionostemma asperum*: lenticular leaf. 48-49) *Salacia*: 48) globoid leaf gall; 49) globoid leaf gall. 50) *Tontelea*: conical leaf gall. 51) *Couepia*: globoid leaf gall. 52) *Licania*: marginal leaf roll. 53) *Symphonia globulifera*: 53) marginal leaf roll. 54) *Combretum fruticosum*: conical leaf gall. 55) *Dichapetalum*: globoid leaf gall. 56) *Dichapetalum pedunculatum*: globoid leaf gall. 57) *Davilla rugosa*: globoid leaf gall.

Gall (Fig. 39): on stem, globoid, green, glabrous and one-chambered. Galler: indeterminate. Localities: Monte Negro (Cachoeira) and Cacaúlândia (Fazenda do cabeça). Collected in October 2011 and May 2012.

Comment: First record of *Tanaecium* hosting insect galls in Amazon rainforest areas.

Burseraceae (n= 1)

Protium unifoliolatum Engl. (n= 2) (native species)

Gall (Fig. 40): on leaf, globoid, green, covered with small trichomes and one-chambered. Galler: Cecidomyiidae. Larvae and pupae obtained. Locality: Monte Negro (Cachoeira). Collected in October 2011.

Gall (Fig. 41): on leaf, marginal roll, brownish green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Comments: First record of *Protium unifoliolatum* hosting insect galls in Amazon rainforest areas. However, *Protium* species were previously recorded hosting insect galls in Amazon rainforest areas by Araújo et. al. (2012), Araújo & Espírito-Santo Filho (2012), Carvalho & Mota (2018), Maia (2011) and Silva et al. (2011).

Cannabaceae (n= 1)

Celtis iguanaea (Jacq.) Sarg. (n= 3) (native species)

Gall (Fig. 42): on leaf, conical, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Figs. 43 and 44): on bud and spine, globoid, with pointed apex, green or brown, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae and pupae obtained. Localities: Campo Novo de Rondônia (Point 03) and Cacaúlândia (Fazenda do cabeça). Collected in October 2011 and May 2012.

Gall (Fig. 45): on leaf, lenticular, light green, with small trichomes and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Comments: First record of *Celtis* hosting insect galls in Amazon rainforest areas.

Celastraceae (n= 4)

Hippocratea L. sp. (native genus) (n= 1)

Gall (Fig. 46): on leaf, lenticular, green or black, glabrous and one-chambered. Galler: indeterminate. Associated fauna: Thysanoptera. Adults and nymphs (successor). Locality: Monte Negro (Cachoeira). Collected in October 2011.

Comments: First record of *Hippocratea* hosting insect galls in Amazon rainforest areas.

Prionostemma asperum (Lam.) Miers (native species) (n= 1)

Gall (Fig. 47): on leaf, lenticular, green, rounded by a yellow ring and with reddish apex, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comments: First record of *Prionostemma* hosting insect galls in Amazon rainforest areas.

Salacia L. sp. (native species) (n=2)

Gall (Fig. 48): on leaf, globoid, brown, glabrous and multi-chambered. Galler: indeterminate. Associated fauna: Hymenoptera (parasitoid). Adult obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Gall (Fig. 49): on leaf, globoid, on both leaf's surfaces, more evident on the abaxial side, light green, yellow apex, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Comments: First record of *Salacia* hosting insect galls in Amazon rainforest areas.

Tontelea Miers sp. (native genus) (n=1)

Gall (Fig. 50): on leaf, conical, apex with a concavity, green, glabrous and one-chambered. Galler: *Lopesia* sp. nov. (Cecidomyiidae, Cecidomyiidi, Lopesiini). Larvae, pupal exuviae and adults obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011 and May 2012.

Comments: First record of *Tontelea* hosting insect galls in Amazon rainforest areas.

Chrysobalanaceae (n=2)

Couepia Aubl. sp. (native genus) (n=1)

Gall (Fig. 51): on leaf, globoid, brown, hairy and one-chambered. Galler: *Lopesia* sp. (Cecidomyiidae, Cecidomyiidi, Lopesiini). Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comentários: First record of *Couepia* hosting insect galls in Amazon rainforest areas. First record of this gall morphotype in Amazon rainforest areas.

Licania sp. Aubl. (native genus) (n=1)

Gall (Fig. 52): on leaf, marginal roll, light green, with small yellow trichomes and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comments: *Licania* species were previously found hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011), Araújo et. al. (2012), Maia (2011) and Silva et. al. (2011).

Clusiaceae (n= 1)

Symphonia globulifera L.f. (native species) (n= 1)

Gall (Fig. 53): on leaf, marginal roll, globoid, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012. Comments: First record of *Symphonia globulifera* hosting insect galls in Amazon rainforest areas. First record of this gall morphotype in Amazon rainforest areas.

Combretaceae (n= 1)

Combretum fruticosum (Loefl.) Stuntz (native species) (n= 1)

Gall (Fig. 54): on leaf, conical, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Line c20). Collected in May 2012. Comments: One *Combretum* species was previously found hosting galls in Amazon rainforest area by Almada & Fernandes (2011). First record of *Combretum fruticosum* hosting insect gasl in Amazon rainforest areas.

Dichapetalaceae (n= 2)

Dichapetalum sp. Thouars (native genus) (n= 1)

Gall (Fig. 55): on leaf, globoid, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira e Sector Chacareiro: Line 25). Collected in October 2011. Comments: One *Dichapetalum* species was previously found hosting insect galls in Amazon rainforest area by Almada and Fernandes (2011).

Dichapetalum pedunculatum (DC.) Baill (native species) (n= 1)

Gall (Fig. 56): on leaf, globoid, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Associated fauna: Hymenoptera (parasitoid). Larvae and adults obtained. Localities: Cacaúlândia (Fazenda do Cabeça) and Monte Negro (Cachoeira e Sector Chacareiro: Line 25). Collected in October 2011 and May 2012. Comments: First record of *Dichapetalum pedunculatum* hosting insect galls in Amazon rainforest areas.

Dilleniaceae (n= 2)

Davilla rugosa Poir. (native species) (n= 3)

Gall (Fig. 57): on leaf, globoid, coalescent, green, covered by small with trichomes and one-chambered. Galler: Lepidoptera. Larvae obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011. Comments: first record of this gall in Amazon rainforest area.

Gall (Fig. 58): on leaf, lenticular, green, covered by small trichomes and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Sector Chacareiro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: first record of this gall morphotype in Amazon rainforest areas.

Comments: *Davilla rugosa* was previously recorded hosting discoid, green and glabrous leaf galls, induced by Cecidomyiidae, in Amazon rainforest area by Almada & Fernandes (2011).

Doliocarpus dentatus (Aubl.) Standl. (native species) (n= 2)

Gall (Fig. 59): on leaf, globoid, reddish brown, hairy and one-chambered. Galler: indeterminate. Associated fauna: Hymenoptera (parasitoid). Larvae obtained. Locality: Monte Negro (Cachoeira). Collected in October 2011 and May 2012. Comments: Almada & Fernandes (2011) recorded two leaf galls induced by Cecidomyiidae on *Doliocarpus dentatus* in Amazon rainforest area. One gall is discoid, green and glabrous, and the other elliptic, brown and glabrous. First record of this gall morphotype in Amazon rainforest areas.

Elaeocarpaceae (n= 1)

Sloanea sp. L. (native species) (n= 1)

Gall (Fig. 60): on leaf petiole, globoid, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: *Sloanea* species were previously recorded hosting insect galls in Amazon rainforest areas by Araújo et. al. (2012).

Euphorbiaceae (n= 2)

Croton cf. spruceanus Benth. (endemic in Brazil) (n= 1)

Gall (Fig. 61): on stem, fusiform, green, glabrous and one-chambered. Galler: Lepidoptera. Pupa obtained. Locality: Monte

Negro (Cachoeira). Collected in October 2011 and May 2012. Comments: One *Croton* species was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011). First record of *Croton cf. spruceanus* hosting insect galls in Amazon rainforest areas.

Hevea sp. Aubl. (native genus) (n= 1)

Gall (Fig. 62): on leaf, globoid, green and glabrous. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: First record of *Hevea* hosting insect galls in Amazon rainforest areas. First record of *Hevea* hosting insect galls in Amazon rainforest areas.

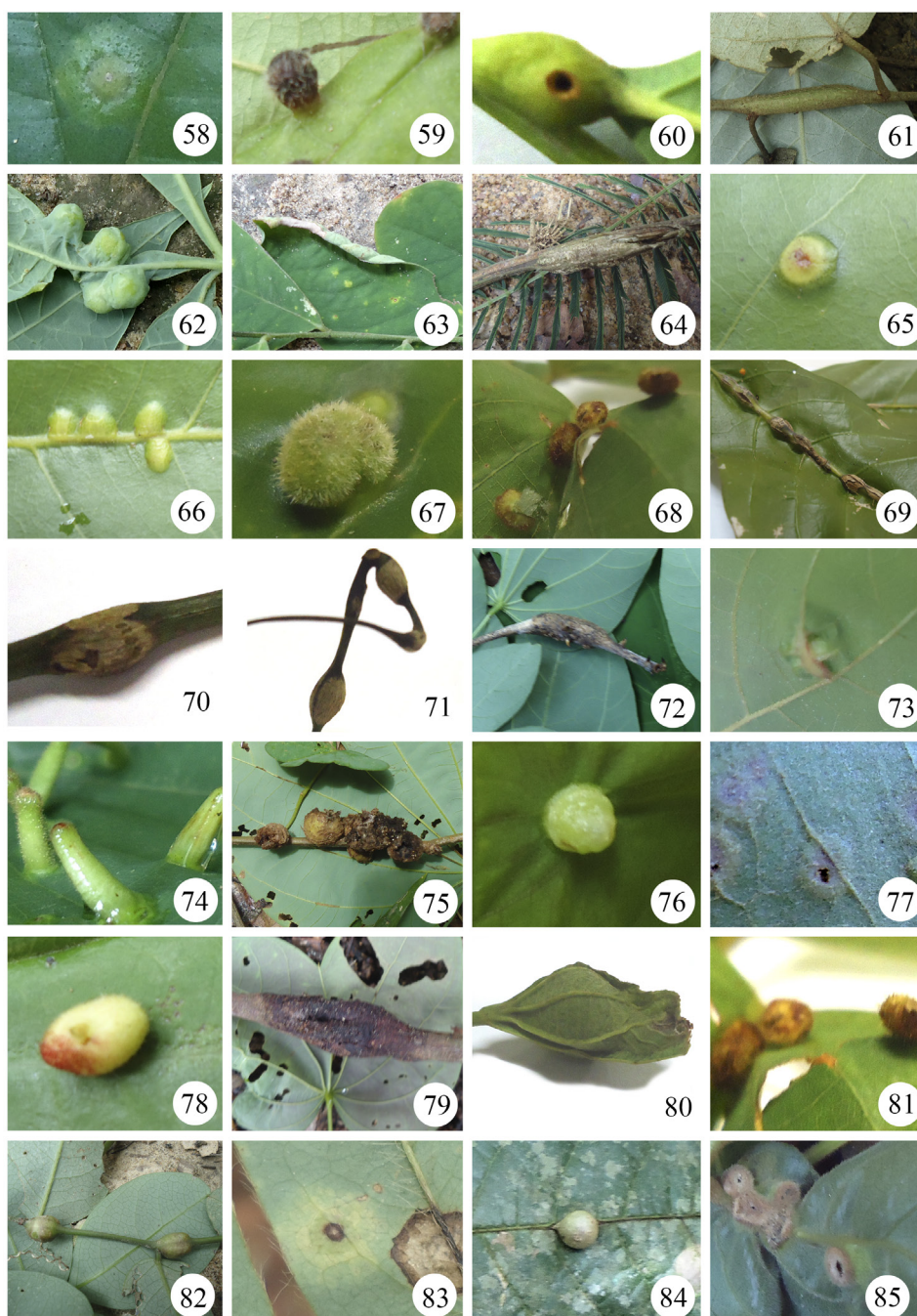
Fabaceae (n= 29)

Abarema Pittier sp. (native genus) (n=1)

Gall (Fig. 63): on leaf, marginal roll, light green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: First record of *Abarema* hosting insect galls in Amazon rainforest areas.

Anadenanthera peregrina (L.) Speg. (native species) (n=4)

Gall (Fig. 64): on stem, with small spines, fusiform, brown, glabrous and multi-chambered. Galler: Cecidomyiidae. Larvae obtained. Associated fauna: Thysanoptera (successor). Adult obtained. Locality: Monte Negro (Sector Chacareiro: Line 25) and Campo Novo de Rondônia (Fazenda Amorim). Collected in October 2011 and May 2012. Comments: *Anadenanthera* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011). However, in this study the authors used the synonym name of this plant, *Piptadenia*, instead of *Anadenanthera*, which is the currently genus name. First record of *Anadenanthera peregrina* hosting insect galls in Amazon rainforest areas.



Figures 58-85. Insect galls from Amazon rainforest area in Rondônia (Brazil). 58) *Davilla rugosa*: lenticular leaf gall. 59) *Doliocarpus dentatus*: globoid leaf gall. 60) *Sloanea*: globoid leaf petiole gall. 61) *Croton cf. spruceanus*: fusiform stem gall. 62) *Hevea*: globoid leaf gall. 63) *Abarema*: marginal leaf gall. 64) *Anadenanthera peregrina*: fusiform stem gall. 65-66) *Andira surinamensis*: 65) lenticular leaf gall; 66) oval leaf gall. 67) *Andira vermifuga*: globoid leaf gall. 68) *Bauhinia* sp.1: oval leaf gall. 69) *Bauhinia* sp.2: oval leaf vein gall. 70-71) *Bauhinia* sp.3: 70) globoid stem gall; 71) oval tendril gall. 72) *Bauhinia acreana*: fusiform stem gall. 73-81) *Bauhinia unguolata*: 73) fusiform leaf vein gall; 74) conical leaf gall; 75) globoid leaf gall; 76) conical leaf gall; 77) lenticular leaf gall; 78) oval leaf gall; 79) fusiform stem gall; 80) globoid leaf gall; 81) globoid leaf gall. 82) *Galactia*: globoid stem gall. 83) *Hymenolobium excelsum*: lenticular leaf gall. 84) *Inga*: globoid leaf gall. 85) *Inga cayennensis*: globoid leaf vein gall.

Andira surinamensis (Bondt) Splitg. ex Pulle (native species) (n=2)

Gall (Fig. 65): on leaf, lenticular, yellowish green, reddish in the middle, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Gall (Fig. 66): on central leaf vein, oval, yellow and glabrous. Young gall. Galler: indeterminate. Localities: Campo Novo de Rondônia (Point 03) and Campo Novo de Rondônia (Fazenda Amorim). Collected in October 2011 and May 2012. Comments: First record of this gall morphotype in Amazon rainforest areas.

Comments: *Andira surinamensis* was previously recorded hosting one cylindrical, brown and glabrous leaf gall in Amazon rainforest areas by Almada & Fernandes (2011).

Andira vermifuga (Mart.) Benth. (native species) (n=1)

Gall (Fig. 67): on leaf, globoid, green, hairy and multi-chambered. (Figure 63). Galler: Cecidomyiidae. Larvae and pupae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012. Comments: First record of *Andira* hosting insect galls in Amazon rainforest areas. First record of *Andira* hosting insect galls in Amazon rainforest areas.

Bauhinia sp.1 L. (native genus) (n=1)

Gall (Fig. 68): on leaf, oval, joining both leaf sides, reddish yellow, hairy and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Line C20). Collected in May 2012.

Bauhinia sp.2 (n= 1)

Gall (Fig. 69): on leaf vein, oval, brown, with rough surface, glabrous and one-chambered. Galler: *Neolasioptera* sp. (Cecidomyiidae, Lasiopteridi, Alycaulini). Larvae obtained. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Bauhinia sp.3 (n= 2)

Gall (Fig. 70): on stem, globoid, green or brown and glabrous. Galler: indeterminate. Locality: Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Gall (Fig. 71): on tendril, oval, green or brown, glabrous and one-chambered. Galler: Hemiptera. Nymph obtained. Locality: Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Comments: *Bauhinia* species were previously recorded hosting insect galls in Amazon rainforest areas by Araújo et al. (2012) and Carvalho & Mota (2018).

Bauhinia acreana Harms (native species) (n=1)

Gall (Fig. 72): on stem, fusiform, brown, with small spines, glabrous, one or two-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011. Comments: First record of *Bauhinia acreana* hosting insect galls in Amazon rainforest area.

Bauhinia unguolata L. (native species) (n= 9)

Gall (Fig. 73): on leaf vein, fusiform, yellow, with small reddish trichomes and one-chambered. Galler: indeterminate. Localities: Cacaúlândia (Fazenda do Cabeça); Cachoeira (Monte Negro) and Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 74): on leaf, conical, green, with small brownish trichomes on the apex and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011 and May 2012.

Gall (Fig. 75): on bud, globoid, similar to a fruit, brown, glabrous, and one-chambered. Galler: Cecidomyiidae. Pupae obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011.

Gall (Fig. 76): on leaf, conical, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Localities: Cacaúlândia

(Fazenda do Cabeça) and Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 77): on leaf, lenticular, green, glabrous and one-chambered. Galler: indeterminate. Localities: Cacaupândia (Fazenda do Cabeça); Monte Negro (Cachoeira) and Campo Novo de Rondônia (Fazenda Amorim). Collected in October 2011 and May 2012.

Gall (Fig. 78): on leaf, oval, reddish yellow, with small brownish trichomes and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Cacaupândia (Fazenda do Cabeça). Collected in October 2011.

Gall (Fig. 79): on stem, fusiform, brown, glabrous and multi-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 80): on leaf, globoid, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Gall (Fig. 81): on leaf, globoid, brown, hairy and one-chambered. Galler: Lepidoptera. Adult obtained. Locality: Cacaupândia (Fazenda do Cabeça). Collected in May 2012.

Comments: First record of *Bauhinia unguolata* hosting insect galls in Amazon rainforest area.

Galactia sp. P. Browne (n=1)

Gall (Fig. 82): on stem, globoid, brownish green and glabrous. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: First record of *Galactia* hosting insect galls in Amazon rainforest area.

Hymenolobium excelsum Ducke (endemic in Brazil) (n=1)

Gall (Fig. 83): on leaf, lenticular, yellow, covered with small trichomes and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: First record of *Hymenolobium* hosting insect galls in Amazon rainforest area.

First record of *Hymenolobium excelsum* hosting insect galls in Amazon rainforest areas.

Inga sp. Mill. sp. (native genus) (n=1)

Gall (Fig. 84): on leaf, globoid, light green, glabrous and one chambered. Galler: indeterminate. Locality: Cacaupândia (Fazenda do Cabeça). Collected in October 2011.

Comments: *Inga* species were previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011), Araújo et. al. (2012), Carvalho & Mota (2018) and Silva et al. (2011).

Inga cayennensis Sagot ex Benth (native species) (n=1)

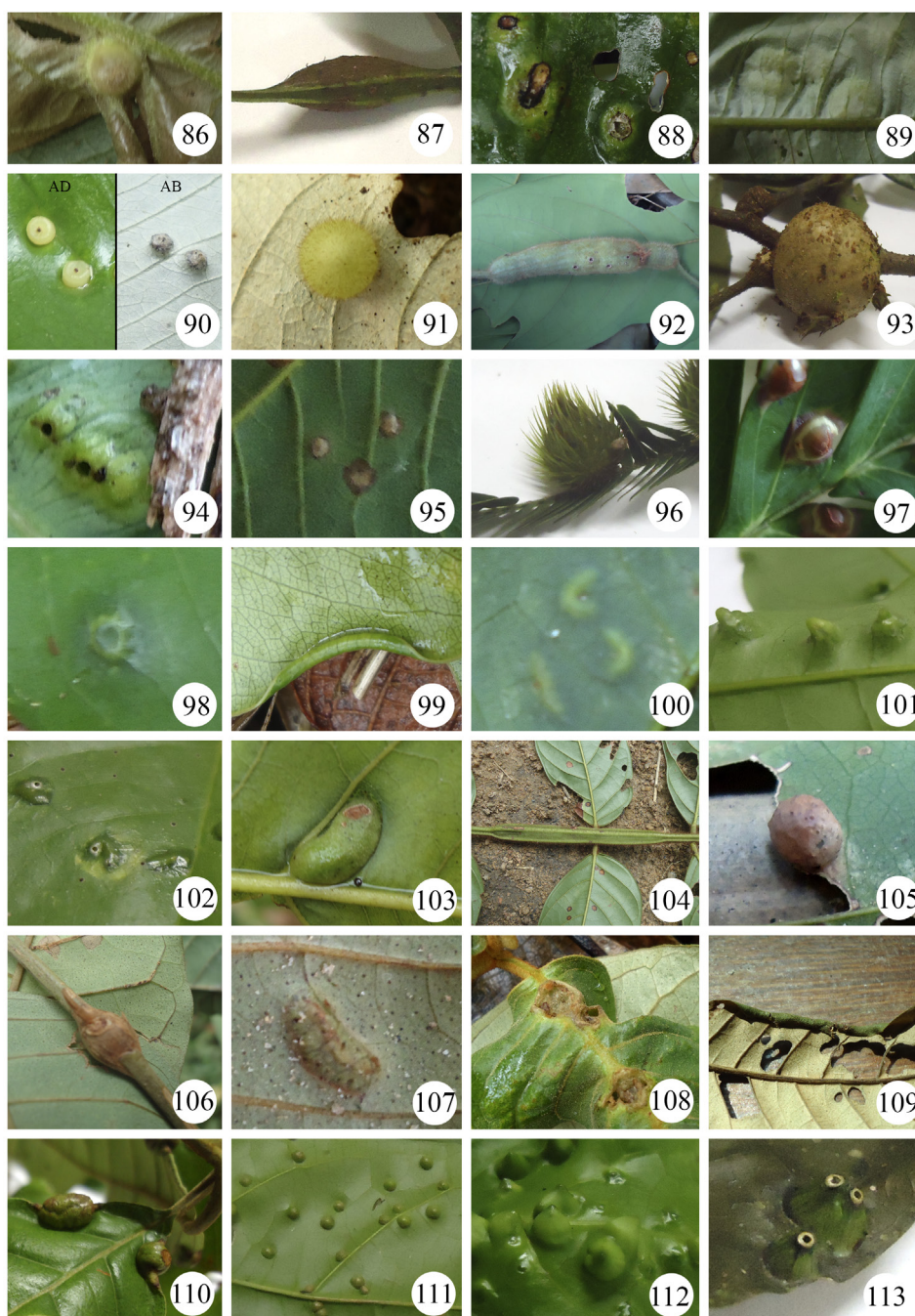
Gall (Fig. 85): on leaf vein, globoid, reddish brown, covered with small trichomes, with a central hole and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: Some of the galls are gregarious. *Inga cayennensis* was recorded hosting a brown, glabrous and parenchymatous leaf gall in Amazon rainforest by Maia (2011). First record of this gall morphotype in Amazon rainforest areas.

Inga edulis Mart. (native species) (n=1)

Gall (Fig. 86): on leaf, globoid, green or reddish, with small trichomes and one-chambered. Galler: indeterminate. Localities: Monte Negro (Sector Chacareiro: Line 25) and Campo Novo de Rondônia (Marimbondo's trail). Collected in October 2011 and May 2012. Comments: *Inga edulis* was record hosting a discoid, green, glabrous leaf gall, induced by Cecidomyiidae, in Amazon rainforest by Almada & Fernandes (2011). First record of this gall morphotype in Amazon rainforest areas.

Inga heterophylla Willd. (native species) (n=2)

Gall (Fig. 87): on stem, fusiform, green or brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012. Comments:



Figures 86-113. Insect galls from Amazon rainforest area in Rondônia (Brazil). 86) *Inga edulis*: globoid leaf gall. 87) *Inga heterophylla*: fusiform stem gall. 88) *Machaerium* sp.1: lenticular leaf gall. 89-91) *Machaerium* sp.2: 89) lenticular leaf gall; 90) conical leaf gall; 91) globoid leaf gall. 92) *Machaerium* sp.3: cylindrical leaf gall. 93) *Machaerium* sp.4: globoid stem gall. 94-95) *Machaerium amplum*: 94) globoid leaf gall; 95) lenticular leaf gall. 96) *Mimosa debilis*: conical leaf gall. 97) *Parkia igneiflora*: globoid leaf gall. 98) *Peltogyne*: globoid leaf gall. 99) *Platymiscium filipes*: marginal leaf roll. 100) *Pterocarpus*: fusiform leaf gall. 101-102) *Pterocarpus santalinoides*: 101) conical leaf gall; 102) lenticular leaf gall. 103) *Swartzia*: oval leaf gall. 104) *Tachigali bracteosa*: fusiform stem gall. 105) *Zygia ramiflora*: globoid leaf gall. 106-110) *Vismia guianensis*: 106) globoid stem gall; 107) lenticular leaf gall; 108) oval leaf vein gall; 109) marginal leaf roll gall; 110) marginal leaf roll gall. 111) *Casimirella* sp.1: globoid leaf gall. 112) *Casimirella* sp.2: conical leaf gall. 113) *Casimirella ampla*: conical leaf gall.

First record of *Inga heterophylla* hosting galls in Amazon rainforest areas.

Machaerium sp.1 Pers. (native genus) (n=1)

Gall (Fig. 88): on leaf, lenticular, with a central hole, green, glabrous and one-chambered. Galler: indeterminate. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011.

Machaerium sp.2 (n=3)

Gall (Fig. 89): on leaf, lenticular, green, glabrous and one-chambered. Galler: *Epihormomyia* sp. (Diptera: Cecidomyiidae). Adults obtained. Localities: Cacaúlândia (Fazenda do Cabeça) e Monte Negro Sector Chacareiro: Line 25). Collected in October 2011. Comments: First record of *Epihormomyia* sp. to Amazon rainforest areas. Comments: First record of *Epihormomyia* sp. to Amazon rainforest areas.

Gall (Fig. 90): on leaf, conical on abaxial side and globoid on the adaxial side, white or brown, glabrous and one-chambered. Galler: indeterminate. Localities: Cacaúlândia (Fazenda do Cabeça) and Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011 and May 2012.

Gall (Fig. 91): on leaf, globoid, green with small brown trichomes and one-chambered. Galler: Cecidomyiidae. Pupa obtained. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011.

Machaerium sp.3 (n=1)

Gall (Fig. 92): on stem, cylindrical, green, with small trichomes and multi-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011.

Machaerium sp.4 (n=1)

Gall (Fig. 93): on stem, globoid, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012.

Comments: *Machaerium* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011).

Machaerium amplum Benth. (native species) (n=2)

Gall (Fig. 94): on leaf, globoid on the abaxial and conical on the adaxial side, green, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 95): on leaf, lenticular, green, covered by reddish small trichomes and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Comments: First record of *Machaerium amplum* hosting insect galls in Amazon rainforest areas.

Mimosa debilis Humb. & Bonpl. ex Willd. (native species) (n=1)

Gall (Fig. 96): on leaf, conical, green, hairy and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Cacaúlândia (Fazenda do cabeça). Collected in May 2012. Comments: First record of *Mimosa* hosting insect galls in Amazon rainforest areas.

Parkia igneiflora Ducke (native species) (n=1)

Gall (Fig. 97): on leaf, projected simultaneously on both leaf sides, more visible on the abaxial surface, globoid, green or red, glabrous and one-chambered. Galler: Cecidomyiidae. Pupal exuviae and adults obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011 and May 2012.

Comments: *Parkia* species were previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011). First record of *Parkia igneiflora* hosting insect galls in Amazon rainforest areas.

Peltogyne sp. Vogel (native genus) (n=1)

Gall (Fig. 98): on leaf, irregularly globoid, green, glabrous and one-chambered. Galler: indeterminate. Localities: Monte Negro (Cachoeira and Sector Chacareiro: Line 25) and

Campo Novo de Rondônia (Marimbondo's trail). Collected in October 2011 and May 2012.

Comments: *Peltogyne* species were previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011) and Araújo et al. (2012). First record of this gall morphotype in Amazon rainforest areas.

Platymiscium filipes Benth. (endemic in Brazil) (n=1)

Gall (Fig. 99): on leaf, marginal roll, green, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: *Platymiscium* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011). First record of *Platymiscium filipes* hosting insect galls in Amazon rainforest areas.

Pterocarpus sp. Jacq. (native genus) (n=1)

Gall (Fig. 100): on leaf, fusiform, light green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Cachoeira and Sector Chacareiro: Line 25). Collected in October 2011. Comments: *Pterocarpus* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011).

Pterocarpus santalinoides L'Hér. ex DC. (native species) (n=2)

Gall (Fig. 101): on leaf, conical, projected on both leaf sides, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira and Sector Chacareiro: Line 25). Collected in May 2012.

Gall (Fig. 102): on leaf, lenticular, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Comments: First record of *Pterocarpus santalinoides* hosting insect galls in Amazon rainforest areas.

Swartzia sp. Schreb. (native genus) (n=1)

Gall (Fig. 103): on leaf, oval, yellow or green, glabrous and one-chambered. Galler: *Lopesia* sp. nov. (Cecidomyiidae, Cecidomyiidi, Lopesiini). Larvae, pupal exuviae and adults obtained. Associated fauna: Hymenoptera (parasitoid). Adult obtained. Locality: Campo Novo de Rondônia (Point 03 and Fazenda Amorim). Collected in October 2011 and May 2012. Comments: *Swartzia* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011) and Carvalho & Mota (2018).

Tachigali bracteosa (Harms) Zarucchi & Pipoly (native species) (n=1)

Gall (Fig. 104): on stem, fusiform, green, with small brownish trichomes and one-chambered. Galler: indeterminate. Associated fauna: Hymenoptera (Formicidae). Adults obtained. Hemiptera (Coccoidea) (successor). Adult obtained. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: *Tachigali* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011). First record of *Tachigali bracteosa* hosting insect galls in Amazon rainforest areas.

Zygia ramiflora (Benth.) Barneby & J.W.Grimes (native species) (n=1)

Gall (Fig. 105): on leaf, globoid, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: *Zygia ramiflora* was previously recorded hosting an elliptical, brown and glabrous leaf gall in Amazon rainforest areas by Almada & Fernandes (2011). First record of this gall morphotype in Amazon rainforest areas.

Hypericaceae (n=1)

Vismia guianensis (Aubl.) Choisy (native species) (n=5)

Gall (Fig. 106): on stem, globoid, brown, glabrous and multi-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte

Negro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Gall (Fig. 107): on leaf, lenticular, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Cachoeira (Monte Negro). Collected in October 2011.

Gall (Fig. 108): on leaf vein, oval, green, glabrous and one-chambered. Galler: indeterminate. Localities: Cacaúlândia (Fazenda do Cabeça) and Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Gall (Fig. 109): on leaf, marginal roll, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Gall (Fig. 110): on leaf, marginal roll, globose, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011. Comments: First record of this gall morphotype in Amazon rainforest areas.

Comments: *Vismia guianensis* was previously recorded hosting two insect galls induced by Cecidomyiidae in Amazon rainforest areas by Almada & Fernandes (2011). One is spherical, green, glabrous leaf gall, and the other is elliptical, brown and glabrous leaf gall.

Icacinaceae (n=3)

Casimirella sp. 1 Hassl. (native species) (n=1)

Gall (Fig. 111): on leaf, globose, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae, pupal exuviae and adults obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Casimirella sp.2 (n=1)

Gall (Fig. 112): on leaf, conical (projected on both leaf's surfaces), green and glabrous. Galler: indeterminate. Locality: Campo Novo de Rondônia (Fazenda Amorim). Collected in October 2011.

Casimirella ampla (Miers) R.A.Howard (endemic in Brazil) (n=1):

Gall (Fig. 113): on leaf, conical, with concavity on the apex, green, glabrous and one-chambered. Galler: Cecidomyiidae. Pupa obtained. Locality: Campo novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Comments: First record of *Casimirella* hosting insect galls in Amazon rainforest areas.

Lamiaceae (n=1)

Aegiphila sp. Jacq. (native genus) (n=2)

Gall (Fig. 114): on leaf, cylindrical, green or yellow, hairy and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012. Comments: First record of *Aegiphila* hosting insect galls in Amazon rainforest areas.

Lauraceae (n=1)

Aniba sp. Aubl. (native genus) (n=1)

Gall (Fig. 115): on leaf, globose, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012. Comments: *Aniba* species were previously recorded hosting insect galls in Amazon rainforest areas by Araújo et. al. (2012) and Maia (2011).

Lecythidaceae (n=1)

Eschweilera coriacea (DC.) S. A. Mori (native species) (n=1)

Gall (Fig. 116): on leaf, marginal roll, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: *Eschweilera coriacea*



Figures 114-141. Insect galls from Amazon rainforest area in Rondônia (Brazil). 114) *Aegiphila*: cylindrical leaf gall. 115) *Aniba*: globoid leaf gall. 116) *Eschweilera coriacea*: marginal leaf roll gall. 117-118) *Byrsonima* sp.1: 117) fusiform petiole and leaf vein gall; 118) fusiform, leaf vein gall. 119) *Byrsonima* sp.2: fusiform petiole leaf gall. 120) *Byrsonima* sp.3: 120) fusiform stem and petiole gall; 121) *Mascagnia*: lenticular leaf gall; 122) Melastomataceae not determined: globoid leaf vein gall. 123-124) *Guarea guidonia*: 123) globoid leaf gall; 124) globoid leaf gall. 125-127) *Trichilia*: 125) globoid stem gall; 126) globoid leaf gall; 127) conical leaf gall. 128) *Cissampelos*: globoid bud gall. 129-130) *Myrcia splendens*: 129) globoid leaf gall; 130) group of rolling leaves gall. 131-132) *Neea*: 131) fusiform stem gall; 132) globoid leaf gall. 133) *Heisteria acuminata*: conical leaf gall. 134) *Heisteria barbata*: fusiform leaf vein gall. 135) *Phyllanthus cf. juglandifolius*: 135) marginal leaf roll gall. 136) *Piper*: globoid leaf vein gall. 137-138) *Piper aduncum*: 137) cylindrical leaf gall; 138) conical bud gall. 139) *Psychotria*: globoid leaf gall. 140-141) *Uncaria guianensis*: 140) globoid leaf gall; 141) lenticular leaf gall.

was previously recorded hosting three galls induced by Cecidomyiidae in Amazon rainforest areas by Almada & Fernandes (2011). One is discoid, green and glabrous leaf gall, the other is spherical, green and glabrous leaf gall, and the third is conical, green, glabrous leaf gall. First record of this gall morphotype in Amazon rainforest areas.

Malpighiaceae (n=4)

Byrsonima sp.1 Rich. ex Kunth (native genus) (n=2)

Gall (Fig. 117): on leaf vein and petiole, fusiform, brown, glabrous and one-chambered. (Figure 116). Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25) and Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Gall (Fig. 118): on leaf central vein, fusiform, green and glabrous. Galler: indeterminate. Localities: Monte Negro (Sector Chacareiro: Line 25) and Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Byrsonima sp.2 (n=1)

Gall (Fig. 119): on leaf petiole, fusiform, brown, glabrous and multi-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Byrsonima sp.3 (n=1)

Gall (Fig. 120): on stem and leaf petiole, fusiform, brown and glabrous. Galler: indeterminate. Locality: Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Comments: *Byrsonima* was previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011).

Mascagnia sp. Bertero (native genus) (n=1)

Gall (Fig. 121): on leaf, lenticular, light green or brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro

(Cachoeira). Collected in October 2011 and May 2012. Comments: First record of *Mascagnia* hosting insect galls in Amazon rainforest areas.

Melastomataceae (n=1)

Melastomataceae not determined (n=1)

Gall (Fig. 122): on leaf vein, globoid, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012.

Meliaceae (n=2)

Guarea guidonia (L.) Sleumer (native species) (n=2)

Gall (Fig. 123): on leaf, globoid, reddish brown, hairy and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Localities: Monte Negro (Cachoeira) and Campo Novo de Rondônia (Marimbondo's trail). Collected in October 2011 and May 2012.

Gall (Fig. 124): on leaf, globoid, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Comments: First record of *Guarea* hosting insect galls in Amazon rainforest area.

Trichilia sp. P. Browne (native genus) (n=2)

Gall (Figs. 125 and 126): on leaf and stem, globoid, brown, glabrous and one-chambered. Galler: Cecidomyiidae. Pupae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 127): on leaf, conical, green, glabrous and one-chambered. Galler: Cecidomyiidae. Pupae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Comments: *Trichilia* species were previously recorded hosting insect galls in Amazon rainforest areas by Araújo et. al. (2012).

Menispermaceae (n=1)

Cissampelos sp. L. (native genus) (n=1)

Gall (Fig. 128): on bud, globoid, brown and glabrous. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Comments: First record of *Cissampelos* hosting insect galls in Amazon rainforest area.

Myrtaceae (n=2)

Myrcia splendens (Sw.) DC. (endemic in Brazil) (n=2)

Gall (Fig. 129): on leaf, globoid, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011.

Gall (Fig. 130): group of rolling leaves, green and glabrous. Galler: Cecidomyiidae. Larvae obtained. Associated fauna: Thysanoptera (successor). Adults and nymphs obtained. Locality: Monte Negro (Cachoeira). Collected in May 2012.

Comments: Galls on *Myrcia bracteata*, *M. sphecosa* and *Myrcia* sp. were previously recorded hosting insect galls in Amazon rainforest areas by Carvalho & Mota (2018) and Araújo et al. (2012). First record of *Myrcia splendens* hosting insect galls in Amazon rainforest area.

Nyctaginaceae (n=1)

Neea Ruiz & Pav. sp. (native genus) (n=2)

Gall (Fig. 131): on stem, fusiform, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011.

Gall (Fig. 132): on leaf, globoid, brown, hairy and one-chambered. Galler: indeterminate. Localities: Campo Novo de Rondônia (Point 03) and Campo Novo de Rondônia (Fazenda Amorim). Collected in October 2011 and May 2012.

Comments: First record of *Neea* hosting insect galls in Amazon rainforest area.

Olacaceae (n=2)

Heisteria acuminata (Humb. & Bonpl.) Engl. (native species) (n=1)

Gall (Fig. 133): on leaf, conical, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cacaulândia). Collected in May 2012.

Heisteria barbata Cuatrec. (native species) (n=1)

Gall (Fig. 134): on leaf vein, fusiform, green, glabrous, and one-chambered. Galler: indeterminate. Locality: Cacaulândia (Fazenda do cabeça). Collected in May 2012.

Comments: First record of *Heisteria* hosting insect galls in Amazon rainforest area.

Phyllanthaceae (n=1)

Phyllanthus cf. *juglandifolius* Willd. (native species) (n=1)

Gall (Fig. 135): on leaf, marginal roll, reddish green, glabrous and one-chambered (gregarious larvae). Galls in young leaves. Galler: *Clinodiplosis* sp. (Cecidomyiidi: Clinodiplosini). Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: First record of *Phyllanthus* hosting insect galls in Amazon rainforest area.

Piperaceae (n=2)

Piper sp. L. (native genus) (n=1)

Gall (Fig. 136): on leaf vein, irregularly globoid, green, hairy and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012.

Comments: One *Piper* species was previously recorded hosting insect galls in Amazon rainforest areas by Araújo et al. (2012).

Piper aduncum L. (native species) (n=2)

Gall (Fig. 137): on leaf, cylindrical, green, with small trichomes and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Associated

fauna: Hymenoptera (parasitoid). Larvae obtained. Localities: Cacaúlândia (Fazenda do Cabeça) and Campo Novo de Rondônia (Marimbondo's trail). Collected in October 2011 and May 2012.

Gall (Fig. 138): on bud, conical, green, hairy and one-chambered. Galler: *Neolasioptera* sp. (Cecidomyiidae, Lasiopteridi, Alycaulini). Larvae obtained. Localities: Cacaúlândia (Fazenda do Cabeça) and Campo Novo de Rondônia (Marimbondo's trail). Collected in October 2011 and May 2012.

Comments: First record of *Piper aduncum* hosting insect galls in Amazon rainforest area.

Rubiaceae (n= 2)

Psychotria sp. L. (native genus) (n=1)

Gall (Fig. 139): on leaf, globoid, green, glabrous and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: *Psychotria* species were previously recorded hosting insect galls on Amazon rainforest areas by Silva et al. (2011).

Uncaria guianensis (Aubl.) J. F. Gemel (native species) (n=2)

Gall (Fig. 140): on leaf, globoid, brownish green, glabrous and one-chambered. Galler: indeterminate. Localities: Cacaúlândia (Fazenda do Cabeça) and Monte Negro (Cachoeira). Collected in October 2011.

Gall (Fig. 141): on leaf, lenticular, with a central role, brown near the role and green on the rest, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.

Comments: First record of *Uncaria* hosting insect galls in Amazon rainforest area.

Rutaceae (n=1)

Metrodorea flavida K. krause (native species) (n=3)

Gall (Fig. 142): on leaf, conical, green and glabrous. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011.

Gall (Fig. 143): on leaf, lenticular, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Associated fauna: Hymenoptera (parasitoid). Larvae obtained. Locality: Campo Novo de Rondônia (Marimbondo's trail). Collected in May 2012.

Gall (Fig. 144): on petiole tendril, oval, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Poço das Antes (Marimbondo's trail). Collected in May 2012.

Comments: First record of *Metrodorea* hosting insect galls in Amazon rainforest area.

Salicaceae (n=2)

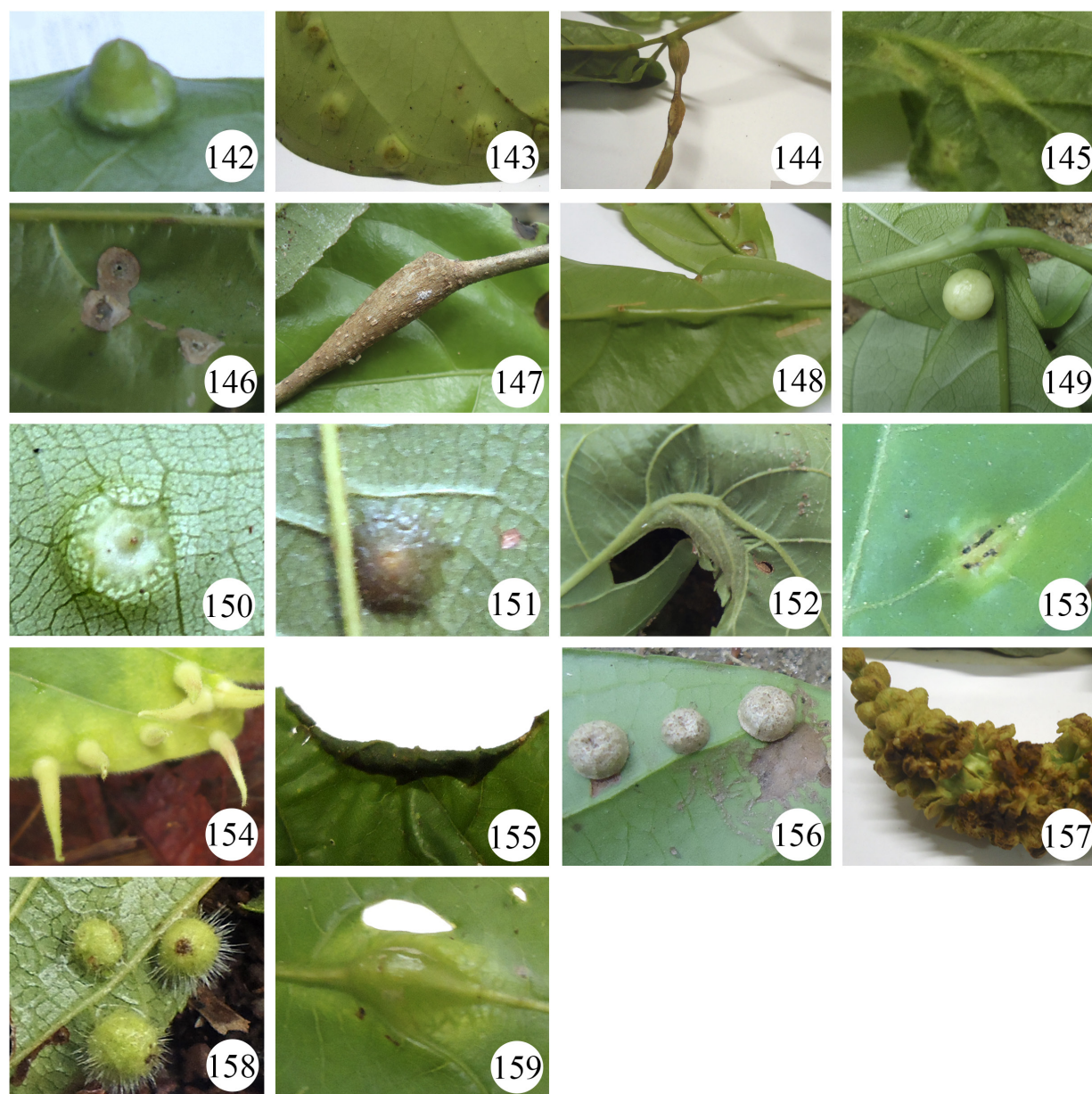
Casearia sp. Jacq. (native genus) (n=1)

Gall (Fig. 145): leaf vein, irregularly globoid, green, hairy and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012. Comments: *Casearia* species were previously recorded hosting insect galls on Amazon rainforest areas by Almada & Fernandes (2011), Araújo et.al. (2012) and Maia (2011). First record of this gall morphotype in Amazon rainforest areas.

Casearia fasciculata (Ruiz & Pav.) Sleumer (native species) (n=3)

Gall (Fig. 146): on leaf, lenticular, green or brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011 and May 2012.

Gall (Fig. 147): on stem, claviform, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in October 2011.



Figures 142-159: Insect galls from Amazon rainforest area in Rondônia (Brazil). 142-144) *Metrodorea flavida*: 142) conical leaf gall; 143) lenticular leaf gall; 144) oval tendril gall. 145) *Casearia*: globoid leaf vein gall. 146-148) *Casearia fasciculata*: 146) lenticular leaf gall; 147) claviform stem gall; 148) fusiform leaf vein gall. 149-150) *Allophylus glabratus*: 149) globoid leaf gall; 150) lenticular leaf gall. 151) *Paullinia*: lenticular leaf gall. 152) *Paullinia pinnata*: amorphous leaf vein gall. 153) *Serjania*: fusiform leaf vein gall. 154) *Serjania cf. ovalifolia*: cylindrical leaf gall. 155) *Vouarana guianensis*: marginal leaf roll gall. 156) *Siparuna guianensis*: globoid leaf gall. 157) *Cecropia*: globoid stem gall. 158) *Lantana camara*: globoid leaf gall. 159) *Rinoreocarpus ulei*: fusiform, leaf vein gall.

Gall (Fig. 148): on leaf vein, fusiform, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012.

Comments: First record of *Casearia fasciculata* hosting insect galls in Amazon rainforest area.

Sapindaceae (n=6)

Allophylus glabratus (Kunth) Radlk. (native species) (n=2)

Gall (Fig. 149): on leaf, globoid, light green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011.

Gall (Fig. 150): on leaf, lenticular, concave apex, with small triangular spine, green, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae obtained. Locality: Monte Negro (Cachoeira). Collected in October 2011.

Comments: First record of *Allophylus* hosting insect galls in Amazon rainforest area.

Paullinia. sp. L. (native genus) (n=1)

Gall (Fig. 151): on leaf, lenticular, green or brown, glabrous and one-chambered. Galler: Cecidomyiidae. Larvae and pupae obtained. Associated fauna: Hymenoptera (parasitoid). Larvae and pupae obtained. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: One *Paullinia* species was previously recorded hosting insect galls in Amazon rainforest areas by Araújo et. al. (2012).

Paullinia pinnata L. (native species) (n=1)

Gall (Fig. 152): on leaf vein, amorphous, causing leaf distortion, green and glabrous. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in October 2011. Comments: First record of *Paullinia pinnata* hosting insect galls in Amazon rainforest areas.

Serjania sp. Mill. (native genus) (n=1)

Gall (Fig. 153): on leaf vein, fusiform, green, glabrous and one-chambered. Galler: indeterminate. Locality: Cacaúlândia (Fazenda do Cabeça). Collected in October 2011. Comments: *Serjania* species were previously recorded hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011) and Araújo et. al. (2012).

Serjania cf. ovalifolia Radlk. (native species) (n=1)

Gall (Fig. 154): on leaf, cylindrical, yellowish green, with small trichomes and one-chambered. Galler: indeterminate. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: First record of *Serjania cf. ovalifolia* hosting insect galls in Amazon rainforest area.

Vouarana guianensis Aubl. (native species) (n=1)

Gall (Fig. 155): on leaf, marginal roll, green, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012. Comments: First record of *Vouarana guianensis* hosting insect galls in Amazon rainforest area. First record of this gall morphotype in Amazon rainforest areas.

Siparunaceae (n=1)

Siparuna guianensis Aubl. (native species) (n=1)

Gall (Fig. 156): on leaf, globoid, brown, glabrous and one-chambered. Galler: indeterminate. Locality: Monte Negro (Cachoeira). Collected in May 2012. Comments: *Siparuna* species were previously recorded hosting insect galls on Amazon rainforest areas by Araújo et. al. (2012), Maia (2011) and Silva et al. (2011). First record of *Siparuna guianensis* hosting insect galls in Amazon rainforest areas by Almada & Fernandes (2011).

Urticaceae (n=1)

Cecropia Loefl. sp. (native genus) (n=1)

Gall (Fig. 157): on stem, globoid, green or brown, glabrous and one-chambered. Galler: *Clinodiplosis cecropiae* Proença & Maia, 2020 (Cecidomyiidae, Cecidomyiidi, Clinodiplosini). Associated fauna: *Diadiplosis* Felt, 1911 sp. (Cecidomyiidae, Cecidomyiidi) (predator). Locality: Monte Negro (Sector Chacareiro: Line 25). Collected in May 2012.

Verbenaceae (n=1)

Lantana camara L. (naturalized species) (n=1)

Gall (Fig. 158): on leaf, globoid, green, hairy and one-chambered. Galler: *Schismatodiplosis lantanae* (Rübsaamen, 1908) (Cecidomyiidae, Cecidomyiidi, Clinodiplosini). Larvae obtained. Associated fauna: *Mycodiplosis* sp. (Cecidomyiidae, Cecidomyiidi, Mycodiplosini) (inquiline). Larvae obtained. Locality: Campo Novo de Rondônia (Point 03). Collected in October 2011. Comments: First record of *Mycodiplosis* to Amazon rainforest areas. First record of *Lantana camara* hosting insect galls in Amazon rainforest area.

Violaceae (n=1)

Rinoreocarpus ulei (Melch.) Ducke (native species) (n=1)

Gall (Fig. 159): on central leaf vein, fusiform, green, glabrous and one-chambered. Galler: *Neolasioptera* sp. (Cecidomyiidae, Lasiopteridi, Alycaulini). Larvae obtained. Locality: Monte Negro (Line c20). Collected in May 2012. Comments: First record of *Rinoreocarpus* hosting insect galls in Amazon rainforest area.

DISCUSSION

According to Araújo et al. (2019), the Atlantic Forest and Cerrado are the most studied Brazilian areas, with 23 and 22 gall inventories, respectively. Areas of Amazon rainforest remain neglected in this aspect, although this study and several other surveys point out high gall richness in this area (Almada & Fernandes 2011, Araújo & Espírito-santo Filho 2012, Maia 2011, Julião et al. 2014a, b, 2005). The first insect gall survey in Rondônia was done by Price et al. (1998), but this author did not identify the host plants neither characterized the gall morphotypes. Araújo & Espírito-santo Filho (2012), Julião et al. (2005, 2014b) and Yukawa et al. (2001) found 194, 1,150, 236 and 84 gall morphotypes, respectively, in Brazilian Amazon rainforest areas. However,

due to lack of botanical identification we cannot compare their results to our data.

More recently, five inventories, with host plants identification and gall characterization, have been published for areas of Amazon rainforest by Araújo et al. (2012), Almada & Fernandes (2011), Maia (2011), Silva et al. (2011), and Carvalho & Mota (2018) in Pará and Amazonas states. These authors found 112, 309, 77, 27 and 27 morphotypes, respectively, but none of them applied the survey methodology used in the present study. This methodological difference may influence the results obtained, since they imply differences in the sampling effort. The average of galls per host plant species (n=1.4) in this study was the third highest when compared to other studies, where Araújo et al. (2012) and Maia (2011) reported averages of 1.7 and 2.0, respectively.

Fabaceae were recorded as the host plant family with the greatest gall richness in this study and also by Maia (2011) and Araújo et al. (2012) in Oriximiná municipality, by Carvalho & Mota (2018) in Santarém municipality, all localities situated in Pará state (in Amazon rainforest area). Some studies indicate that the greatest gall richness is related to the family of host plant with greatest diversity of species, in different architectural groups, in a certain area (Gonçalves-Alvim & Fernandes 2001). Fabaceae are known to be one of the main hosts of insect galls in different areas of the Neotropical region (Maia 2011). This family stands out as the third largest family of plants in the world (Lewis et al. 2005). Fabaceae species can be found in almost all Brazilian biomes and ecosystems, presenting a cosmopolitan distribution (Queiroz 2009). These plants are well represented in areas of Amazon rainforest, especially those with tree habit (Ducke 1949). Bignoniaceae and Sapotaceae also presented high gall richness in the study of Araújo et al. (2012). According to

Julião et al. (2014a), the families with the highest gall richness in Amazon rainforest are Fabaceae, Sapotaceae, Burseraceae, Chrysobalanaceae, and Lecythidaceae.

In the present study *Bauhinia* L. (Fabaceae) and *Adenocalymma* Mart. ex Meisn. (Bignoniaceae) were the genera with the highest number of galls, results also found by Araújo et al. (2012). However, Maia (2011) and Almada & Fernandes (2011), verified the highest gall richness in *Protium* (Burseraceae) and *Inga* (Fabaceae). Species of *Bauhinia* were previously recorded in Amazon rainforest by Araújo et al. (2012) and Carvalho & Mota (2018), and in Cerrado areas by Coelho et al. (2009), hosting two and one gall morphotypes. Due to the low gall richness observed, these authors did not consider *Bauhinia* as a superhost genus. Therefore, we considered this the first record of *Bauhinia* as superhost in Amazon rainforest.

Vismia guianensis (Aubl.) Choisy (Hypericaceae) is considered, for the first time, a superhost species in this phytophysiology. Other species of *Vismia* were previously recorded as superhosts by Almada & Fernandes (2011).

Other studies also recorded the leaves as the most galled organ plant (Maia 2011, Almada & Fernandes 2011, Silva et al. 2011, Araújo et al. 2012, and Carvalho & Mota 2018). Generally, leaves are the most attacked plant organ. According to Isaías et al. (2014), among all registered galls in Brazil, 52.6% are induced on leaves and 35.2% on stems. It is believed that this pattern is related to the fact that the leaves are a constant and abundant resource for the gallers (Maia 2001). We did not find galls in flowers or fruits, as well as Maia (2011), Silva et al. (2011), Almada & Fernandes (2011), and Carvalho & Mota (2018). Galls on buds and tendrils were less frequent, but they were also observed by Araújo et al. (2012).

The globoid morphotype was the most abundant in our study. According to Isaías et al. (2014), this is the most common shape in the Neotropical region. Most galls were glabrous, as also found by Silva et al. (2011a), Maia (2011), Araújo et al. (2012) and Carvalho & Mota (2018) in the Amazon rainforest.

Cecidomyiidae were the most frequent gallers, reinforcing the pattern of this family as the main taxonomic group among the gallers in the Neotropical region, responsible for more than 90% of all recorded galls (Mani 1964, Carneiro et al. 2009). The inducers of 86 gall morphotypes (56.5% of the total) could not be determined, because of the presence of parasitoids, occurrence of insects with diverse feeding habits in the same gall, and collecting of empty galls. Additionally, we can also mention that about 78% of the galls were found in only one or two trails, resulting in insufficient material to identify the inducers.

In spite of comprising more than 6,500 species in the world (Gagné & Jaschhof 2021), only 29 species of Cecidomyiidae have been reported in Amazonian Forest (Maia 2021). This is a very low value, especially if we consider the high number of gall morphotypes induced by gall midges in Amazonian forest inventories.

Although there are no studies on endemisms of Cecidomyiidae, Maia & Mascarenhas (2017) proposed some species as endemic when they are exclusively associated with endemic host plant species. Based on this same argument, we suggest the endemism of the gallers which are associated with *Adenocalymma coriaceum* A.DC. (Bignoniaceae), *Adenocalymma magnificum* Mart. ex DC. (Bignoniaceae), *Casimirella ampla* (Miers) R.A.Howard (Icacinaceae), *Croton cf. spruceanus* Benth. (Euphorbiaceae), *Hymenolobium excelsum* Ducke (Fabaceae), *Myrcia splendens* (Sw.) DC. (Myrtaceae) and *Platymiscium filipes*

Benth. (Fabaceae). Unfortunately, none of these gall midge species have been described so far.

Regarding the associated fauna, the presence of parasitoids, inquilines, predators and successors have been reported in several surveys such as in Cerrado by Maia & Fernandes (2004); in Amazon rainforest by Maia (2011); and in Atlantic Forest (Restinga) by Rodrigues et al. (2014). According to Maia (2001), parasitoids are usually the most frequent natural enemies of galling species in Atlantic Forest (Restinga) and Cerrado areas, as well as throughout the world (Gagné 1994). However, Maia (2011) observed that the inquilines were more frequent than parasitoid and predators in an Amazon rainforest area. In the present study, parasitoids were more frequent than inquilines, being recorded in about 7.2% of the gall morphotypes, whereas the later were found in 0.6%.

Several insects are pointed out as inquilines, such as Diptera (Sciaridae and Cecidomyiidae), Thysanoptera, Coleoptera, Lepidoptera, Hemiptera and Hymenoptera. However, in our study inquilinous and predator guilds were less diverse and little frequent, being composed only by Cecidomyiidae. In these studies, the term “inquiline” is used in a broad sense, including cecidophages, true inquilines and kleptoparasites. We observed the same to the successors, which included only Hemiptera, Thysanoptera and Hymenoptera (Formicidae), differing from other studies where mites (Acari), springtails (Collembola) and booklice (Psocoptera) were found (Bregonci et al. 2010, Maia et al. 2008). But it is important to mention that our data resulted from two collecting periods, while in the other studies the period of investigation was longer than our.

Larger plant taxa potentially offer more hosts and consequently bear a greater number of galling insects (Fernandes 1992). Gallling insect richness was positively correlated with

plant family size as larger plant families hosted more galling species than smaller plant families. Host plants from related or closer lineages contain similar chemical compounds and plants belonging to the same taxon in a sympatric condition would result in the speciation of galling insects via host replacement (Jermy 1984, Futuyama et al. 1995, Joy & Crespi 2007). These results corroborate previous studies carried out at the Neotropical region such as Carneiro et al. 2014. The taxon of the host plant appears to be the best predictor of the number of insect species at one site.

CONCLUSIONS

Our data confirm the high richness of insect galls in Amazon rainforest areas of Rondônia. Fabaceae presented the highest gall richness and *Bauhinia unguolata* was considered super-host. Leaves were the most galled plant organ and no galls were found in flowers and fruits. The average of morphotypes per host plant species was 1.4 and the most frequent morphotype was globoid. Most galls were glabrous and one-chambered. Cecidomyiidae were the most frequent galling inducers. All results are similar to the previously known patterns to Brazil.

The plant size hypothesis was corroborated, reinforcing the importance of the plant composition for gall richness.

Twenty-three botanical species were recorded as host plants in Amazon rainforest for the first time, as well as 34 botanical genera and 100 gall morphotypes. We suggest the endemism of ten morphospecies of Cecidomyiidae.

The associated entomofauna was few abundant and less diverse when compared with other inventories in Cerrado and Atlantic Forest.

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BP and VCM performed laboratory procedures and characterization of the galls, identified the insects and wrote the manuscript. VCM participated in the field work, in the preparation of the exsiccates and photographed the galls.

