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Insect galls of São Tomé das Letras (MG, Brazil)

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Abstract: Six localities of São Tomé das Letras (MG, Brazil) were investigated from September, 2011 to June, 2012. The local vegetation was examined in search of insect galls. A total of 152 morphotypes of insect galls were found on 94 plant species (74 genera and 37 families). Fabaceae, Melastomataceae, Myrtaceae, and Asteraceae were the plant families with the greatest richness of galls, with 20, 18, 17, and 12 gall morphotypes, respectively. The super host genera were *Copaifera* L. (Fabaceae), *Myrcia* DC. ex. Guill. (Myrtaceae), and *Miconia* Ruiz & Pav. (Melastomataceae), with 10, 10 and 09 gall morphotypes, respectively. The super host species was *Copaifera* cf.*langsdorfii* Desf. (Fabaceae), with 10 gall morphotypes. Galls were found on leaves, stems, buds, and aerial roots. Leaves were the most galled plant organ, followed by stems, and buds. The inducers belong to Diptera, Lepidoptera, Hemiptera, Thysanoptera, Coleoptera, and Hymenoptera, being Cecidomyiidae (Diptera) the most frequent and diversified gallers. The associated fauna included parasitoids (Hymenoptera), inquilines (Lepidoptera and Thysanoptera), successors (Formicidae, Hymenoptera), and predators (pseudoscorpion), obtained from 18, 02, 02, and 01 gall morphotype, respectively. Ten galling species are recorded for the first time in São Tomé das Letras (MG). The present study indicates São Tomé das Letras (MG) as an area of great richness of insect galls.
Keywords: *Atlantic forest, gall richness, host plants, insect-plant interaction.*

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Resumo: Seis localidades de São Tomé das Letras (MG, Brasil) foram investigadas de setembro, 2011 a junho, 2012. A vegetação local foi examinada à procura de galhas entomógenas. Um total de 152 morfotipos de galhas de insetos foi encontrado em 94 espécies vegetais (74 gêneros e 37 famílias). Fabaceae, Melastomataceae, Myrtaceae e Asteraceae foram as famílias botânicas com maior riqueza de galhas, com 20, 18, 17 e 12 morfotipos de galha cada, respectivamente. Os gêneros super-hospedeiros foram *Copaifera* L. (Fabaceae), *Myrcia* DC. ex. Guill. (Myrtaceae) e *Miconia* Ruiz & Pav. (Melastomataceae), com 10, 10 e 09 morfotipos de galhas. A espécie super-hospedeira foi *Copaifera langsdorfii* Desf. (Fabaceae) com 10 morfotipos de galhas. Galhas foram encontradas em folhas, caules, gemas e raízes aéreas. As folhas foram o órgão vegetal mais atacado, seguidas por caules e gemas. Os galhadores pertencem às ordens Diptera, Lepidoptera, Hemiptera, Thysanoptera, Coleoptera e Hymenoptera, sendo os insetos da família Cecidomyiidae (Diptera) os indutores mais frequentes e diversificados. A fauna associada incluiu parasitóides (Hymenoptera), inquilinos (Lepidoptera e Thysanoptera), sucessores (Formicidae, Hymenoptera) e predadores (pseudoscorpion), obtidos de 18, 02, 02 e 01 morfotipo de galha, respectivamente. Dez espécies galhadoras são registradas pela primeira vez para São Tomé das Letras (MG). O presente estudo indica São Tomé das Letras (MG) como uma área de grande riqueza de galhas de insetos.
Palavras-chave: *Mata Atlântica, riqueza de galhas, plantas hospedeiras, interação inseto-planta.*

Introduction

Insect galls are pathologically developed cells, tissues or organs of plants that have risen mostly by hypertrophy (over-growth) and hyperplasy (cell proliferation) under the influence of these parasitic organisms (Shorthouse & Rohfritsch 1992, Shorthouse et al. 2005). In this biological association, the galling species apparently derives all the benefit and the plant suffers loss of substance, deviations in the direction of growth, disturbances in sap flow, premature decays, and increase of non-essential parts at the cost of essential and other injury (Felt 1940, Stone & Schönrogge 2003).

Several insect gall inventories have been developed in State of Minas Gerais (Fernandes et al. 1988, 1997, Urso-Guimarães et al. 2003, Maia & Fernandes 2004, Carneiro et al. 2009, Coelho et al. 2009, Malves & Frieiro-Costa 2012, Maia 2012). These inventories focused mainly on cerrado physiognomies, being the Atlantic Forest areas of Minas Gerais still little investigated.

The Atlantic Forest comprises high species diversity and richness, as well as a high number of flora and fauna endemisms. In the past, it covered approximately 330 million acres, but the original area has been greatly reduced and fragmented, remaining about 7% only. It has been considered a world biosphere reserve and a high priority area for biological conservation (Myers et al. 2000).

The main objective of this study is to contribute to the knowledge of the richness of insect galls from Atlantic Forest areas of Minas Gerais.

Material and Methods

Insect galls were collected seasonally (from September, 2011 to June, 2012) in six localities of São Tomé das Letras (MG): Ladeira do Amendoim (22° 42' 24" S and 44° 58' 57" W), Cachoeira da Lua (21° 42' 11" S and 44° 56' 24" W), Vale das Borboletas (22° 42' 24" S and 44° 58' 57" W), Gruta do Sobradinho (21° 39' 24" S and 44° 53' 08" W), Eubiose (21° 43' 0" S and 44° 59' 0" W), and Harmonia (21° 43' 24" S and 44° 57' 33" W).

The vegetation was examined in search of galling insects during two hours in each locality per collection. All plant organs were investigated, except for subterranean roots. Galled plants, preferably with flowers and fruits were pressed for identification and preservation. All gall morphotypes were photographed in field and characterized by shape, color, presence of trichomes, and plant organ.

Samples of each morphotype were collected and transported individually in labeled plastic bags. Larvae and pupa of immature insects were obtained in the laboratory from the dissection of each gall morphotype under a stereoscopic microscope. This procedure also allowed the determination of the number of internal chambers. The pupal exuviae and adults were obtained from rearing, by keeping samples of each kind of gall individually in covered plastic pots with damp cotton at the bottom. These pots were examined daily for adults' emergence. The galls were kept in these pots until their deterioration.

All insects were preserved in 70% alcohol. The gall midges (larvae, pupae, pupal exuviae and adults) were later mounted on microscope slides following the methodology of Gagné (1989). The Cecidomyiidae genera were identified based on the keys of Gagné (1994). The insects were incorporated in the entomological collection of Museu Nacional, Universidade Federal do Rio de Janeiro (MNRJ).

The plant species were identified by Dr. Gracialda Costa Ferreira (Universidade Federal Rural da Amazônia, Brazil), and the dried specimens were incorporated into the herbarium of the Instituto de Ciências Agrárias (Pará, Brazil).

Results

A total of 152 gall morphotypes were found in São Tomé das Letras (MG). They occurred on 94 plant species distributed in 74 genera and 37 families (Table 1). The medium number of gall morphotypes per plant species was 1.62.

Fabaceae, Melastomataceae, Myrtaceae, and Asteraceae were the plant families with the greatest richness of galls, with 20, 18, 17, and 12 morphotypes each, respectively. The super host genera were *Copaifera* L. (Fabaceae), *Myrcia* DC. ex. Guill. (Myrtaceae), and *Miconia* Ruiz & Pav. (Melastomataceae), with 10, 10, and 9 gall morphotypes. The super host species were *Copaifera langsdorfii* Desf. (Fabaceae), *Myrcia sylvatica* (G. Mey) DC. (Myrtaceae), and *Calophyllum brasiliense* Cambéss (Calophyllaceae), with 10, 7, and 6 gall morphotypes each, respectively. Galls were found on leaves (79 morphotypes, ca. 57%), stems (41 morphotypes, ca. 28%), buds (21 morphotypes, ca. 14%), and aerial roots (01 morphotype, ca. 0.7%). Leaves were the most galled plant organ, followed by stems, and buds. Flower, fruit and tendril galls were not found. Five morphotypes occurred on leaves and buds (ca.3%) and four morphotypes on buds and stems (ca. 2.6%).

The inducers are represented by six insect orders: Diptera (82 gall morphotypes, ca. 86%), Lepidoptera (05 gall morphotypes, ca. 5%), Hemiptera (04 gall morphotypes, ca. 4%), Thysanoptera (02 gall morphotypes, ca. 2%), Coleoptera (01 gall morphotype, ca. 1%), and Hymenoptera (01 gall morphotype, ca. 1%), being Cecidomyiidae (Diptera) the most frequent and diversified gallers (81 gall morphotypes, ca. 85%).

Concerning gall morphology, the following shapes were found: bulbous, burn-shaped, bursiform, catterpillar-like, circular, conical, cylindrical, discoid, elliptical, fusiform, globoid, horn-shaped, imbricated, leaf roll, linear, marginal leaf roll, ovoid, rosette, rugose, spot-like, and vermiform. Globoid and fusiform galls predominate with ca. 34% and ca. 27%, respectively, followed by circular ones (9%), marginal leaf roll (ca. 4%), bulbous, ovoid, conical and leaf roll (ca.3% each), and cylindrical (ca 2.5%). The other shapes were represented by less than 2% each. The majority of the galls were glabrous (86.18%) and one-chambered (90.8%).

The associated fauna included parasitoids (Hymenoptera), inquilines (Lepidoptera and Thysanoptera), successors (Formicidae, Hymenoptera), and predators (pseudoscorpion), obtained from 18, 02, 02, and 01 gall morphotype, respectively. Ten galling species are recorded for the first time in São Tomé das Letras (MG): *Asphondylia serrata* Maia, 2004; *Contarinia gemmae* Maia, 2003; *Dactylodiplosis heptaphylli* Maia, 2004; *Lopesia caulinaris* Maia, 2003; *Lopesia conspicua* Maia, 2003; *Lopesia elliptica* Maia, 2003; *Lopesia linearis* Maia, 2003; *Lopesia similis* Maia, 2004; *Myrciaryiamia admirabilis* Maia, 2007; and *Tomoplagia rudolphi* (Lutz & Lima, 1918). All gall records are new as this is the first gall inventory of São Tomé das Letras (MG).

Data on insect galls are presented under host plant family, genus and species in alphabetical order. They include morphological characterization (plant organ, shape, color, presence/absence of trichomes, number of internal chamber), galler, locality and date of collection, associated fauna, and previous records in Brazil. The values in parenthesis indicate the number of gall morphotypes.

Anacardiaceae (n=1)

Tapirira sp. (n=1)

Leaf gall, circular, yellow, glabrous, one-chambered (Figure 1). Galler: Hemiptera. Locality: Cachoeira da Lua. Date: September/2011. Previous records: Maia et al. (2008) described other gall on *Tapirira guianensis* Aubl. from Bertioga (SP).

Table 1. Distribution of insect gall morphotypes by plant families and species in São Tomé das Letras (MG, Brazil).

Plant family (n=37)	Plant species (n=94)	Number of insect gall morphotypes (n=152)
Anacardiaceae	*Tapirira* sp.	01
		Total 01
Annonaceae	*Duguetia furfuracea*	01
	Pseudoxandra sp.	01
		Total 02
Asteraceae	*Baccharis* sp.1	03
	Baccharis cfr	01
	Dimerostemma brasilianum	01
	Eremanthus polycephalus	04
	Vernonia sp.	02
	Not determined	01
		Total 12
Bignoniaceae	*Macfadyena* sp.	01
	Stigophyllum riparium	01
	Not determined	01
		Total 03
Burseraceae	*Protium heptaphyllum*	04
		Total 04
Calophyllaceae	*Calophyllum brasiliense*	06
		Total 06
Celastraceae	*Maytenus* sp.	01
	Hippocratea sp.	01
		Total 02
Clusiaceae	*Kielmeyera* sp.	01
		Total 01
Dilleniaceae	*Davilla brasiliensis*	02
		Total 02
Ebenaceae	*Diospyros* sp.	01
		Total 01
Erythroxylaceae	*Erythroxylum* cf. *suberosum*	05
		Total 05
Euphorbiaceae	*Croton* sp.	03
	Pera sp.	01
		Total 04
Fabaceae	*Andira* sp.	03
	Copaifera cf. langsdorfii	10
	Dalbergia foliosa	03
	Inga crassifólia	01
	Inga edulis	01
	Machaerium sp.	01
	Stylosanthes gracilis	01
		Total 20
Lamiaceae	*Hyptis recurvata*	01
	Ocimum sp.	01
		Total 02
Lauraceae	*Ocotea cernua*	01
	Ocotea sp.	01
		Total 02
Loranthaceae	*Struthanthus* sp.	01
		Total 01
Lythraceae	*Cuphea* sp.	01
		Total 01
Malpighiaceae	*Byrsonima verbascifolia* (L.) Rich. var. *intermedia*	01

Table 1. Continued...

Plant family (n=37)	Plant species (n=94)	Number of insect gall morphotypes (n=152)
	Byrsonima verbascifolia (L.) Rich. var. *villosa*	01
	Byrsonima verbascifolia	01
	Mascagnia sp.	01
	Mendocia sp.	01
		Total 05
Malvaceae	*Luehea grandiflora*	01
	Melochia sp.	01
	Waltheria indica	01
		Total 03
Melastomataceae	*Aciotis* cf. *indecora*	02
	Clidemia sp.1	02
	Clidemia sp.2	01
	Miconia ligustroides	01
	Miconia cf. *theaezans*	01
	Miconia sp.1	03
	Miconia sp.2	01
	Miconia sp.3	02
	Mouriri sp.	01
	Tibouchina granulosa	01
	Tibouchina cf. *stenocarpa*	01
	not determined 1	01
	not determined 2	01
		Total 18
Monimiaceae	*Moriri* sp.	01
		Total 01
Moraceae	*Brosimum* sp.	02
	Pseudolmedia macrophylla	03
		Total 05
Myrsinaceae	*Rapanea* cf. *parvifolia*	01
	Rapanea sp.	01
		Total 02
Myrtaceae	*Aulomyrcia tomentosa* var. *longipes*	01
	Campomanesia pubescens	01
	Eugenia biflora	01
	Eugenia punicifolia	01
	Eugenia sp	01
	Myrcia splendens	02
	Myrcia sylvatica	07
	Myrcia sp.	01
	Myrciaria floribunda	02
		Total 17
Nyctaginaceae	*Guapira* sp.	01
	Neea sp.	02
		Total 03
Passifloraceae	*Turnera* sp.	01
		Total 01
Piperaceae	*Piper* sp.	01
		Total 01
Proteaceae	*Roupala montana* Aubl. var. *montana*	02
		Total 02
Rubiaceae	*Amaioua intermedia* var. *brasiliana*	02

Table 1. Continued...

Plant family (n=37)	Plant species (n=94)	Number of insect gall morphotypes (n=152)
	Coussarea sp.	01
	Faramea sp.	01
	Palicourea rigida	01
	Sabicea brasiliensis	01
		Total 06
Sapindaceae	*Serjania communis*	02
	Serjania glutinosa	01
	Serjania meridionalis	01
	Serjania sp.	01
		Total 05
Sapotaceae	*Manilkara* sp.	01
		Total 01
Siparunaceae	*Siparuna guianensis*	01
		Total 01
Smilacaceae	*Smilax cissoides*	01
		Total 01
Solanaceae	*Solanum lycocarpum*	01
	Solanum sp.1	01
	Solanum sp.2	01
		Total 03
Sterculiaceae	*Buettneria* sp	01
	Not determined	01
		Total 02
Verbenaceae	*Lantana camara*	01
	Lantana sp.	01
		Total 02
Vochysiaceae	cf. *Salvertia convallariodora*	01
	Vochysia cf. *maxima*	03
		Total 04

Annonaceae (n=2)

Duguetia furfuracea (A. St.-Hil) Saff. (n=1)

Leaf gall, globoid, yellow, glabrous, one-chambered (Figure 2). Galler: not determined. Other dwellers: parasitoids (Hymenoptera). Localities: Ladeira do Amendoim, Cachoeira da Lua. Date: December/2011, March/2012.

Previous records: Vale do Jequitinhonha, MG (Fernandes et al. 1997), Delfinópolis, MG (Urso-Guimarães et al. 2003), Santa Rita do Passa Quatro, SP (Urso-Guimarães & Scareli-Santos 2006), and Ingaí, MG (Malves & Frieiro-Costa 2012). Saito & Urso-Guimarães (2012) described other galls on this host plant from Luiz Antonio (SP).

Pseudoxandra sp. (n=1)

Bud gall, conical, green, glabrous, one-chambered (Figure 3). Galler: not determined. Locality: Eubiose. Date: June/2012.

Asteraceae (n=12)

Baccharis sp. 1 (n=3)

Leaf gall, circular, yellow, glabrous, one-chambered (Figure 4). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: September/2011.

Leaf gall, cylindrical, green, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: September/2011.

Stem swelling, fusiform, brown, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: September/2011.

Baccharis cfr. (n=1)

Leaf or bud gall, conical or ovoid, green, glabrous, one-chambered (Figure 5). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: June/2012.

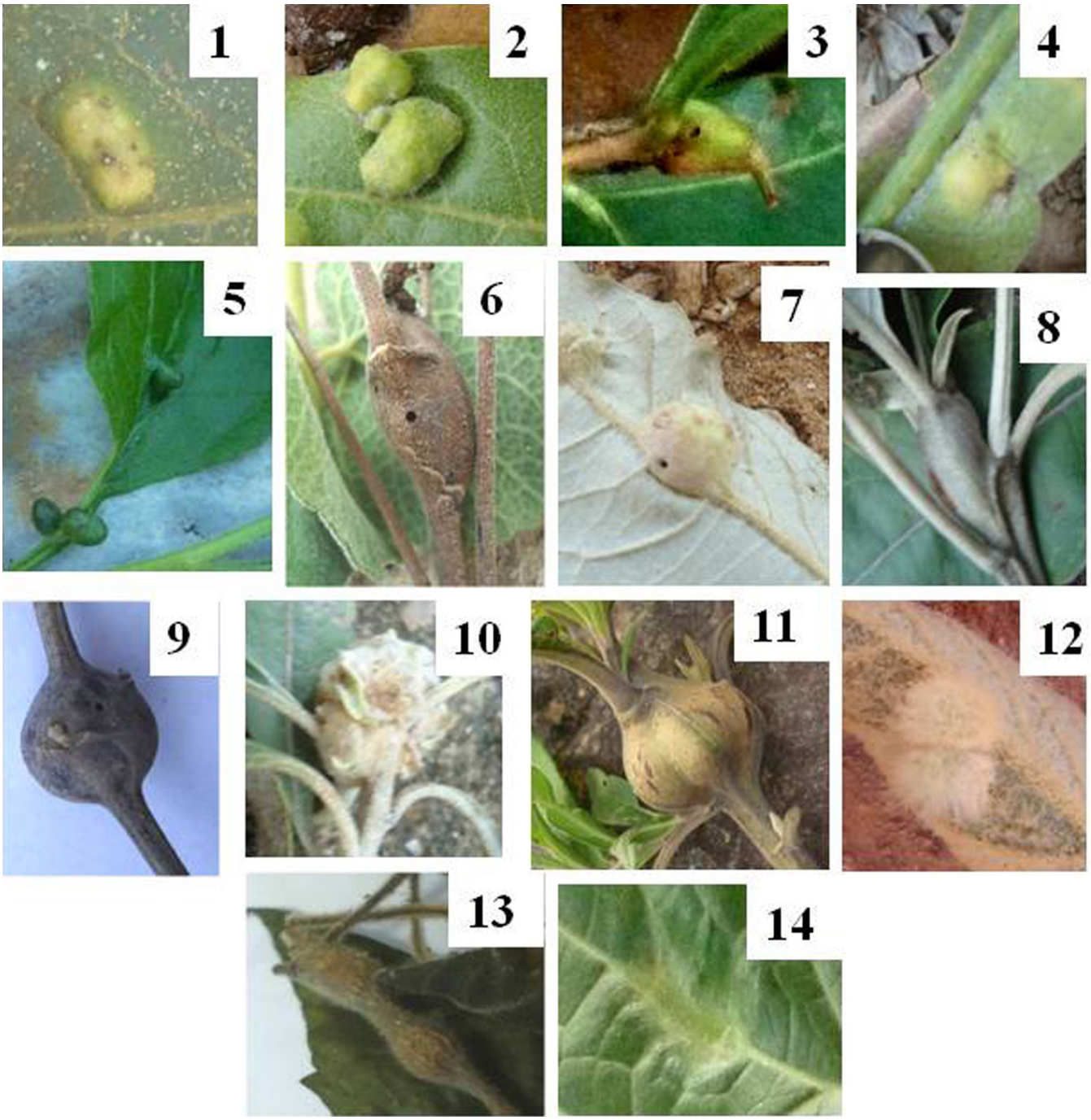
Previous records: Maia & Fernandes (2004), Maia et al. (2008), Coelho et al. (2009), Carneiro et al. (2009), Maia & Souza (in press), Maia et al. (in press), and Maia (2012) described several galls on *Baccharis* spp. from Serra de São José (MG), Bertioga (SP), Serra do Cipó (MG), Cadeia do Espinhaço (MG), Ilha do Cabo Frio (Arraial do Cabo, RJ), Santa Teresa (ES), and Itamonte (MG), respectively.

Dimerostemma brasilianum Cass. (n=1)

Bud gall, fusiform, brown, glabrous, multi-chambered (Figure 6). Galler: not determined. Locality: Ladeira do Amendoim. Date: December/2011.

Eremanthus polycephalus (DC.) MacLeish. (n=4)

Leaf gall, globoid, yellow, micropubescent, one-chambered (Figure 7). Galler: *Asphondylia serrata* Maia, 2004 (Diptera, Cecidomyiidae). Localities: Ladeira do Amendoim, Vale das Borboletas, Harmonia, Eubiose, Gruta do Sobradinho. Date: September/2011, December/2011, March/2012, June/2012. Previous



Figures 1-14. Insect galls from São Tomé das Letras: 1. Leaf gall on *Tapirira* sp.; 2. Leaf gall on *Duguetia furfuracea*; 3. Bud gall on *Pseudoxandra* sp.; 4. Leaf gall on *Baccharis* sp.; 5. Leaf or bud gall on *Baccharis* cfr.; 6. Bud gall on *Dimerostemma brasilianum*; 7-10. Galls on *Eremanthus polycephalus*: 7. Leaf gall, 8. Stem swelling, 9. Stem swelling, 10. Bud gall; 11. Stem gall on *Vernonia* sp.; 12. Leaf gall on Asteraceae not determined; 13. Stem swelling on *Macfadyena* sp.; 14. Stem swelling on *Stigophyllum riparium*.

records: Vale do Jequitinhonha (Fernandes et al. 1997), Serra de São José (Maia & Fernandes 2004), and Ingaí, MG (Malves & Frieiro-Costa 2012).

Stem swelling, fusiform, glabrous, one-chambered (Figure 8). Galler: not determined. Locality: Gruta do Sobradinho. Date: March/2012, June/2012. Previous records: Vale do Jequitinhonha (Fernandes et al. 1997), and Cadeia do Espinhaço, MG (Carneiro et al. 2009).

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 9). Galler: Cecidomyiidae (Diptera). Other dwellers: successors - ants (Formicidae, Hymenoptera). Localities: Ladeira do Amendoim, Cachoeira da Lua, Harmonia, Eubiose, Gruta do Sobradinho. Date: September/2011, December/2011, March/2012, June/2012. Previous records: Vale do Jequitinhonha, MG (Fernandes et al. 1997), Cadeia do Espinhaço, MG (Carneiro et al. 2009), and Ingaí, MG (Malves & Frieiro-Costa 2012).

Bud gall, globoid, glabrous, one-chambered (Figure 10). Galler: not determined. Locality: Gruta do Sobradinho. Date: March/2012.

Vernonia sp. (n=2)

Stem gall, bulbous, brown, glabrous, one-chambered (Figure 11). Galler: *Tomoplagia rudolpphi* (Tephritidae, Diptera). Localities: Cachoeira da Lua, Ladeira do Amendoim. Date: September/2011, March/2012, June/2012.

Previous records: Fernandes et al. (1988), Urso-Guimarães et al. (2003), Maia & Fernandes (2004), and Maia (2012) recorded the same gall from Belo Horizonte, Delfinópolis, Serra de São José, and Itamonte (MG), respectively.

Leaf gall, globoid, green, glabrous, one-chambered. Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012, June/2012.

Other galls on *Vernonia* spp. have been recorded by Fernandes et al. (1997) from Vale do Jequitinhonha (MG), Maia (2001) from Carapebus (RJ), Fernandes & Negreiros (2006) from Aimorés (MG), Maia et al. (2008) from Bertioga (SP), and Maia et al. (in press) from Santa Teresa (ES).

Asteraceae não determinada (n=1)

Leaf gall, globoid, yellowish, micropubescent, one-chambered (Figure 12). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: September/2011, March/2012.

Bignoniaceae (n=3)

Macfadyena sp. (n=1)

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 13). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: March/2012.

Stigophyllum riparium (Kunth) Sandwith (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 14). Galler: not determined. Locality: Eubiose. Date: June/2012

Bignoniaceae não determinada (n=1)

Vein swelling, fusiform, brown, woody, one-chambered (Figure 15). Galler: Cecidomyiidae (Diptera). Other dwellers: parasitoids (Hymenoptera). Locality: Cachoeira da Lua. Date: September/2011.

Burseraceae (n=4)

Protium heptaphyllum (Aubl.) March (n=4)

Leaf gall, circular, red, glabrous, one-chambered (Figure 16). Galler: Hemiptera. Localities: Vale das Borboletas, Cachoeira da Lua, Gruta do Sobradinho. Date: September/2011, December/2011, March/2012, June/2012. Previous records: Vale do Rio Doce, MG (Fernandes et al. 2001).

Marginal leaf roll, green, glabrous, one-chambered (Figure 17). Galler: *Lopesia similis* Maia, 2004 (Diptera, Cecidomyiidae). Localities: Vale das Borboletas, Gruta do Sobradinho. Date: September/2011, December/2011, June/2012. Previous records: Carapebus, RJ (Maia 2001), Ilha do Cabo Frio (Arraial do Cabo, RJ (Maia & Souza, in press), and Itamonte, MG (Maia 2012)).

Leaf gall, cylindrical, green or yellowish, glabrous, one-chambered (Figure 18). Galler: *Dactylodiplosis heptaphylli* Maia, 2004 (Diptera, Cecidomyiidae). Locality: Vale das Borboletas, Cachoeira da Lua, Gruta do Sobradinho. Date: September/2011, March/2012, June/2012.

Stem swelling, globoid, brown, glabrous, multi-chambered (Figure 19). Galler: not determined. Dweller: Hymenoptera. Localities: Gruta do Sobradinho, Cachoeira da Lua. Date: September/2011, March/2012.

Previous records: Maia (2001), Santos et al. (2010), and Malves & Frieiro-Costa (2012) recorded the other galls on *Protium heptaphyllum* from Carapebus (RJ), Goiânia (GO) and Ingaí (MG).

Calophyllaceae (n=6)

Calophyllum brasiliense Cambéss. (n=6)

Leaf gall, linear, green, glabrous, one-chambered (Figure 20). Galler: *Lopesia linearis* Maia, 2003 (Cecidomyiidae, Diptera). Localities: Gruta do Sobradinho, Vale das Borboletas. Date: September/2011, December/2011, March/2012. Previous records: Serra de São José (Maia & Fernandes 2004).

Leaf gall, elliptical, green, glabrous, one-chambered (Figure 21). Galler: *Lopesia elliptica* Maia, 2003 (Cecidomyiidae, Diptera).Galler: *Lopesia elliptica* Maia, 2003 (Cecidomyiidae, Diptera). Locality: Vale das Borboletas. Date: September/2011, December/2011. Previous records: Serra de São José, MG (Maia & Fernandes 2004), and Bertioga, SP (Maia et al. 2008).

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 22). Galler: *Lopesia caulinaris* Maia, 2003 (Cecidomyiidae, Diptera). Localities: Gruta do Sobradinho, Vale das Borboletas. Date: September/2011, December/2011, March/2012, June/2012. Previous records: Serra de São José (Maia & Fernandes 2004), and Bertioga, SP (Maia et al. 2008).

Bud gall, fusiform, brown, glabrous, one or multi-chambered (Figure 23). Galler: *Contarinia gemmae* Maia, 2003 (Cecidomyiidae, Diptera). Other dwellers: predators (Pseudoscorpion) and parasitoids (Hymenoptera). Localities: Gruta do Sobradinho, Vale das Borboletas. Date: September/2011, December/2011, March/2012. Previous records: Bertioga, SP (Maia et al. 2008).

Leaf gall, globoid, glabrous, one-chambered (Figure 24). Galler: *Lopesia conspicua* Maia, 2003 (Cecidomyiidae, Diptera). Localities: Vale das Borboletas, Gruta do Sobradinho. Date: September/2011, December/2011, June/2012.

Marginal leaf roll, green, glabrous, one-chambered (Figure 25). Galler: Cecidomyiidae (Diptera). Localities: Gruta do Sobradinho, Vale das Borboletas. Date: December/2011, June/2012. Previous records: Serra de São José (Maia & Fernandes 2004).

Celastraceae (n=2)

Maytenus sp. (n=1)

Leaf gall, globoid, red, glabrous, one-chambered (Figure 26). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: September/2001, December/2011, March/2012, June/2012.

Previous records: Galls on *Maytenus* spp. have been recorded by Maia (2001) from Carapebus and Maricá (RJ), Oliveira & Maia (2005) from Grumari (Rio de Janeiro, RJ), and Maia et al. (2008) from Bertioga (SP)

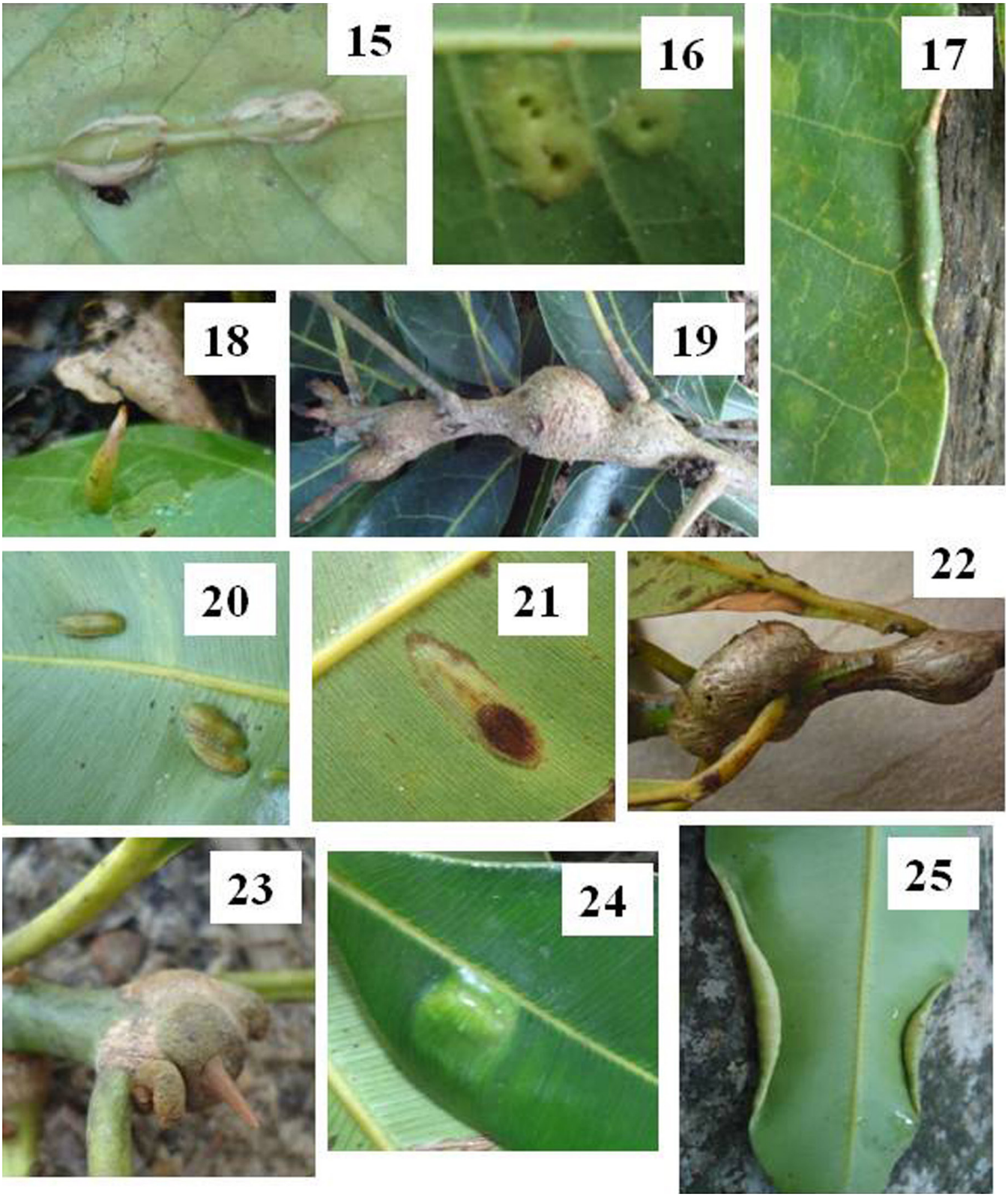
Hippocratea sp. (n=1)

Leaf gall, circular, brown, glabrous, one-chambered (Figure 27). Galler: not determined. Locality: Vale das Borboletas. Date: September/2011.

Clusiaceae (n=1)

Kielmeyera sp. (n=1)

Leaf gall, circular, yellowish, glabrous, one-chambered (Figure 28). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: December/2011, March/2012.



Figures 15-25. Insect galls from São Tomé das Letras: 15. Vein swelling on Bignoniaceae not determined; 16-19. Galls on *Protium heptaphyllum*: 16. Circular leaf gall, 17. Marginal roll, 18. Cylindrical leaf gall, 19. Stem swelling; 20-25 Galls on *Calophyllum brasiliense*: 20. Linear leaf gall, 21. Elliptical leaf gall, 22. Stem gall, 23. Bud gall; 24. Globoid gall, 25. Marginal roll..

Dilleniaceae (n=2)

Davilla brasiliana DC. (n=2)

Leaf gall, circular, yellowish, glabrous, one-chambered (Figure 29). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: March/2012.

Bud gall, imbricated, green or brown, glabrous (Figure 30). Galler: *Asphondylia* sp. (Diptera, Cecidomyiidae). Date: September/2011, December/2011, June/2012. Localities: Cachoeira da Lua, Gruta do Sobradinho, Eubiose. Previous records: Serra de São José, MG (Maia & Fernandes 2004).

Other galls on *Davilla* spp. have been described by Fernandes et al. (1997), Fernandes et al. (2001), and Maia et al. (in press) from Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), and Santa Teresa (ES).

Ebenaceae (n=1)

Diospyros sp. (n=1)

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 31). Galler: not determined. Locality: Eubiose. Date: June/2012.

Erythroxylaceae (n=5)

Erythroxylum cf. *suberosum* A. St.-Hil. (n=5)

Leaf gall, red, hairy (Figure 32). Galler: *Myrciaryiamia admirabilis* Maia, 2007 (Cecidomyiidae, Diptera). Localities: Cachoeira da Lua, Gruta do Sobradinho, Vale das Borboletas. Date: December/2011, March/2012, June/2012.

Previous records: Serra de São José, MG (Maia & Fernandes 2004), Santa Rita do Passa Quatro, SP (Urso-Guimarães & Scareli-Santos 2006) and Ingaí, MG (Malves & Frieiro-Costa 2012).

Apical bud, globoid, brown, glabrous, multi-chambered (Figure 33). Galler: Hymenoptera. Locality: Ladeira do Amendoim. Date: December/2011, March/2012.

Marginal leaf roll, green, glabrous, one-chambered (Figure 34). Galler: Cecidomyiidae (Diptera). Localities: Gruta do Sobradinho, Ladeira do Amendoim. Date: June/2012.

Leaf gall globoid, green, glabrous, one-chambered (Figure 35). Galler: not determined. Locality: Ladeira do Amendoim. Date: December/2011, March/2012, June/2012.

Leaf roll, green, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Other dwellers: inquiline (Lepidoptera). Localities: Cachoeira da Lua, Gruta do Sobradinho. Date: December/2011.

Other galls on *Erythroxylum* spp. have been described by Fernandes et al. (1988) from Belo Horizonte (MG), Fernandes et al. (1997) from Vale do Jequitinhonha (MG), Fernandes et al. (2001) from Vale do Rio Doce (MG), Maia (2001) from Carapebus and Maricá (RJ), Julião et al. (2002) from Pantanal sul mato-grossense (MS), Urso-Guimarães et al. (2003) from Delfinópolis (MG), Maia & Fernandes (2004) from Serra de São José (MG), Oliveira & Maia (2005) from Grumari (Rio de Janeiro, RJ), Maia et al. (2008) from Bertioga (SP), Maia & Oliveira (2010) from Ilha Grande (Angra dos Reis, RJ), Maia & Souza (in press) from Ilha do Cabo Frio (Arraial do Cabo, RJ), and Maia et al. (in press) from Santa Teresa (ES).

Euphorbiaceae (n=4)

Croton sp. (n=3)

Leaf gall, globoid, yellowish, hairy, one-chambered (Figure 36). Galler: Cecidomyiidae (Diptera). Localities: Cachoeira da Lua, Vale das Borboletas, Eubiose. Date: September/2011, December/2011, June/2012. Previous records: Malves & Frieiro-Costa (2012) recorded the same gall from Ingaí, MG.

Leaf gall, ovoid, yellowish or brownish, with few short trichomes (Figure 37), glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Other dwellers: parasitoids (Hymenoptera). Locality: Cachoeira da Lua. Date: December/2011. Previous records: Malves & Frieiro-Costa (2012) recorded the same gall from Ingaí, MG.

Leaf gall, discoid, green, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Several galls on *Croton* sp. have been recorded by Fernandes et al. (2001), Urso-Guimarães et al. (2003), Maia & Fernandes (2004), Carneiro et al. (2009), Malves & Frieiro-Costa (2012), Maia & Souza (in press), Maia et al. (in press), and Maia (2012) from Vale do Rio Doce (MG), Delfinópolis (MG), Serra de São José (MG), Cadeia do Espinhaço (MG), Ingaí (MG), Ilha do Cabo Frio (Arraial do Cabo, RJ), Santa Teresa (ES), and Itamonte (MG).

Pera sp. (n=1)

Leaf gall, circular, green, glabrous, one-chambered (Figure 38). Galler: not determined. Locality: Vale das Borboletas. Cachoeira da Lua. Date: September/2011, December/2011.

Previous records: Galls on *Pera* spp. have been described by Fernandes et al. (2001) from Vale do Rio Doce (MG), and Maia et al. (2008) from Bertioga (SP).

Fabaceae (n= 20)

Andira sp. (n=3)

Leaf gall, vermiform, green, one-chambered (Figure 39). Galler: Cecidomyiidae (Diptera). Other dwellers: parasitoids (Hymenoptera). Localities: Vale das Borboletas, Gruta do Sobradinho. Date: September/2011, March/2012. Previous records: Serra de São José, MG (Maia & Fernandes 2004), and Luiz Antonio, SP (Saito & Urso-Guimarães 2012).

Leaf gall, globoid, yellow or reddish, glabrous, one-chambered (Figure 40). Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012.

Marginal leaf roll, green, glabrous, one-chambered (Figure 41). Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012.

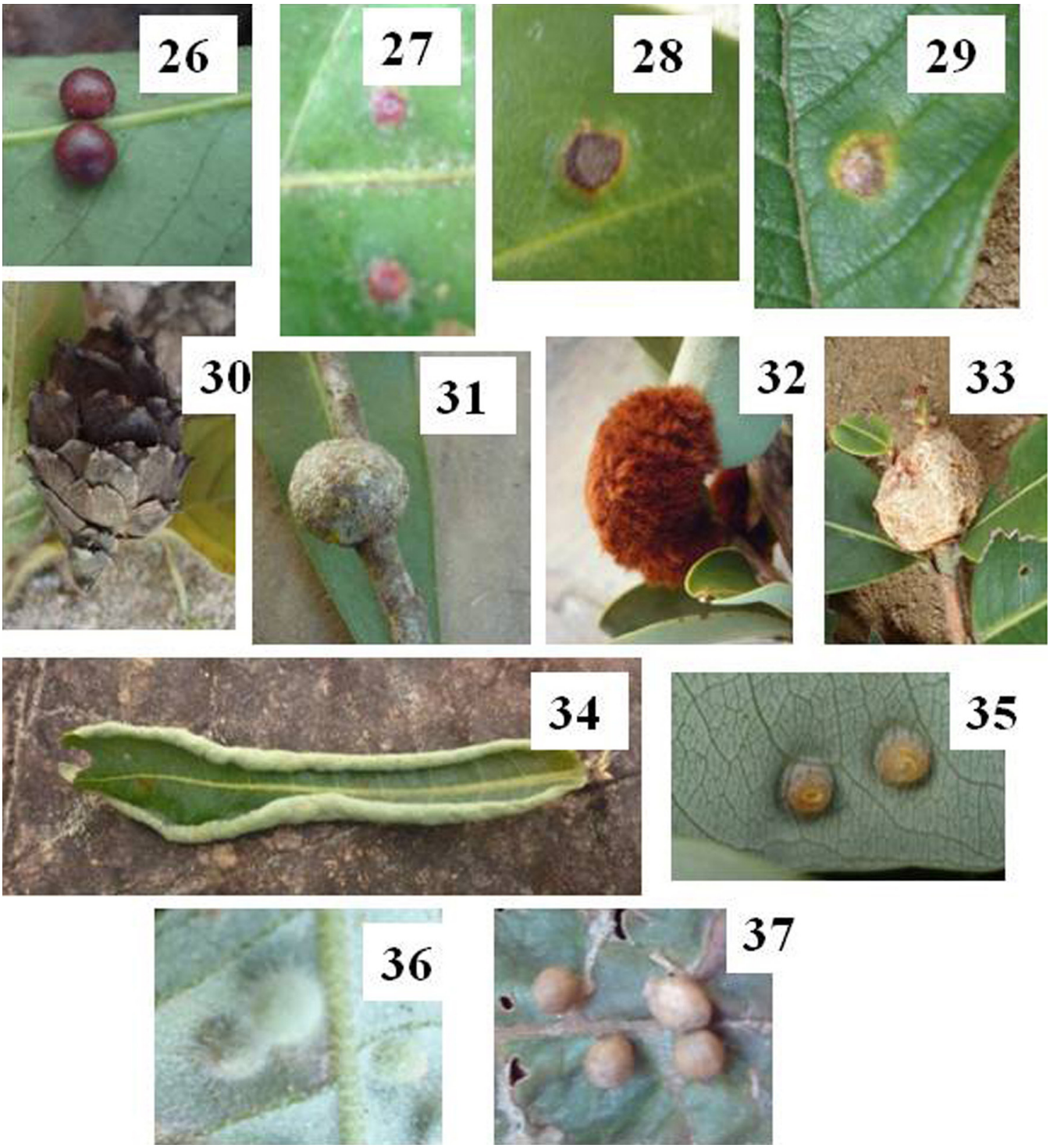
Previous records: Fernandes et al. (1988), Fernandes et al. (2001), Julião et al. (2002), Maia et al. (2008), and Maia et al. (in press) recorded galls on *Andira* spp. from Belo Horizonte (MG), Vale do Rio Doce (MG), Pantanal sul mato-grossense (MS), Bertioga (SP), and Santa Teresa (ES), respectively.

Copaifera cf. langsdorfii Desf. (n=10)

Midvein swelling, fusiform, brown, woody, glabrous, one-chambered (Figure 42). Galler: Cecidomyiidae (Diptera). Localities: Vale das Borboletas, Cachoeira da Lua, Gruta do Sobradinho. Date: March/2011, September/2011, June/2012. Previous records: Belo Horizonte (Fernandes et al. 1988), and Vale do Jequitinhonha, MG (Fernandes et al. 1997).

Bud or leaf gall, horn-shaped, green or reddish, glabrous, one-chambered (Figure 43). Galler: Cecidomyiidae (Diptera). Localities: Cachoeira da Lua, Gruta do Sobradinho. Date: March/2012, June/2012. Previous records: Belo Horizonte (Fernandes et al. 1988) and Serra de São José, MG (Maia & Fernandes 2004).

Leaf gall, globoid, green, reddish or yellowish, glabrous, one-chambered (Figure 44). Galler: not determined. Localities: Ladeira do Amendoim, Vale das Borboletas, Gruta do Sobradinho, Cachoeira da Lua. Date: June/2012. Previous records: Belo Horizonte (Fernandes et al. 1988), and Serra de São José, MG (Maia & Fernandes 2004).



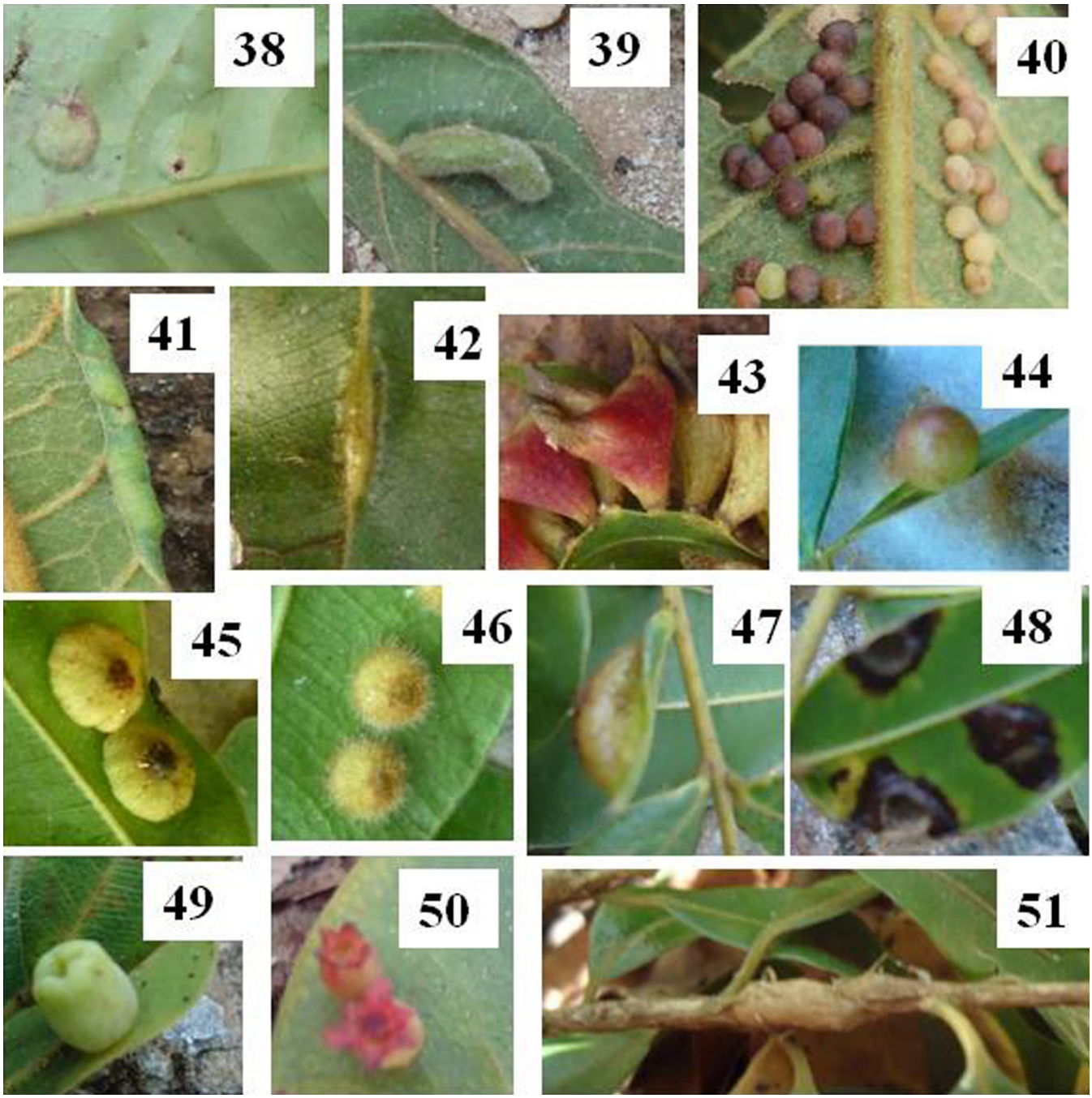
Figures 26-37. Insect galls from São Tomé das Letras: 26. Leaf gall on *Maytenus* sp.; 27. Leaf gall on *Hippocratea* sp.; 28. Leaf gall on *Kielmeyera* sp.; 29-30. Galls on *Davilla brasiliensis*: 29. Leaf gall, 30. Bud gall; 31. Stem swelling on *Diospyros* sp.; 32-35. Galls on *Erythroxylum* cf. *suberosum*: 32. Leaf gall, 33. Apical bud gall, 34. Marginal leaf roll, 35. Leaf gall; 36-37. Leaf galls on *Croton* sp.

Leaf gall, discoid, yellowish, green or brownish, glabrous, one-chambered (Figure 45). Galler: not determined. Localities: Cachoeira da Lua, Vale das Borboletas, Harmonia. Date: March/2012, June/2012. Previous records: Vale do Jequitinhonha (Fernandes et al. 1997), and Serra de São José, MG (Maia & Fernandes 2004).

Leaf gall, globoid, yellowish, hairy, one-chambered (Figure 46). Galler: Cecidomyiidae (Diptera). Localities: Vale das Borboletas, Cachoeira da Lua. Date: December/2011, June/2012.

Leaf fold, yellowish or greenish, glabrous, one-chambered (Figure 47). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: March/2012. Previous records: Serra do Cipó, MG (Coelho et al. 2009).

Leaf gall, spot-like, black, glabrous, one-chambered (Figure 48). Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012.



Figures 38-51. Insect galls from São Tomé das letras (MG): 38. Leaf gall on *Pera* sp.; 39-41. Galls on *Andira* sp.; 39. Vermiform gall; 40. Globoid gall; 41. Marginal roll; 42-51. Galls on *Copaifera cf. langsdorfii*; 42. Midvein swelling; 43. Horn-shaped gall; 44. Globoid gall (glabrous); 45. Discoid gall; 46. Globoid gall (hairy); 47. Leaf fold; 48. Spot-like gall; 49. Cylindrical gall; 50. Cylindrical gall; 51. Stem swelling.

Leaf gall, yellow or greenish, conical or cylindrical, glabrous, one-chambered (Figure 49). Galler: not determined. Localities: Vale das Borboletas, Cachoeira da Lua. Date: March/2012.

Leaf gall, cylindrical, reddish or yellowish, glabrous, one-chambered (Figure 50). Galler: not determined. Dweller: Thysanoptera. Locality: Gruta do Sobradinho. Date: September/2011.

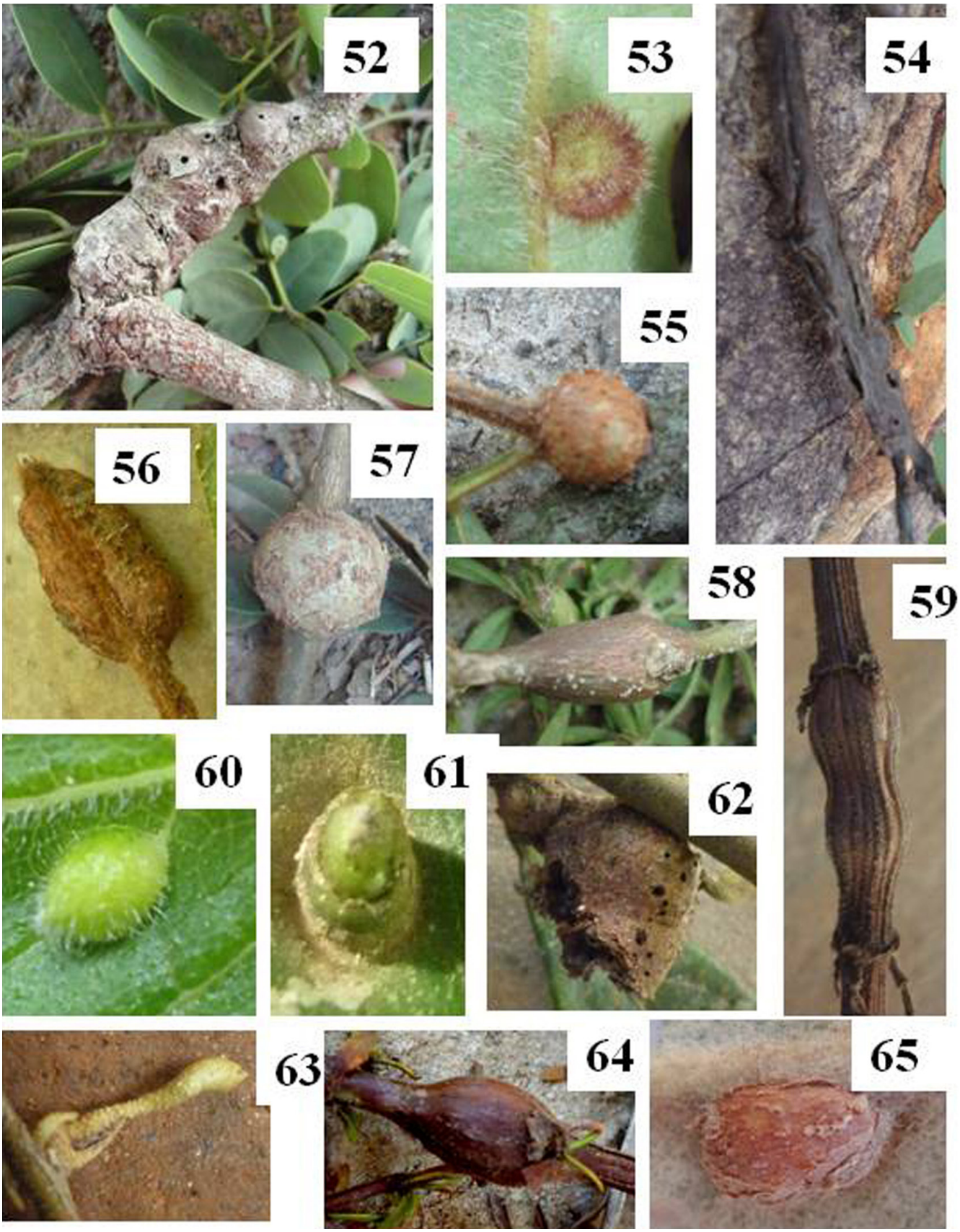
Stem swelling, fusiform, brown, glabrous (Figure 51). Galler: not determined. Locality: Gruta do sobradinho. Date: September/2011.

Fernandes et al. (1988, 1997), Urso-Guimarães & Scareli-Santos (2006), and Maia & Souza (in press) described other galls on this host plant from Belo Horizonte (MG), Vale do Jequitinhonha (MG), Santa Rita do Passa-Quatro (SP), and Ilha do Cabo Frio (Arraial do Cabo, RJ), respectively.

Dalbergia foliosa (Benth.) A. M. Carvalho (n=3)

Stem swelling, fusiform, brown, glabrous, multi-chambered (Figure 52). Galler: Cecidomyiidae (Diptera). Localities: Ladeira do Amendoim, Cachoeira da Lua, Eubiose. Date: December/2011, March/2012, June/2012.

Leaf gall, globoid, yellowish or greenish, hairy, glabrous, one-chambered (Figure 53). Galler: Cecidomyiidae (Diptera). Other dwellers: parasitoids (Hymenoptera). Locality: Cachoeira da Lua. Date: December/2011, March/2012.



Figures 52-65. Insect galls of São Tomé das Letras (MG): 52-54. On *Dalbergia foliosa*; 52. Stem gall; 53. Leaf gall; 54. Stem gall (elongate); 55. Bud gall on *Inga crassifolia*; 56. Bud or stem gall on *Inga edulis*; 57. Stem swelling on *Machaerium* sp.; 58. Stem swelling on *Stylosanthes gracilis*; 59. Stem swelling on *Hyptis recurvata*; 60. Leaf or bud gall on *Ocimum* sp.; 61. Leaf gall on *Ocotea cernua*; 62. Bud gall on *Ocotea* sp.; 63. Aerial root swelling on *Struthanthus* sp.; 64. Stem swelling on *Cuphea* sp.; 65. Vein swelling on *Byrsonima verbascifolia* var. *intermedia*.

Stem swelling, fusiform, elongate, dark brown, glabrous, multi-chambered (Figure 54). Galler: Lepidoptera. Other dwellers: parasitoids (Hymenoptera). Localities: Cachoeira da Lua, Gruta do Sobradinho. Date: December/2011.

Previous records: Maia (2001), Fernandes et al. (2001), Maia et al. (2008); Carneiro et al. (2009), Maia & Oliveira (2010), and Maia et al. (in press) described some galls on *Dalbergia* spp. from Carapebus (RJ), Vale do Rio Doce (MG), Bertioga (SP), Cadeia do Espinhaço (MG), Ilha Grande (Angra dos Reis, RJ), and Santa Teresa (ES), respectively.

Inga crassifolia Klotzsch ex Benth. (n=1)

Bud gall, globoid, brown, glabrous, one-chambered (Figure 55). Galler: not determined. Locality: Vale das Borboletas. Date: December/2011.

Inga edulis Mart. (n=1)

Bud or stem gall, fusiform, brown, glabrous, one-chambered (Figure 56). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: March/2012, June/2012. Previous records: Urso-Guimarães et al. (2003) recorded a leaf gall on this same host plant from Delfinópolis, MG.

Other galls on *Inga* spp. have been described by Fernandes et al. (1988) from Belo Horizonte (MG), Maia (2001) from Maricá (RJ), Julião et al. (2002) from Pantanal sul mato-grossense (MS); Maia & Fernandes (2004) from Serra de São José (MG), Oliveira & Maia (2005) from Grumari (Rio de Janeiro, RJ), Fernandes & Negreiros (2006) from Aimorés (MG), Maia et al. (2008) from Bertioga (SP), Maia & Oliveira (2010) from Ilha Grande (Angra dos Reis, RJ); Santos et al. (2010) from Goiânia (GO), Maia (2011) from Porto de Trombetas (Pará), Maia et al. (in press) from Santa Teresa (ES); and Maia (2012) from Itamonte (MG).

Machaerium sp. (n=1)

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 57). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: September/2011.

Previous records: Fernandes et al. (1988), Fernandes et al. (2001), Fernandes & Negreiros (2006), Maia et al. (2008), Malves & Frieiro-Costa (2012), and Maia et al. (in press) recorded stem galls on *Machaerium* spp. from Belo Horizonte (MG), Vale do Rio Doce (MG), Aimorés (MG), Bertioga (SP), Ingaí (MG), and Santa Teresa (ES).

Stylosanthes gracilis Kunth. (n=1)

Stem swelling, fusiform, brownish or reddish, glabrous, one-chambered (Figure 58). Galler: Cecidomyiidae (Diptera). Localities: Cachoeira da Lua, Gruta do Sobradinho. Date: March/2012.

Previous records: Itamonte, MG (Maia 2012). Other records: galls on *Stylosanthes* spp. were described by Coelho et al. (2009) from Serra do Cipó, MG.

Lamiaceae (n=2)

Hyptis recurvata Poit. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 59). Galler: Cecidomyiidae (Diptera). Localities: Gruta do Sobradinho, Eubiose. Date: June/2012.

Previous records: Galls on *Hyptis* spp. were described by Maia et al. (2008) from Bertioga (SP), Carneiro et al. (2009) from Cadeia do Espinhaço (MG), Coelho et al. (2009) from Serra do Cipó (MG), Santos et al. (2011) from Pernambuco, and Maia (2012) from Itamonte (MG).

Ocimum sp. (n=1)

Leaf or bud gall, globoid, greenish, hairy (Figure 60). Galler: Cecidomyiidae (Diptera). Locality: ale das Borboletas. Date: December/2011.

Lauraceae (n=2)

Ocotea cernua (Nees) Mez. (n=1)

Leaf gall, conical, green, glabrous, one-chambered (Figure 61). Galler: not determined. Locality: Cachoeira da Lua. Date: June/2012.

Ocotea sp. (n=1)

Apical bud gall, ovoid, brown, glabrous, one-chambered (Figure 62). Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Previous records: Maia (2001), Fernandes et al. (2001), Julião et al. (2002), Maia et al. (2008), Carneiro et al. (2009), Bregonci et al. (2010), Saito & Urso-Guimarães (2012), Maia et al. (in press); and Maia (2012) recorded other galls on *Ocotea* spp. from Carapebus and Maricá (RJ), Vale do Rio Doce (MG), Pantanal sul mato-grossense (MS), Bertioga (SP), Cadeia do Espinhaço (MG), Guarapari (ES), Luiz Antonio (SP), Santa Teresa (ES), and Itamonte (MG), respectively.

Loranthaceae (n=1)

Struthanthus sp. (n=1)

Aerial root swelling, fusiform, brown, glabrous, one-chambered (Figure 63). Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Lythraceae (n=1)

Cuphea sp. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 64). Galler: Cecidomyiidae (Diptera). Localities: Cachoeira da Lua, Gruta do Sobradinho. Date: September/2011. Previous records: Itamonte, MG (Maia 2012). Other records: Carneiro et al. (2009) recorded a gall on *Cuphea ericoides* Cham. & Schlech. from Cadeia do Espinhaço, MG.

Malpighiaceae (n=5)

Byrsonima verbascifolia (L.) Rich. var. *intermedia* A. Juss. (n=1)

Vein swelling, globoid, brown, woody, glabrous, one-chambered (Figure 65). Galler: not determined. Dwellers: Hymenoptera. Localities: Ladeira do Amendoim, Cachoeira da Lua, Gruta do Sobradinho. September/2011.

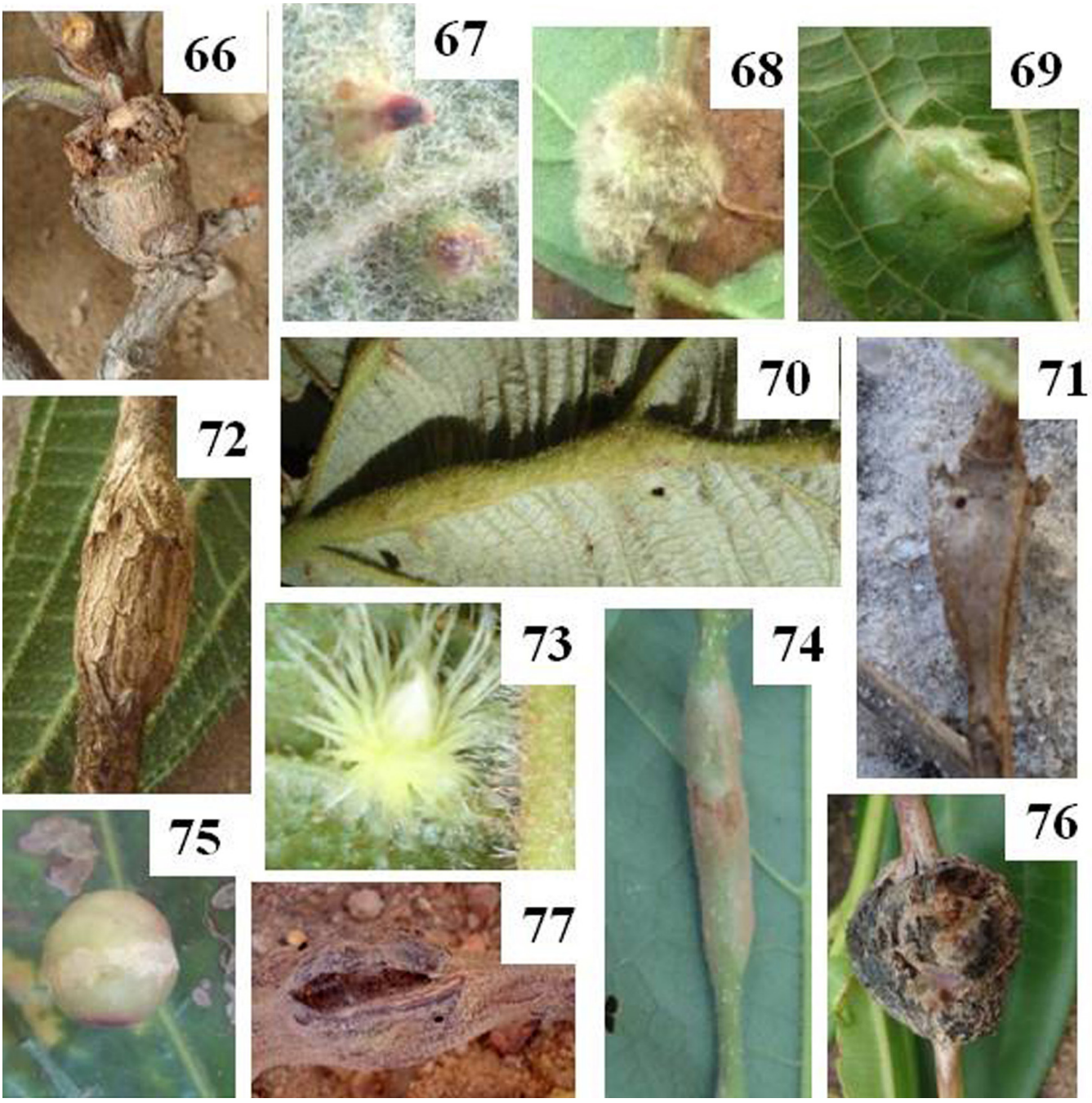
Byrsonima verbascifolia (L.) Rich. var. *villosa* Griseb (n=1)

Stem gall, globoid, brown, glabrous, one-chambered (Figure 66). Galler: not determined. Localities: Ladeira do Amendoim, Cachoeira da Lua, Gruta do Sobradinho. Date: March/2012.

Byrsonima verbascifolia (L.) Rich. (n=1)

Leaf gall, conical, brown, micropubescent, glabrous, one-chambered (Figure 67). Galler: Cecidomiidae (Diptera). Other dwellers: parasitoids (Hymenoptera). Localities: Gruta do Sobradinho, Ladeira do Amendoim, Harmonia. Date: September/2011, December/2011, March/2012. Previous records: Serra de São José, MG (Maia & Fernandes 2004).

Previous records: Fernandes et al. (1997), Fernandes et al. (2001), Maia (2001), Julião et al. (2002), Urso-Guimarães et al. (2003), Maia & Fernandes (2004), Oliveira & Maia (2005), Urso-Guimarães & Scareli-Santos (2006), Carneiro et al. (2009), Maia & Oliveira (2010), Bregonci et al. (2010), Santos et al. (2011), Saito & Urso-Guimarães (2012), and Maia et al. (in press) recorded several galls on *Byrsonima*



Figures 66-77. Insect galls of São Tomé das Letras (MG): 66. Stem gall on *Byrsonima verbascifolia* var. *villosa*; 67. Leaf gall on *B. verbascifolia*; 68. Bud gall on *Mascagnia* sp.; 69. Vein swelling on *Mendocia* sp.; 70. Midvein swelling on *Luehea grandiflora*; 71. Stem swelling on *Melochia* sp.; 72. Stem swelling on *Aciotis* cf.*indecora*; 73. Leaf gall on *Clidemia* sp.1; 74. Stem swelling on *Clidemia* sp.2; 75. Leaf gall on *Miconia ligustroides*; 76. Stem swelling on *Miconia* cf. *theaezans*; 77. Stem swelling on *Miconia* sp.1.

spp. from Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Carapebus and Maricá (RJ), Pantanal sul mato-grossense (MS), Delfinópolis (MG), Serra de São José (MG), Grumari (Rio de Janeiro, RJ), Santa Rita do Passa-Quatro (MG), Cadeia do Espinhaço (MG), Ilha Grande (Angra dos Reis, RJ), Guarapari (ES), Pernambuco, Luiz Antonio (SP), and Santa Teresa (ES), respectively.

Mascagnia sp. (n=1)

Bud gall, ovoid, yellow, hairy, one-chambered (Figure 68) Galler: not determined. Localities: Vale das Borboletas, Eubiose. Date: September/2011, June/2012.

Mendocia sp. (n=1)

Vein swelling, globoid, greenish, glabrous, one-chambered (Figure 69). Galler: not determined. Locality: Eubiose. Date: June/2012.

Malvaceae (n=3)

Luehea grandiflora Mart. (n=1)

Midvein or petiole swelling, bulbous, greenish, glabrous, one-chambered (Figure 70). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: March/2012.

Melochia sp. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 71). Galler: not determined. Locality: Gruta do Sobradinho. Date: December/2011.

Waltheria indica L. (n=1)

Leaf gall, globoid, yellow, hairy, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: June/2012.

Previous records: Santos et al. (2011) described other leaf gall on this plant from Pernambuco.

Melastomataceae (n=18)

Aciotis cf. *indecora* (Bonpl) Triana (n=2)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 72). Galler: not determined. Locality: Eubiose. Date: June/2012. Previous records: Itamonte, MG (Maia 2012).

Vein swelling, fusiform, green, glabrous, one-chambered. Galler: not determined. Locality: Eubiose. Date: June/2012. Previous records: Itamonte, MG (Maia 2012).

Clidemia sp. 1 (n=2)

Leaf gall, globoid, red or yellow, hairy, glabrous, one-chambered (Figure 73). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: December/2011.

Bud gall, globoid, rugose, glabrous, one-chambered. Galler: not determined. Locality: Vale das Borboletas. Date: December/2011.

Clidemia sp. 2 (n=1)

Stem swelling, fusiform, glabrous, one-chambered (Figure 74). Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012.

Previous records: Fernandes et al. (2001), Maia et al. (2008), Maia et al. (in press), and Maia (2012) recorded galls on *Clidemia* spp. from Vale do Rio Doce (MG), Bertioga (SP), Santa Teresa (ES), and Itamonte (MG), respectively.

Miconia ligustroides (DC.) Naudin (n=1)

Leaf gall, globoid, yellow, glabrous, one-chambered (Figure 75). Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012.

Miconia cf. *theaezans* Cogn. (n=1)

Stem swelling, fusiform, brown with black spot, glabrous, one-chambered (Figure 76). Galler: not determined. Localities: Ladeira do Amendoim, Vale das Borboletas, Cachoeira da Lua, Gruta do Sobradinho, Harmonia. Date: December/2011, March/2012.

Miconia sp.1 (n=3)

Bud or stem swelling, globoid, brown, glabrous, one-chambered (Figure 77). Galler: not determined. Locality: Ladeira do Amendoim. Date: September/2011.

Bud or leaf gall, globoid, brownish, glabrous, one-chambered (Figure 78). Galler: not determined. Locality: Eubiose. Date: June/2012.

Leaf gall, globoid, reddish, micropubescent, glabrous, one-chambered (Figure 79). Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Miconia sp.2 (n=1)

Bud gall, globoid, green with red trichomes, one-chambered (Figure 80). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: March/2012.

Miconia sp. 3 (n=2)

Vein swelling, fusiform, green, glabrous, one-chambered (Figure 81). Galler: not determined. Locality: Vale das Borboletas. Date: June/2012.

Leaf gall, globoid, whitish, glabrous, one-chambered. Galler: not determined. Locality: Vale das Borboletas. Date: June/2012.

Previous records: Fernandes et al. (1997), Fernandes et al. (2001), Maia (2001), Maia & Fernandes (2004), Urso-Guimarães & Scareli-Santos (2006), Maia et al. (2008), Carneiro et al. (2009), Maia (2011), Malves & Frieiro-Costa (2012), Saito & Urso-Guimarães (2012), Maia et al. (in press), and Maia (2012) recorded several galls on *Miconia* spp. from Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Carapebus (RJ), Serra de São José (MG), Santa Rita do Passa-Quatro (SP), Bertioga (SP), Cadeia do Espinhaço (MG), Porto de Trombetas (Pará), Ingaí (MG), Luiz Antonio (SP), Santa Teresa (ES), and Itamonte (MG), respectively.

Mouriri sp. (n=1)

Petiole swelling, bulbous, brown, glabrous, one-chambered (Figure 82). Galler: not determined. Locality: Gruta do Sobradinho. Date: March/2012.

Tibouchina granulosa (Desr.) Cogn (n=1)

Vein swelling, fusiform, green or brownish, glabrous, one-chambered (Figure 83). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: September/2011.

Tibouchina cf. *stenocarpa* (DC.) Cogn. (n=1)

Leaf gall, burn-shaped, green, one-chambered (Figure 84). Galler: Lepidoptera. Locality: Cachoeira da Lua. Date: March/2012, June/2012. Previous records: Itamonte, MG (Maia 2012).

Previous records: Fernandes et al. (2001), Maia & Fernandes (2004), Maia et al. (2008), Carneiro et al. (2009), and Maia et al. (in press) recorded several galls on *Tibouchina* spp. from Vale do Rio Doce (MG), Serra de São José (MG), Bertioga (SP), Cadeia do Espinhaço (MG), and Santa Teresa (ES), respectively.

Melastomataceae not determined 1 (n=1)

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 85). Galler: not determined. Locality: Ladeira do Amendoim. Date: September/2011.

Melastomataceae not determined 2 (n=1)

Bud gall, globoid, green, glabrous, one-chambered (Figure 86). Galler: not determined. Locality: Ladeira do Amendoim. Date: June/2012.

Monimiaceae (n=1)

Moriri sp. (n=1)

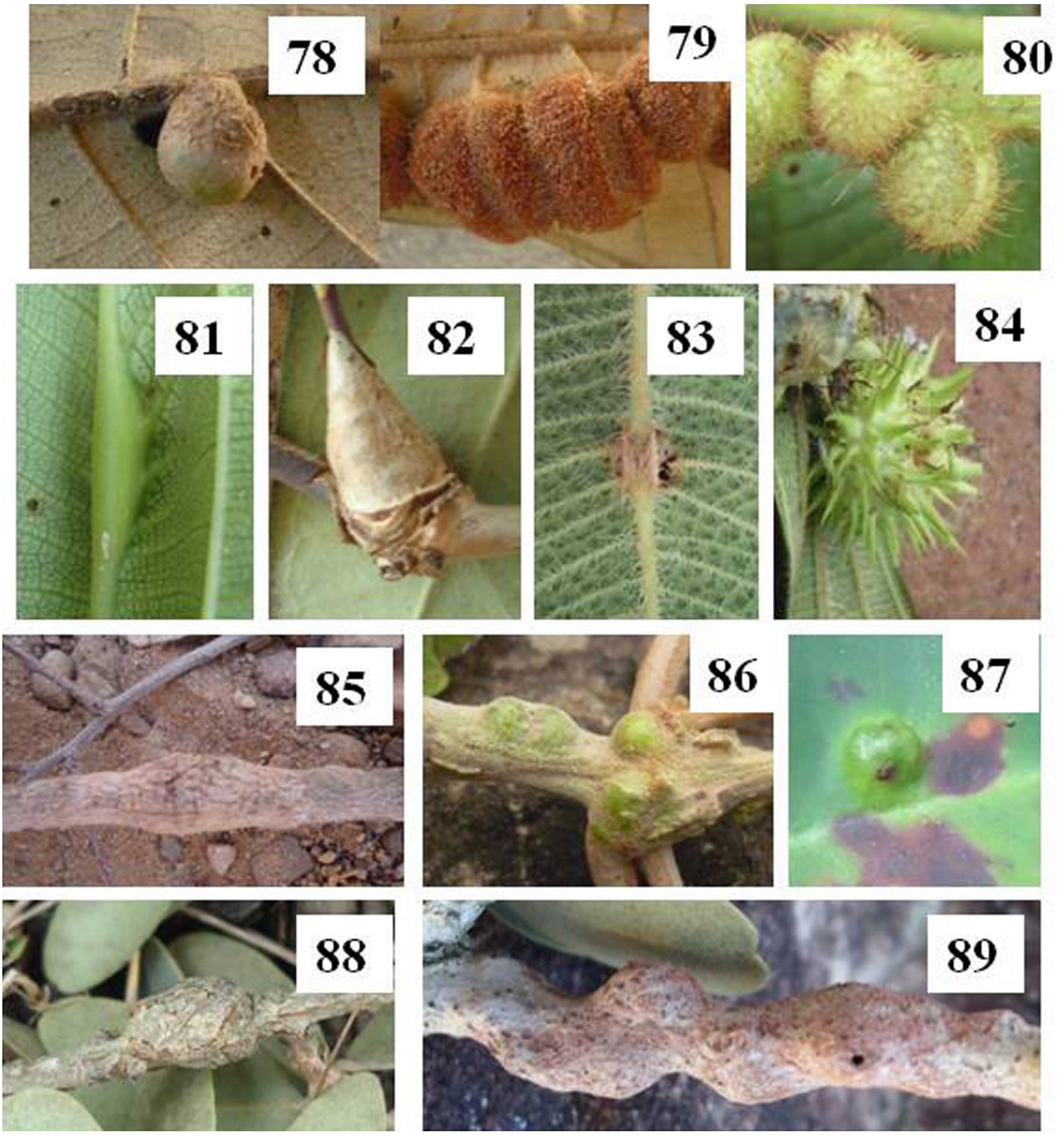
Leaf gall, globoid, brown, hairy, one-chambered (Figure 87). Galler: not determined. Locality: Eubiose. Date: June/2012. Previous records: Itamonte, MG (Maia et al., in press).

Moraceae (n=5)

Brosimum sp. (n=2)

Stem swelling, brown, ovoid, glabrous, multi-chambered (Figure 88). Galler: not determined. Dwellers: Hymenoptera. Locality: Ladeira do Amendoim. Date: December/2011.

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 89). Galler: not determined. Locality: Gruta do Sobradinho. Date: December/2011.



Figures 78-89. Insect galls of São Tomé das Letras (MG): 78. Bud or leaf gall on *Miconia* sp.1; 79. Leaf gall on *Miconia* sp.1; 80. Bud gall on *Miconia* sp.2; 81. Vein swelling on *Miconia* sp.3; 82. Petiole swelling on *Mouriri* sp.; 83. Vein swelling on *Tibouchina granulosa*; 84. Leaf gall on *Tibouchina* cf. *stenocarpa*; 85. Stem swelling on Melastomataceae not determined 1; 86. Bud gall on Melastomataceae not determined 2; 87. Leaf gall on *Moriri* sp.; 88. Stem swelling on *Brosimum* sp.; 89. Stem swelling on *Brosimum* sp.

Pseudolmedia macrophylla Trécul (n=3)

Leaf gall, globoid, brown, hairy, one-chambered (Figure 90). Galler: Cecidomyiidae (Diptera). Other dwellers: inquilines (Thysanoptera). Locality: Gruta do Sobradinho. Date: September/2011, March/2012.

Leaf gall, globoid, whitish, hairy, one-chambered (Figure 91). Galler: not determined. Locality: Gruta do Sobradinho. Date: September/2011.

Leaf gall, globoid, green-yellowish, glabrous, one-chambered (Figure 92). Galler: Hemiptera. Locality: Gruta do Sobradinho. Date: September/2011, March/2012.

Myrsinaceae (n=2)

Rapanea cf. *parvifolia* (A. DC.) Mez (n=1)

Leaf gall, circular, green, glabrous, one-chambered (Figure 93). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim,

Cachoeira da Lua, Gruta do Sobradinho. Date: December/2011, March/2012, June/2012.

Rapanea sp. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 94). Galler: Lepidoptera. Locality: Gruta do Sobradinho. Date: September/2011.

Previous records: Maia (2001), Maia & Fernandes (2004), Maia et al. (2008), and Maia & Oliveira (2010) recorded galls on *Rapanea* spp. from Maricá (RJ), Serra de São José (MG), Bertioga (SP), and Ilha Grande (Angra dos Reis, RJ).

Myrtaceae (n=17)

Aulomyrcia tomentosa (Aubl.) DC. var. *longipes* (n=1)

Bud gall, bulbous, green, micropubescent, one-chambered (Figure 95). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: March/2012.

Campomanesia pubescens (DC.) Berg. (n=1)

Stem gall, bulbous, reddish, glabrous, one-chambered. Galler: not determined. Locality: Vale das Borboletas. Date: December/2011, March/2012.

Eugenia biflora L. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: June/2012.

Eugenia punicifolia (Kunth.) DC. (n=1)

Stem swelling, fusiform, brown, glabrous, multi-chambered (Figure 96). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: March/2012.

Eugenia sp. (n=1)

Bud gall apical, globoid, brown, glabrous, multi-chambered (Figure 97). Galler: not determined. Locality: Gruta do Sobradinho. Date: December/2011.

Previous records: Fernandes et al. (1988), Fernandes et al. (1997), Fernandes et al. (2001), Maia (2001), Julião et al. (2002), Maia & Fernandes (2004), Oliveira & Maia (2005), Urso-Guimarães & Scareli-Santos (2006), Maia et al. (2008), Carneiro et al. (2009), Coelho et al. (2009), Maia & Oliveira (2010); Santos et al. (2011), Malves & Frieiro-Costa (2012), Saito & Urso-Guimarães (2012), Maia & Souza (in press), Maia et al. (in press), and Maia (2012) recorded several galls on *Eugenia* spp. from Belo Horizonte (MG), Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Carapebus and Maricá (RJ), Pantanal sul mato-grossense (MS), Serra de São José (MG), Grumari (Rio de Janeiro, RJ), Santa Rita do Passa-Quatro (SP), Bertioga (SP), Cadeia do Espinhaço (MG), Serra do Cipó (MG), Ilha Grande (Angra dos Reis, RJ), Pernambuco, Ingaí (MG), Luiz Antonio (SP), Ilha do Cabo Frio (Arraial do Cabo, RJ), Santa Teresa (ES), and Itamonte (MG), respectively.

Myrcia splendens (Sw.) DC. (n=2)

Stem swelling, fusiform, brown, glabrous, multi-chambered (Figure 98). Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: December/2011. Previous records: Serra do Cipó, MG (Coelho et al. 2009).

Bud gall, globoid, spongy, brown, glabrous, multi-chambered. Galler: not determined. Dwellers: Hymenoptera. Locality: Cachoeira da Lua. Date: December/2011.

Myrcia sylvatica (G. Mey) DC. (n=7)

Leaf or bud gall, red, rugose, glabrous (Figure 99). Galler: Thysanoptera. Localities: Ladeira do Amendoim, Cachoeira da Lua, Gruta do Sobradinho. Date: December/2011, September/2011, March/2012, June/2012.

Marginal leaf roll, green, glabrous, one-chambered (Figure 100). Galler: Thysanoptera. Localities: Ladeira do Amendoim, Cachoeira da Lua, Gruta do Sobradinho, Harmonia, Eubiose. Date: September/2011, December/2011, March/2012, June/2012.

Leaf roll, green, glabrous, one-chambered (Figure 101). Galler: Cecidomyiidae (Diptera). Localities: Cachoeira da Lua, Vale das Borboletas, Eubiose. Date: December/2011, June/2012.

Stem swelling, fusiform, brown, multi-chambered (Figure 102). Galler: not determined. Dwellers: Hymenoptera. Locality: Cachoeira da Lua, Vale das Borboletas, Gruta do Sobradinho, Harmonia, Eubiose. Date: September/2011, March/2012. June/2012.

Leaf gall, globoid, green, glabrous, one-chambered (Figure 103). Galler: Cecidomyiidae (Diptera). Dwellers: Hymenoptera. Localities: Cachoeira da Lua, Harmonia, Eubiose. Date: December/2011, March/2012, June/2012.

Bud gall, conical, green-yellowish, glabrous, one-chambered (Figure 104). Galler: Cecidomyiidae (Diptera).Locality: Vale das Borboletas. Date: September/2011, June/2012.

Bud gall, horn-shaped, green, spongy, glabrous, multi-chambered (Figure 105). Galler: Cecidomyiidae (Diptera). Parasitoids (Hymenoptera), successors (Formicidae: adults, pupae and larvae). Localities: Cachoeira da Lua, Gruta do Sobradinho, Harmonia, Eubiose. Date: September/2011, December/2011, March/2012, June/2012.

Myrcia sp. (n=1)

Bud gall, ovoid, green, glabrous, multi-chambered (Figure 106). Galler: not determined. Locality: Vale das Borboletas. Date: December/2011.

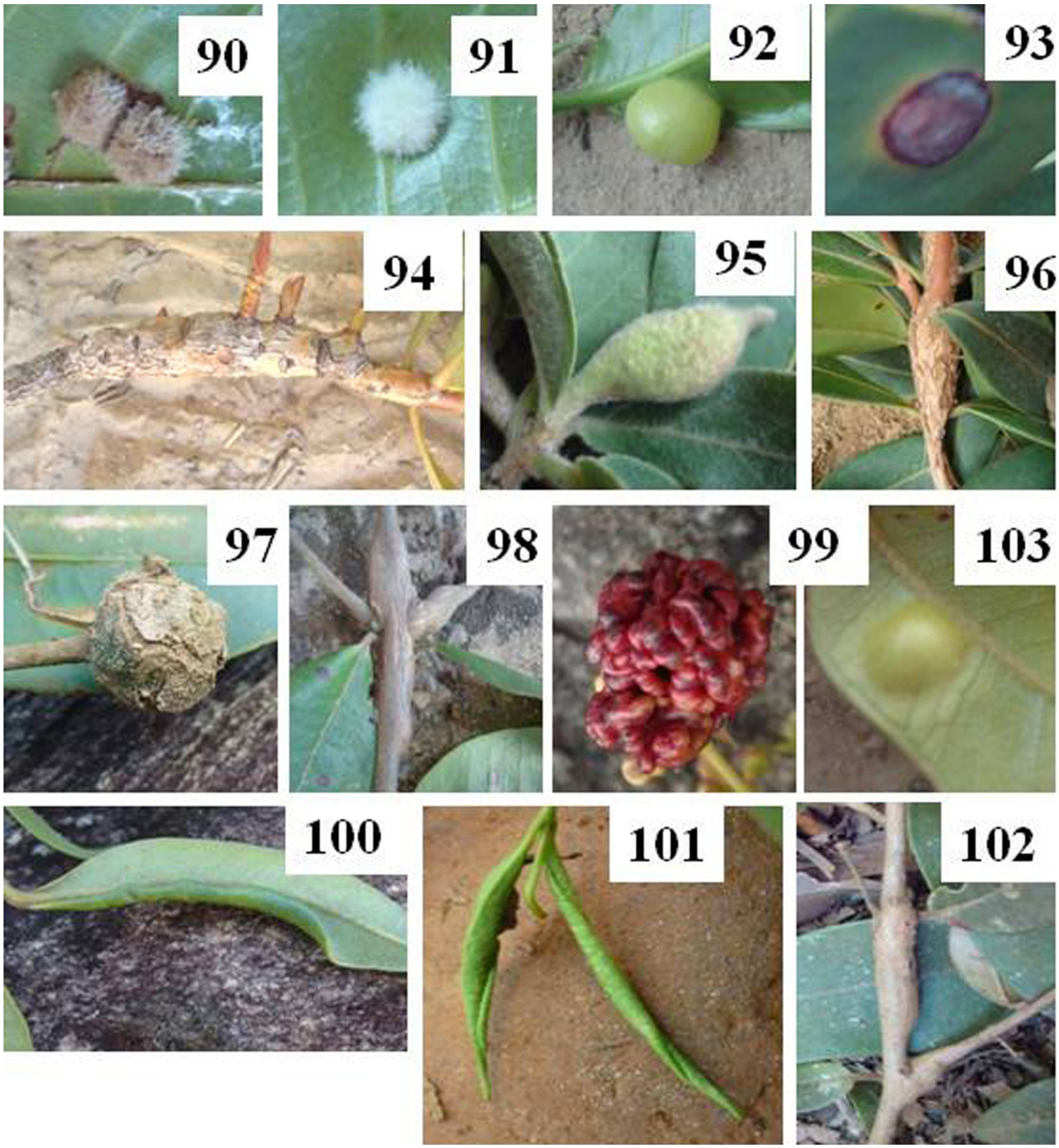
Previous records: Fernandes et al. (1988), Fernandes et al. (1997), Fernandes et al. (2001), Maia (2001), Maia & Fernandes (2004), Urso-Guimarães & Scareli-Santos (2006), Maia et al. (2008), Carneiro et al. (2009); Coelho et al. (2009), Santos et al. (2010), Malves & Frieiro-Costa (2012), Saito & Urso-Guimarães (2012), Maia et al. (in press), and Maia (2012) recorded several galls on *Myrcia* spp. from Belo Horizonte (MG), Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Carapebus and Maricá (RJ), Serra de São José (MG), Santa Rita do Passa-Quatro (SP), Bertioga (SP), Cadeia do Espinhaço (MG), Serra do Cipó (MG), Goiânia (GO), Ingaí (MG), Luiz Antonio (SP), Santa Teresa (ES), and Itamonte (MG), respectively.

Myrciaria floribunda (H. West ex Willd) O. Berg (n=2)

Stem swelling, fusiform, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Localities: Vale das Borboletas, Eubiose. Date: June/2012.

Leaf gall, conical, green, glabrous, one-chambered (Figure 107). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: June/2012. Previous records: Santa Teresa, ES (Maia et al., in press).

Fernandes et al. (1997, 2001), Maia (2001), Maia & Fernandes (2004), Maia & Oliveira (2010), Bregonci et al. (2010), Maia et al. (in press), and Maia (2012) described some galls on *Myrciaria* spp. from Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Carapebus and Maricá (RJ), Serra de São José (MG), Ilha Grande (Angra dos Reis, RJ), Guarapari (ES), Santa Teresa (ES), and Itamonte (MG), respectively.



Figures 90-103. Insect galls of São Tomé das Letras: 90-92. Leaf galls on *Pseudolmedia macrophylla*, 90. Brown; 91. Whitish; 92. Green; 93. Leag gall on *Rapanea* cf. *parvifolia*; 94. Stem gall on *Rapanea* sp.; 95. Bud gall on *Aulomyrcia tomentosa* var. *longipes*; 96. Stem swelling on *Eugenia punicifolia*; 97. Bud gall on *Eugenia* sp.; 98. Stem swelling on *Myrcia splendens*; 99-103. Galls on *Myrcia sylvatica*: 99. Leaf or bud gall; 100. Leaf roll; 101. Marginal leaf roll; 102. Stem swelling; 103. Leaf gall.

Nyctaginaceae (n=3)

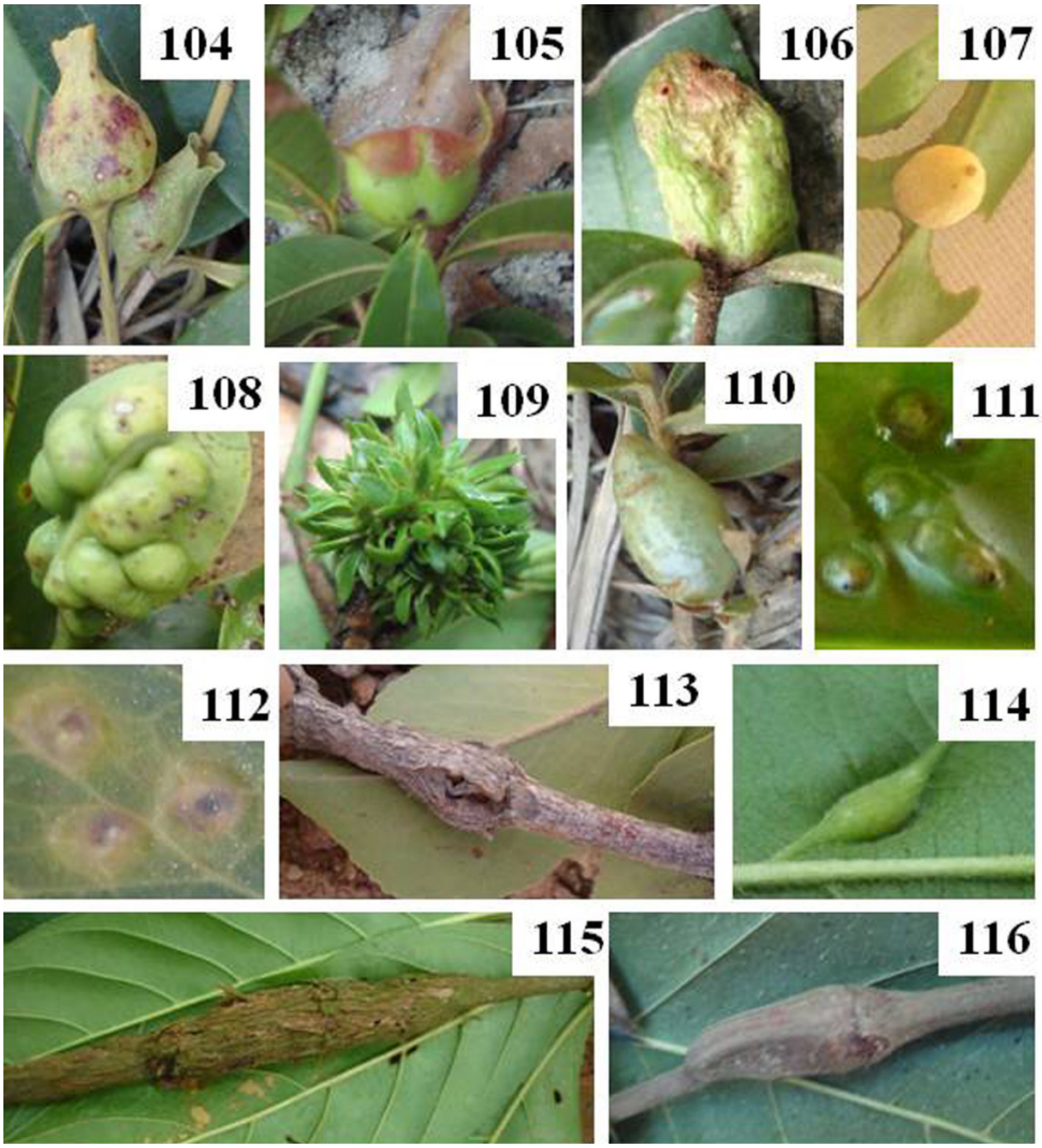
Guapira sp. (n=1)

Leaf gall, globoid, green, glabrous, one-chambered (Figure 108). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: December/2011, March/2012.

Previous records: Galls on *Guapira* spp. have been described by Maia (2001) from Carapebus and Maricá (RJ), Oliveira & Maia (2005) from Grumari (Rio de Janeiro, RJ), Maia et al. (2008) from Bertioga (SP), Carneiro et al. (2009) from Cadeia do Espinhaço (MG), Maia & Oliveira (2010) from Ilha Grande (Angra dos Reis, RJ), Bregonci et al. (2010) from Guarapari (ES), Maia & Souza (in press) from Ilha do Cabo Frio (Arraial do Cabo, RJ), and Maia et al. (in press) from Santa Teresa (ES).

Neea sp. (n=2)

Rosette bud gall, green, glabrous (Figure 109). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: December/2011, June/2012.



Figures 104-116. Insect galls of São Tomé das Letras (MG): 104-105. Galls on *Myrcia sylvatica*: 104. Bud gall (conical), 105. Bud gall (horn-shaped); 106. Bud gall on *Myrcia* sp.; 107. Leaf gall on *Myrciaria floribunda*; 108. Leaf gall on *Guapira* sp.; 109. Rosette bud gall on *Neea* sp.; 110. Bud gall on *Turnera* sp.; 111. Leaf gall on *Piper* sp.; 112-113. Galls on *Roupala montana* var. *montana*: 112. Leaf gall, 113. Stem swelling; 114-115. Galls on *Amaioua intermedia* var. *brasiliana*: 114. Vein swelling, 115. Stem swelling; 116. Stem swelling on *Coussarea* sp.

Leaf gall, globoid, red, hairy, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: December/2011.

Previous records: Julião et al. (2002), and Maia (2012) recorded galls on *Neea* spp. from Pantanal sul mato-grossense (MS), and Itamonte (MG).

Passifloraceae (n=1)

Turnera sp. (n=1)

Bud gall, bursiform, green, glabrous, one-chambered (Figure 110). Galler: Hemiptera. Locality: Cachoeira da Lua. Date: September/2011.

Previous records: Maia (2011) described a leaf gall on *Turnera* sp. from Porto de Trombetas (Pará).

Piperaceae (n=1)

Piper sp. (n=1)

Leaf gall, circular, green, glabrous, one-chambered (Figure 111). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: September/2011, June/2012.

Previous records: Fernandes et al. (2001), Maia (2001), Maia & Fernandes (2004), Oliveira & Maia (2005), Maia et al. (2008), Santos et al. (2010), Maia et al. (in press), and Maia (2012) recorded

galls on *Piper* spp. from Vale do Rio Doce (MG), Carapebus (RJ), Serra de São José (MG), Grumari (Rio de Janeiro, RJ), Bertioga (SP), Goiânia (GO), Santa Teresa (ES), and Itamonte (MG), respectively.

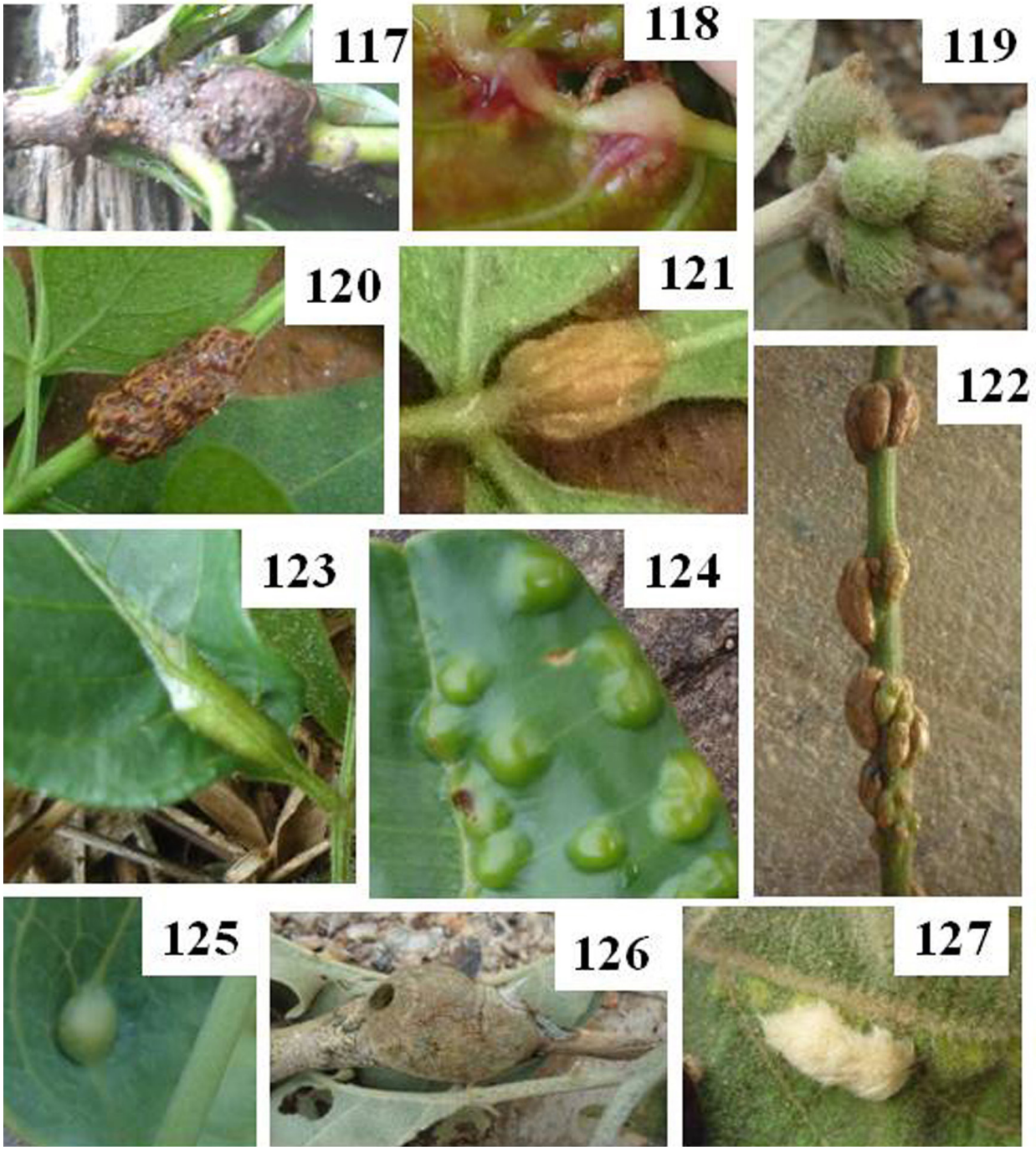
Proteaceae (n=2)

Roupala montana Aubl. var. *montana* (n=2)

Leaf gall, circular, yellow, glabrous, one-chambered (Figure 112). Galler: Cecidomyiidae (Diptera). Other dwellers: parasitoids (Hymenoptera). Locality: Ladeira do Amendoim. Date: September/2011, December/2011, March/2012, June/2012. Previous records: Luiz Antonio, SP (Saito & Urso-Guimarães 2012).

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 113). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: September/2011. Previous records: Luiz Antonio, SP (Saito & Urso-Guimarães 2012).

Fernandes et al. (2001), and Maia (2012) described some galls on *Roupala* spp. from Vale do Rio Doce (MG), and Itamonte (MG), respectively.



Figures 117-127. Insect galls of São Tomé das Letras (MG): 117. Stem swelling on *Faramea* sp.; 118. Leaf gall on *Palicourea rigida*; 119. Bud gall on *Sabicea brasiliensis*; 120-121. Galls on *Serjania communis*: 120. Stem swelling, 121. Petiole swelling; 122. Stem swelling on *Serjania meridionalis*; 123. Leaf gall on *Serjania* sp.; 124. Leaf gall, globoid on *Manilkara* sp.; 125. Vein swelling on *Smilax cissoides*; 126. Stem swelling on *Solanum lycocarpum*; 127. Leaf gall on *Solanum* sp.

Rubiaceae (n=6)

Amaioua intermedia var. *brasiliana* (A. Rich. ex DC.) (n=2)

Vein swelling, fusiform, green, glabrous, one-chambered (Figure 114). Galler: not determined. Locality: Eubiose. Date: June/2012.

Stem swelling, fusiform, brown, glabrous, multi-chambered (Figure 115). Galler: not determined. Locality: Eubiose. Date: June/2012.

Coussarea sp. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 116). Galler: not determined. Locality: Vale das Borboletas. Date: September/2011.

Faramea sp. (n=1)

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 117). Galler: not determined.Locality: Vale das Borboletas. Date: December/2011.

Palicourea rigida Kunth. (n=1)

Leaf gall, globoid, red, glabrous, one-chambered (Figure 118). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: December/2011.

Previous records: Cadeia do Espinhaço (Carneiro et al. 2009). Other records: Fernandes et al. (1997) described other gall on this plant from Vale do Jequitinhonha (MG), Maia (2011), Maia et al. (in press), and Maia (2012) described galls on *Palicourea* spp. from Porto de Trombetas (Pará), Santa Teresa (ES), and Itamonte (MG), respectively.

Sabicea brasiliensis Wemham (n=1)

Bud gall, green, globoid with a short apical projection, pubescent, one-chambered (Figure 119). Galler: not determined. Locality: Cachoeira da Lua. Date: March/2012.

Sapindaceae (n=5)

Serjania communis Cambess. (n=2)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 120). Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Petiole swelling, fusiform, brown, glabrous, one-chambered (Figure 121). Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Serjania glutinosa Radlk. (n=1)

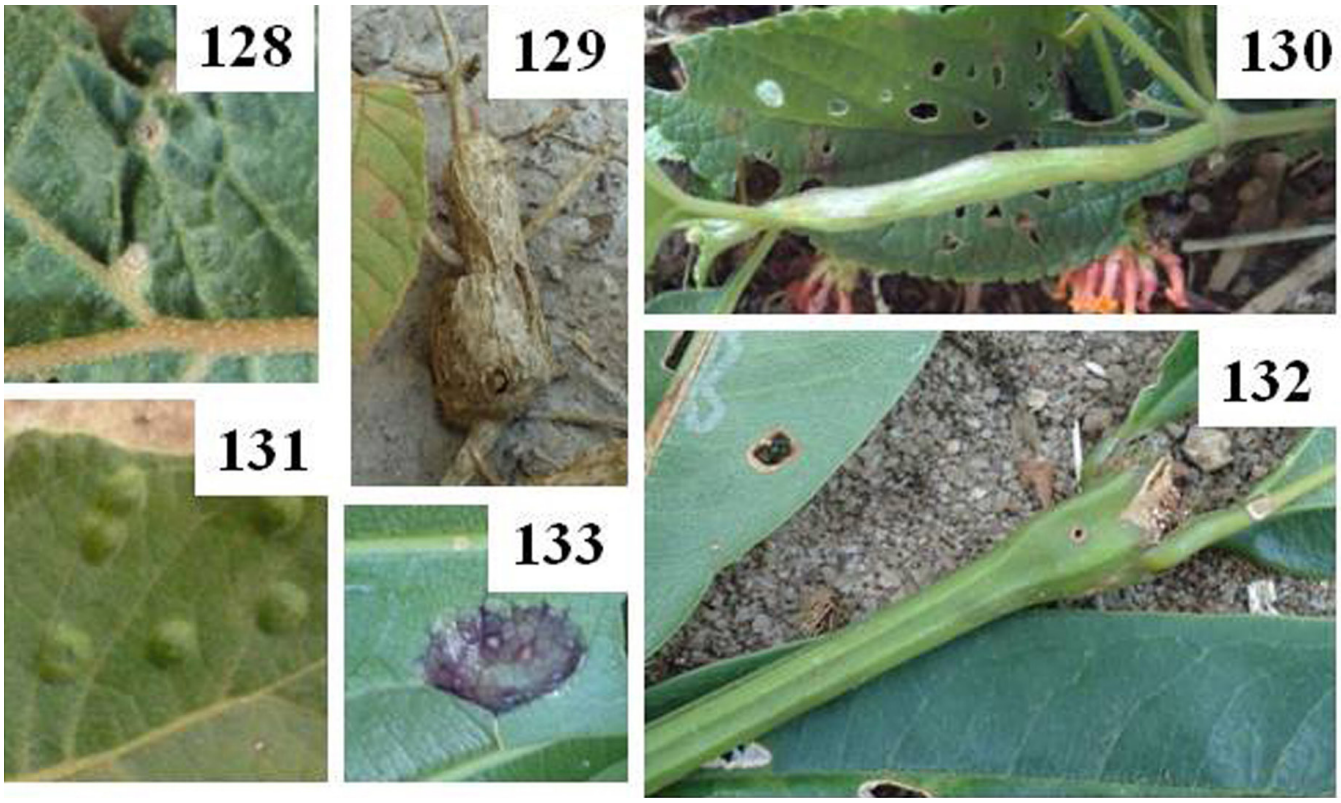
Midvein swelling, fusiform, yellowish, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: March/2012.

Serjania meridionalis Cambess (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered (Figure 122). Galler: Cecidomyiidae (Diptera). Locality: Eubiose. Date: June/2012.

Serjania sp. (n=1)

Leaf gall, circular, green, glabrous, one-chambered (Figure 123). Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: March/2012.



Figures 128-133. Insect galls of São Tomé das Letras (MG): 128. Leaf gall on *Buettneria* sp.; 129. Stem gall on Sterculiaceae not determined; 130. Stem swelling on *Lantana camara*; 131. Leaf gall on cf. *Salvertia convallariodora*; 132-133. Galls on *Vochysia* cf. *maxima*: 132. Stem swelling, 133. Leaf gall.

Previous records: Fernandes et al. (1997), Fernandes et al. (2001), Julião et al. (2002), Coelho et al. (2009), Santos et al. (2010, 2011), Maia et al. (in press), and Maia (2012) recorded several galls on *Serjania* spp. from Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Pantanal sul mato-grossense (MS), Serra do Cipó (MG), Goiânia (GO), Pernambuco, Santa Teresa (ES), and Itamonte (MG), respectively.

Sapotaceae (n=1)

Manilkara sp. (n=1)

Leaf gall, globoid, green, glabrous, one-chambered (Figure 124). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: December/2011, March/2012.

Previous records: Galls on *Manilkara* spp. have been recorded by Oliveira & Maia (2005) from Grumari (Rio de Janeiro, RJ), Maia & Oliveira (2010) from Ilha Grande (Angra dos Reis, RJ), Bregonci et al. (2010) from Guarapari (ES), and Santos et al. (2011) from Pernambuco.

Siparunaceae (n=1)

Siparuna guianensis Aubl. (n=1)

Leaf gall, circular, green, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Vale das Borboletas. Date: September/2011.

Previous records: Santos et al. (2010) described this gall from Goiânia (GO), Saito & Urso-Guimarães (2012) recorded other galls on this host plant from Luiz Antonio (SP), Maia (2011) and Maia et al. (in press) described galls on *Siparuna* spp. from Porto de Trombetas (Pará), and Santa Teresa (ES), respectively.

Smilacaceae (n=1)

Smilax cissoides Mart. ex Griseb (n=1)

Vein swelling, globoid, green, glabrous, one-chambered (Figure 125). Galler: Cecidomyiidae (Diptera). Locality: Gruta do Sobradinho. Date: December/2011.

Previous records: Maia (2001), Julião et al. (2002), Urso-Guimarães et al. (2003), Oliveira & Maia (2005), Urso-Guimarães & Scareli-Santos (2006), Maia et al. (2008), Carneiro et al. (2009), Coelho et al. (2009), Maia & Oliveira (2010), Bregonci et al. (2010), Malves & Frieiro-Costa (2012), and Maia et al. (in press) recorded leaf galls on *Smilax* spp. from Carapebus and Maricá (RJ), Pantanal sul mato-grossense (MS), Delfinópolis (MG), Grumari (Rio de Janeiro, RJ), Santa Rita do Passa-Quatro (SP), Bertioga (SP), Cadeia do Espinhaço (MG), Serra do Cipó (MG), Ilha Grande (Angra dos Reis, RJ), Guarapari (ES), Ingaí (MG), and Santa Teresa, respectively.

Solanaceae (n=3)

Solanum lycocarpum A. St-Hil (n=1)

Stem swelling, globoid, brown, glabrous, one-chambered (Figure 126). Galler: *Collabismus clitellae* Boheman (Curculionidae, Coleoptera). Locality: Gruta do Sobradinho. Date: December/2011. Previous records: Ingaí, MG (Malves & Frieiro-Costa 2012).

Solanum sp.1 (n=1)

Leaf gall, globoid, yellowish, hairy, one-chambered (Figure 127). Galler: not determined. Dwellers: Hymenoptera. Localities: Ladeira do Amendoim, Vale das Borboletas, Cachoeira da Lua. Date: December/2011, March/2012, June/2012.

Solanum sp. 2 (n=1)

Midvein swelling, fusiform, green, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Cachoeira da Lua. Date: March/2012.

Previous records: Several galls on *Solanum* spp. have been recorded by Fernandes et al. (2001) from Vale do Rio Doce, Maia (2001) from Carapebus and Maricá (RJ), Oliveira & Maia (2005) from Grumari (Rio de Janeiro, RJ), Fernandes & Negreiros (2006) from Aimorés (MG), Maia et al. (2008) from Bertioga (SP), Santos et al. (2011) from Pernambuco, Maia et al. (in press) from Santa Teresa (ES), and Maia (2012) from Itamonte (MG).

Sterculiaceae (n=2)

Buettneria sp. (n=1)

Leaf gall, globoid, yellowish or greenish, micropubescent, one-chambered (Figure 128). Galler: not determined. Locality: Cachoeira da Lua. Date: December/2011.

Sterculiaceae not determined (n=1)

Stem gall, fusiform, brown, woody, glabrous, one-chambered (Figure 129). Galler: Cecidomyiidae (Diptera). Dwellers: Hymenoptera. Locality: Gruta do Sobradinho. Date: September/2011.

Verbenaceae (n=2)

Lantana camara L. (n=1)

Stem swelling, fusiform, glabrous, one-chambered (Figure 130). Galler: Lepidoptera. Locality: Cachoeira da Lua. Date: March/2012.

Previous records: Fernandes et al. (2001), Maia (2001), Fernandes & Negreiros (2006), Santos et al. (2011), and Maia & Souza (in press) recorded other galls on this host plant from Vale do Rio Doce (MG), Maricá (RJ), Aimorés (MG), Pernmabuco, and Ilha do Cabo Frio (Arraial do Cabo, RJ), respectively.

Lantana sp. (n=1)

Stem swelling, fusiform, brown, glabrous, one-chambered. Galler: Lepidoptera. Locality: Gruta do Sobradinho. Date: March/2012.

Previous records: Fernandes et al. (1997), Fernandes et al. (2001), Maia & Fernandes (2004), Maia et al. (2008), Coelho et al. (2009), Carneiro et al. (2009), Maia & Souza (in press), and Maia et al. (in press) recorded other galls on *Lantana* spp. from Vale do Jequitinhonha (MG), Vale do Rio Doce (MG), Bertioga (SP), Serra de São José (MG), Serra do Cipó (MG), Cadeia do Espinhaço (MG), Ilha do Cabo Frio (Arraial do Cabo, RJ), and Santa Teresa (ES), respectively.

Vochysiaceae (n=4)

cf. *Salvertia convallariodora* A. St.-Hil (n=1)

Leaf gall, circular, green, glabrous, one-chambered (Figure 131). Galler: Cecidomyiidae (Diptera). Locality: Ladeira do Amendoim. Date: June/2012.

Vochysia cf. *maxima* Ducke (n=3)

Marginal leaf roll, green, glabrous, one-chambered. Galler: Cecidomyiidae (Diptera). Locality: Harmonia. Date: March/2012.

Stem swelling, fusiform, green, glabrous, one-chambered (Figure 132). Galler: not determined. Locality: Harmonia. Date: March/2012.

Leaf gall, circular, black, glabrous, one-chambered (Figure 133). Galler: Cecidomyiidae (Diptera). Locality: Harmonia. Date: March/2012.

Previous records: Fernandes et al. (1997), and Maia (2012) described other galls on *Vochysia* spp. from Vale do Jequitinhonha (MG) and Itamonte (MG), respectively.

Discussion

Several inventories of insect galls from Minas Gerais have been published (Fernandes et al. 1988, Fernandes et al. 1997, Fernandes et al. 2001, Urso-Guimarães et al. 2003, Maia & Fernandes 2004, Fernandes & Negreiros 2006, Carneiro et al. 2009, Coelho et al. 2009, Malves & Frieiro-Costa 2012, Maia 2012). According to these inventories, the gall richness varies from 22 to 273 (Table 2), and the medium number of gall morphotypes per plant species from 1.15 to 1.96. São Tomé das Letras, with 152 gall morphotypes and a medium of 1.64 is the fourth richest investigated area of Minas Gerais.

Fabaceae, Melastomataceae, Myrtaceae, and Asteraceae were the plant families with the greatest richness of galls. All of them have been already indicated in other insect gall inventories as rich taxa in number of gall morphotypes (Table 3). So, the present study corroborates the previous knowledge about super host families (Veldtman & McGeoch 2003), and the plant richness hypothesis (Fernandes 1992).

The super host genera were *Copaifera* L. (Fabaceae), *Myrcia* DC. ex. Guill. (Myrtaceae), and *Miconia* Ruiz & Pav. (Melastomataceae). These three genera were already indicated in other gall inventories as super host (Campus Pampulha – Fernandes et al. (1988), Serra do Cipó – Coelho et al. (2009), Serra de São José – Maia & Fernandes (2004), and Itamonte – Maia (2012)). Other cited genera were *Bauhinia*, *Baccharis*, *Celtis*, and *Serjania* (Serra do Cipó – Coelho et al. (2009), and Espinhaço – Carneiro et al. (2009)). Once more, this study corroborates the previous knowledge about super host genera.

The super host species were *Copaifera langsdorfii* Desf. (Fabaceae), *Myrcia sylvatica* (G. Mey) DC. (Myrtaceae), and *Calophyllum brasiliense* Cambéss (Calophyllaceae). *Copaifera langsdorfii* was already indicated in Campus Pampulha – Fernandes et al. (1988), and Serra de São José – Maia & Fernandes (2004) as super host species. *Bacccharis pseudomyriocephala* (Espinhaço – Carneiro et al. (2009)), *B. dracunculifolia* (Serra do Cipó – Coelho et al. (2009)), *Celtis brasiliensis* (Serra do Cipó – Coelho et al. (2009)), and *Protium heptaphyllum* (Serra de São José – Maia & Fernandes (2004)) are other indicated super hosts. *Myrcia sylvatica*, and *Calophyllum brasiliense* are indicated for the first time.

Leaves were the most galled plant organ, followed by stems, and buds. The same results were found in all other gall inventories of Minas Gerais, excepting by Espinhaço Range, where stems were the most galled plant organ (Carneiro et al. 2009). Stems were also indicated as the most galled plant organ in Vale do Rio Doce by Fernandes et al. (2001), but this result is not corrected. The authors considered vein and petiole as other plant organs, but technically they are part of the leaf, so if the values of vein and petiole are added, the total is 58%, perpassing the stem. Leaves are the most galled plant organ throughout the world. It is a widespread pattern pointed by Felt (1940) and confirmed in this study.

The inducers are represented by Diptera, Lepidoptera, Hemiptera, Thysanoptera, Coleoptera, and Hymenoptera. These are the insect orders which comprise galling species. Cecidomyiidae (Diptera) were the most frequent and diversified gallers. This is true for all other gall inventories of Minas Gerais, where Cecidomyiidae have

Table 2. Distribution of the insect gall morphotypes, number of host plant species and medium number of gall morphotypes per plant species in some localities of Minas Gerais (Brazil).

Locality	Nr. insect gall morphotypes	Nr. host plant species	Medium number of gall morphotypes/ plant species	Reference
Vale do Rio Doce	273	139	1.96	Fernandes et al. (2001)
Espinhaço Range	241	142	1.69	Carneiro et al. (2009)
Vale do Jequitinhonha	236	134	1.76	Fernandes et al. (1997)
São Tomé das Letras	152	94	1.62	Present study
Itamonte	101	64	1.58	Maia (2012)
Serra de São José	137	73	1.87	Maia & Fernandes (2004)
Serra do Cipó	91	51	1.78	Coelho et al. (2009)
Boqueirão (Ingaí)	57	43	1.32	Malves & Frieiro-Costa (2012)
Pampulha (Belo Horizonte)	37	22	1.68	Fernandes et al. (1988)
Fazenda Bulcão (Aimorés)	29	24	1.21	Fernandes & Negreiros (2006)
Delfinópolis	22	19	1.15	Urso-Guimarães et al. (2003)

Table 3. Distribution of the most galled host plant families per localities of Minas Gerais (Brazil).

Localities of Minas Gerais	Plant families		References
	1st	2nd	
Pampulha (Belo Horizonte)	Fabaceae	Boraginaceae	Fernandes et al. (1988)
Vale do Jequitinhonha	Fabaceae	Malpighiaceae	Fernandes et al. (1997)
Boqueirão (Ingaí)	Asteraceae	Myrtaceae	Malves & Frieiro-Costa (2012)
Delfinópolis	Fabaceae	Rubiaceae	Urso-Guimarães et al. (2003)
Fazenda Bulcão (Aimorés)	Fabaceae	Euphorbiaceae	Fernandes & Negreiros (2006)
Espinhaço Range	Asteraceae	Melastomataceae	Carneiro et al. (2009)
Serra do Cipó	Fabaceae	Myrtaceae	Coelho et al. (2009)
Vale do Rio Doce	Asteraceae	Myrtaceae	Fernandes et al. (2001)
Serra de São José	Fabaceae	Myrtaceae	Maia & Fernandes (2004)
Itamonte	Asteraceae	Myrtaceae	Maia (2012)
São Tomé das Letras	Fabaceae	Melastomataceae	Present study

been responsible for 93% to 73% of the insect galls. Cecidomyiidae is the most speciose galling taxa of the world with more than 6,000 species (Gagné 2010).

Globoid and fusiform galls predominated. Similar results were found in other Brazilian inventories, such as Espinhaço Range, MG (Carneiro et al. 2009), Pernambuco (Santos et al. 2001), Guarapari, ES (Bregonci et al. 2010), and Itamonte, MG (Maia 2012), suggesting that these are the most common gall shapes in Brazil.

The majority of the galls was glabrous (86.18%) and one-chambered (90.8%) as in all other Brazilian galls inventories, excepting by Delfinópolis (MG), where hairy galls are more frequent than glabrous (Urso-Guimarães et al. 2003), but the difference is not significant.

The associated fauna included parasitoids (Hymenoptera), inquilines (Lepidoptera and Thysanoptera), successors (Formicidae, Hymenoptera), and predators (pseudoscorpions). The presence of parasitoids is very frequent in Brazilian surveys, being Hymenoptera the most important natural enemies of the gall midges (Maia 2001; Maia & Azevedo 2009). The parasitoids frequence varies from 4% to 71% of the total of gall morphotypes (Table 4). The highest value was recorded to Pirenópolis, GO (Araujo et al. 2007), and the lowest to Porto de Trombetas (Maia 2012). São Tomé das Letras presented one of the lowest values. According to Fernandes & Price (1992), parasitism is higher in mesic than in xeric habitats, because of longer maturation and hardening of the gall. This prediction is not confirmed in the present study.

Data on inquilines, successors, and predators are scarce in Brazilian gall inventories. In the present study, inquilines were rare, occurring in two gall morphotypes (1.3%), being represented by Lepidoptera and Thysanoptera. In other Brazilian inventories, the frequency varies from 0% to 24.4% (Table 5), and other insects are cited as inquilines: Diptera, Lepidoptera, Coleoptera, Hemiptera, Psocoptera, and Thysanoptera. Comparing the results, the inquilines of São Tomé das Letras can be considered less frequent and little diversified.

Successors were recorded in two gall morphotypes in the present study (1.3%), being represented by ants (Hymenoptera). The frequency of successors in Brazilian surveys is very low. The highest recorded value was 7.9%, (Table 6). Successors can include Collembola, Psocoptera, and Thysanoptera also. The low frequency of successors is confirmed in this study. They are probably the less studied associated insects. In São Tomé das Letras, predators (pseudoscorpions) were recorded in a single gall morphotype (0.6%). Similarly to the successors, they are also rare. In Brazilian

Table 4. Distribution of the frequency of parasitoids (Hymenoptera) in some Brazilian gall inventories.

Localities	Frequency of parasitoids	Reference
Pirenópolis (GO)	71%	Araujo et al. (2007)
Carapebus and Maricá	60%	Maia (2001)
Bertioga (SP)	48%	Maia et al. (2008)
Serra de São José (MG)	34%	Maia & Fernandes (2004)
Gurapari (ES)	31%	Bregonci et al. (2010)
Luiz Antônio (SP)	23%	Saito & Urso-Guimarães (2012)
São Tomé das Letras (MG)	12%	Present study
Itamonte (MG)	6%	Maia (2012)
Porto Trombetas (PA)	4%	Maia (2011)

Table 5. Distribution of the frequency of inquilines in some Brazilian gall inventories.

Localities	Frequency of inquilines	Inquilines identification	Reference
Bertioga (SP)	24.4%	Diptera Lepidoptera Coleoptera Hemiptera Thysanoptera	Maia et al. (2008)
Delfinópolis (MG)	22.7%	Diptera Diplopoda Psocoptera Hemiptera	Urso-Guimarães et al. (2003)
Carapebus and Maricá (RJ)	17,6%	Diptera Hymenoptera Lepidoptera Coleoptera	Maia (2001)
Porto Trombetas (PA)	17%	Coleoptera Diptera Thysanoptera	Maia (2011)
Guarapari (ES)	10%	Coleoptera Lepidoptera Thysanoptera	Bregonci et al. (2010)
Serra de São José (MG)	4.7%	Diptera Coleoptera Lepidoptera Hemiptera	Maia & Fernandes (2004)
Santa Rita do Passa Quatro (SP)	2.8%	Diptera	Urso-Guimarães & Scareli-Santos (2006)
São Tomé das Letras (MG)	1.3%	Lepidoptera Thysanoptera	Present study

Table 6. Distribution of the frequency of successors in some Brazilian gall inventories.

Localities	Frequency of successor	Successors identification	Reference
Guarapari (ES)	7.9%	Mites Psocoptera	Bregonci et al. (2010)
Bertioga (SP)	4.7%	Collembola, Psocoptera, and Thysanoptera	Maia et al. (2008)
São Tomé das Letras (MG)	1.3%	Hymenoptera	Present study
Porto Trombetas (PA)	1.3%	Psocoptera	Maia (2011)
Carapebus and Maricá (RJ)	1.0%	Hymenoptera	Maia (2001)
Itamonte (MG)	1.0%	Hymenoptera	Maia (2012)

Table 7. Distribution of the frequency of predators in some Brazilian gall inventories.

Localities	Frequency of predators	Predators identification	Reference
Carapebus and Maricá (RJ)	4.0%	*Lestodiplosis* spp. (Diptera, Cecidomyiidae) *Novohorus* sp. (pseudoscorpions)	Maia (2001)
Guarapari (ES)	2.6%	Hymenoptera (ants)	Bregonci et al. (2010)
Bertioga (SP)	2.1%	Hymenoptera (ants) *Lestodiplosis* sp. (Diptera: Cecidomyiidae)	Maia et al. (2008)
Serra de São José (MG)	1.5%	*Friebrigella* sp. (Chloropidae: Diptera) *Lestodiplosis* sp. (Diptera: Cecidomyiidae)	Maia & Fernandes (2004)
Porto Trombetas (PA)	1.3%	Lestodiplosini (Diptera: Cecidomyiidae)	Maia (2011)
São Tomé das Letras (MG)	0.6%	Pseudoscorpions	Present study
Itamonte (MG)	0%		Maia (2012)

inventories, the highest frequency is 4% (Table 7), and they are represented by ants (Formicidae, Hymenoptera), *Lestodiplosis* spp. (Diptera, Cecidomyiidae), *Friebrigella* sp. (Chloropidae: Diptera), and pseudoscorpions. This is the first record of pseudoscorpions in galls on *Calophyllum brasiliense* Cambéss (Calophyllaceae). They were previously recorded in galls on Myrtaceae.

The geographic distribution of six gall midges, *Contarinia gemmae* Maia, 2003; *Dactylodiplosis heptaphylli* Maia, 2004; *Lopesia caulinaris* Maia, 2003; *Lopesia conspicua* Maia, 2003; *Lopesia elliptica* Maia, 2003; and *Lopesia linearis* Maia, 2003 are widened to Minas Gerais.

Three other gall midges, *Asphondylia serrata* Maia, 2004, *Lopesia similis* Maia, 2004, and *Myrciaryiamia admirabilis* Maia, 2007, and one Tephritidae, *Tomoplagia rudolphi* (Lutz & Lima, 1918) are recorded for the first time to São Tomé das Letras. These species were already known from other localities of Minas Gerais.

Conclusions

The present study corroborates the patterns of insect galls already known from Brazil, and for the first time indicates *Myrcia sylvatica*, and *Calophyllum brasiliense* as super host plants, and records the presence of pseudoscorpion in galls on *Calophyllum brasiliense*.

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