Papéis Avulsos de Zoologia

Museu de Zoologia da Universidade de São Paulo

Volume 52(15):175-184, 2012 **www.mz.usp.br/publicacoes** **ISSN impresso: 0031-1049**
http://portal.revistasusp.sibi.usp.br **ISSN *on-line:* 1807-0205**
www.scielo.br/paz

Coleopterous galls from the Neotropical region

Valéria Cid Maia

ABSTRACT

Data on Neotropical coleopterous galls were compiled from the literature, which showed that 82 galls have so far been recorded among 77 plant species. The Fabaceae and Asteraceae plant families display the greatest richness in galls. Most galls are induced on stems or buds, while leaves constitute the second most attacked plant organ. Only 16 coleopteran gallers have been identified at the species level; most records are presented at the order level. The identified species belong to four families: Apionidae, Buprestidae, Curculionidae and Erirhinidae. The galls are found in Argentina, Brazil, Belize, Chile, Colombia (probably), Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama and Venezuela. Eighteen species of Coleoptera are inquilines of galls and are associated with 18 plant species, most frequently with Asteraceae, Melastomataceae and Fabaceae. The inquilines were recorded mainly in leaf galls induced by Cecidomyiidae (Diptera). The identity of these weevils is poorly known. General data indicate a lack of taxonomic studies in the Neotropical region.

Key-Words: Coleoptera; Diversity; Galler; Inquiline; Neotropics.

INTRODUCTION

From an evolutionary standpoint, galls can be seen as adaptations that allow some insect taxa to feed on high quality tissues and protect themselves from natural enemies and harsh abiotic factors (Price *et al.,* 1986; Fernandes *et al.,* 1994). Galling insects are among the most specialized herbivores. They are typically "host, organ and tissue specific" (Shorthouse & Rohfritsch, 1992). In fact, galling insects have an intimate relationship with their host plant that enables them to induce proliferation of plant cells (the gall) in a pattern characteristic of the galling species. Due to this, several authors have used gall morphotypes as a surrogate for the galling species (Fernandes & Price, 1988; Hanson & Gómez-Laurito, 2005), as well as tools in plant systematics [Raman, 1996; Abrahamson *et al.,* 1998).

Coleopterous galls generally attack branches while cecidomyiideans galls occur more frequently on leaves. This pattern was indicated by Houard in 1933, and corroborated by Maia & Oliveira, 2004. Other insect orders with galling species also show preference for some plant organs; *e.g.* Lepidoptera for bud and stem, Hemiptera and Thysanoptera for leaves (Maia, 2006).

Many coleopterous galls have been recorded in the Neotropical region, but data are scattered in the literature. Therefore, the diversity of these gallers is poorly understood. Many hypotheses have been suggested to explain insect gall diversity, considering global, regional and local patterns (Fagundes &

1. Museu Nacional, Departamento de Entomologia. Quinta da Boa Vista, São Cristóvão, CEP 20940-040, Rio de Janeiro, RJ, Brasil. E-mail: maiavcid@acd.ufrj.br

Fernandes, 2011), as well as different ecological levels (intra-specific, interspecific and community) (Fleck & Fonseca 2007). Among them, the hypotheses of plant species richness (Southwood, 1960, 1961), plant architecture (Lawton, 1983), harsh environment (Fernandes & Price, 1991), and hygrothermic stress (Fernandes & Price, 1988) have been tested, but the results are still controversial.

The main objective of this study was to compile the available information on coleopterous galls in the Neotropics, and to discuss inquilines, host plant preferences and distribution patterns.

MATERIAL AND METHODS

A search of the Thompson ISI database on papers published from 1934 through 2010 was conducted in July 2011, using 'Coleoptera (title) AND gall (topic)' as key-words. Among these papers, those focusing on the Neotropics were verified. Data before 1934 were extracted from the gall catalog of Houard, 1933.

The available information was organized into 10 tables that comprised host plant identification (family, genus and plant species), number of gall morph types per plant species, galled plant organ, galling species, distribution and references.

RESULTS AND DISCUSSION

A total of 82 coleopterous galls have been recorded in the Neotropics. These galls were distributed among 77 species of host plants (50 genera and 28 families) (see Table 1).

Fabaceae and Asteraceae were plant families with the greatest richness of galls (15 and 10 morphotypes, respectively). The other families displayed one to five gall morphotypes. Ten families (Alismaceae, Amaranthaceae, Anacardiaceae, Apocynaceae, Araceae, Bombacaceae, Curcubitaceae, Hippocrateaceae, Malvaceae, and Viscaceae) exhibited only one gall morphotype, while eleven families (Ebenaceae, Euphorbiaceae, Fagaceae, Gnetaceae, Malvaceae, Piperaceae, Rubiaceae Sapindaceae, Solanaceae, Sterculiaceae and Vitaceae) showed two morphotypes. A single family (Myrtaceae) presented four morphotypes; four families (Annonaceae, Lauraceae, Malpighiaceae and Myrtaceae) presented three; and three families (Bignoniaceae, Melastomataceae and Solanaceae) showed five morphotypes (Table 1). Fabaceae and Asteraceae are among the largest families of flowering plants in the world, as they are very diverse in the Neotropical region. Other gall-inducing insects commonly attack these plant families as well, including cecidomyiids (Diptera) and coccoids (Hemiptera) among others. The result corroborated the hypothesis that plant families with the greatest species richness display the greatest richness of galls (Southwood, 1960, 1961).

Most plant species demonstrate only one gall morphotype. Exceptions are *Baccharis concinna* Barroso (Asteraceae), *Helicteres guazumaefolia* H.B.K. (Sterculiaceae), *Notophagous obliqua* Blume (Fagaceae), and *Tibouchina pulchra* Cogn. (Melastomataceae) (Table 1), which demonstrate two morphotypes.

The galls are found in diverse biomes, occurring at dry as well as wet sites, but the majority was collected in xeric habitats (such as steppe, cerrado, restinga, caatinga, monte and semi-arid chaco forest). This corroborates the harsh environment hypothesis, which predicts that "gall formation evolves in response to harsh environments so that galling species richness will be greater in xeric habitats than in mesic habitats" (Fernandes & Price, 1991).

Most galls (about 62%) were induced on stems or buds, while leaves were the second most attacked plant organ (about 29%), followed by roots, flowers and tendrils, each with less than 3% (Table 2). No galls have been observed to occur on fruits. The number of gall morphotypes recorded (n = 76) was lower than the total number of galls (n = 82) because the plant organ has not been recorded for some galls (Table 2). The preference for stems has already been pointed out for gall-inducing coleopteran species (Houard, 1933; Maia & Oliveira, 2004). The stem was also the most attacked organ by galling lepidopteran species (Houard, 1933; Maia, 2006), contrasting with cecidomyiids (Diptera), which induce galls mainly on leaves (Gagné, 1994).

About 96% of gall inducers attacked a specific plant organ, except three species that have been observed attacking stems and leaves (petiole and midvein) simultaneously, as well as buds and leaves, corroborating plant organ specificity (Shorthouse & Rohfritsch, 1992).

Only 16 coleopteran gallers (about 20%) have been identified at the species level (Table 3). The other records have been presented at genera (n = 5), subfamily (5), family (n = 18), and order level (n = 38 or about 46%). These data demonstrate how poorly known the taxonomy of the galling species is.

The identified species belonged to thirteen genera distributed among four families (Table 4): Apionidae – *Apion* Herbst, 1797 (2 spp.) and *Noterapion* Kissinger, 2002 (1 sp.); Buprestidae – *Hylaeogena*

TABLE 1: Distribution and richness of coleopterous galls on each host plant and phytophysiognomy in the Neotropics. References are also given.

Host plant family (n = 28)	Host plant species (n = 76)	Number of gall morphotypes (n = 81)	Gall distribution	Biome	Reference
Alismaceae	*Sagittaria montevidensis* Cham.& Schlecht. f. *immaculata* Hicken	01	Argentina and Brazil	Monte and Atlantic forest	Houard, 1933; Costa-Lima, 1956
Amaranthaceae	*Agasicles vittata* Jacoby, 1905	01	Argentina	No data	Costa-Lima, 1956
Anacardiaceae	*Schinus dependens* Ortega	01	Chile	steppe	Houard, 1933; Kieffer & Herbst, 1905
Annonaceae	*Portulaca oleracea* L.	01	Argentina	Monte	Houard, 1933
	Rollinia sericea R.E. Fr.	01	Brazil	Atlantic forest (restinga)	Maia *et al.*, 2008
	Xilopia aromatica (Lam.) Mart.	01	Brazil	Cerrado	Fernandes *et al.*, 1989
Apocynaceae	*Aspidosperma tomentosum* Mart.	01	Brazil	Cerrado	Gonçalves-Alvim & Fernandes, 2001
Araceae	*Philodendrum* sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
Asteraceae	*Ageratina* sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Baccharis concinna Barroso	02	Brazil	Cerrado	Fernandes *et al.*, 1996
	B. paucidentata DC.	01	South America	No data	Houard, 1933
	Baccharis reticularia DC	01	Brazil	Cerrado	Carneiro *et al.*, 1996
	Chromolaena odorata (L.) King & Robinson	01	Brazil, Venezuela, probably Colombia	Tropical forest	Zachariades *et al.*, 2007
	Eupatorium sp.	01	Brazil	Atlantic forest	Houard, 1933; Tavares, 1917
	Lessingianthus warmingianus (Baker) H. Rob	01	Brazil	Cerrado	Carneiro *et al.*, 1996
	Parthenium hysterophorus L.	01	Argentina	No data	Fiedler, 1940
	Vernonia sp.1	01	Brazil	Atlantic forest	Moreira *et al.*, 2007
Bignoniaceae	*Amphilophium paniculatum* (L.) H.B.K	01	Panama	Tropical forest	Medianero *et al.*, 2007
	Jacaranda paucifoliolata Mart.	01	Brazil	Cerrado	Carneiro *et al.*, 1996
	Tabebuia impetiginosa (Mart. ex DC) Standl	01	Brazil	Tropical dry forest (caatinga)	Santos *et al.*, 2001
	Tabebuia pumila A.H. Gentry	01	Brazil	Cerrado	Carneiro *et al.*, 1996
	Tabebuia sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
Bombacaceae	*Eriotheca gracilipes* (K. Schum) A.Robyns	01	Brazil	Cerrado	Gonçalves-Alvim & Fernandes, 2001
Curcubitaceae	*Apodanthera smilacifolia* Cong.	01	Brazil	No data	Costa-Lima, 1956
Ebenaceae	*Diospyros brasiliensis* Mart. ex. Miq.	01	Brazil	Atlantic forest (restinga)	Maia *et al.*, 2008
	Diospyros hispida DC.	01	Brazil	Cerrado	Souza *et al.*, 2006
Euphorbiaceae	*Croton antisyphiliticus* Mart.	01	Brazil	Cerrado	Maia & Oliveira, 2004
	Not determined	01	Brazil	Cerrado	Fernandes *et al.*, 1997
Fabaceae	*Andira* sp.	01	Brazil	Cerrado	Maia & Fernandes, 2004
	Andira fraxinifolia Benth.	01	Brazil	Atlantic forest (restinga)	Maia *et al.*, 2008
	Bauhinia brevipes Vogel	01	Brazil	Cerrado	Fernandes *et al.*, 1997
	Bauhinia cheilantha (Bong.) Steud	01	Brazil	Tropical dry forest (caatinga)	Santos *et al.*, 2001
	Bauhinia sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005

Continued Table 1.

Host plant family (n = 28)	Host plant species (n = 76)	Number of gall morphotypes (n = 81)	Gall distribution	Biome	Reference
	Eriosema sp.	01	Brazil	Cerrado	Gonçalves-Alvim & Fernandes, 2001
	Erythrina berteroana Urban	01	El Salvador	No data	Whitehead, 1978
	Mimosa polycarpa	01	Brazil	Swamp	Julião *et al.,* 2002
	Nissolia fruticosa Jacq.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Prosopis alba Griseb.	01	Argentina	Monte	Houard, 1933; Jörgensen, 1916
	P. alpataco Phil.	01	Argentina	Monte	Houard, 1933; Kieffer & Jörgensen, 1910
	P. campestris Griseb.	01	Argentina	Monte	Houard, 1933
	P. elata (Burkart) Burkart (Mesquite)	01	Argentina	Semi-arid chaco forest	Fernandes *et al.,* 2002
	P. ruscifolia Grisebach	01	Argentina	Semi-arid chaco Forest	Fernandes *et al.,* 2002
	Not determined	01	Brazil	Cerrado	Maia & Fernandes, 2004
Fagaceae	*Nothofagus obliqua* Blume	02	Chile	Steppe	Houard, 1933; Kieffer & Herbst, 1905
Gnetaceae	*Ephedra tweediana* C.A. Mey.	01	Argentina	Monte	Houard, 1933
	Dahlstedtia pinnata (Benth.) Malme	01	Brazil	Atlantic forest	Costa-Lima, 1956
Hippocrateaceae	*Hippocratea volubilis* L.	01	Brazil	Atlantic forest (restinga)	Maia & Oliveira, 2004
Lauraceae	*Aiouea costaricensis* (Mez) Kosterm.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Beilschmiedia pendula (Sw.) Hemsl.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Cinnamomum cinnamomifolium (Kunth) Kosterm.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
Malpighiaceae	*Banisteriopsis malifolia* (Nees & Mart.) B.Gates	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Byrsonima apicata (Cav.) DC.	01	Brazil	Cerrado	Fernandes *et al.,* 1997
	Byrsonima arctostaphylloides Nied.	01	Brazil	Cerrado	Carneiro *et al.,* 1996
Malvaceae	*Luehea divaricata* Mart.	01	Brazil	Cerrado	Fernandes *et al.,* 1988
	Sida cordifolia L.	01	Brazil	Cerrado	Fernandes *et al.,* 1997
Melastomataceae	*Blakea* sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Miconia prasina (Sw.) DC	01	Brazil	Atlantic forest	Almeida-Cortez *et al.,* 2006
	Miconia sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
	Tibouchina pulchra Cogn.	02	Brazil	Atlantic forest (restinga)	Maia *et al.,* 2008
Myrtaceae	*Calyptranthes brasiliensis* Spreng	01	Brazil	Atlantic forest (restinga)	Vanin, 2008
	Gomidesia fenzliana Berg	01	Brazil	Atlantic forest (restinga)	Monteiro *et al.,* 1993; Vanin *et al.,* 2000
	G. martiana Berg	01	Brazil	Atlantic forest (restinga)	Monteiro *et al.,* 1993; Vanin *et al.,* 2000
	Not determined	01	Brazil	Atlantic forest	Fernandes *et al.,* 2009
Piperaceae	*Piper* sp.	01	Brazil	Atlantic forest	Costa-Lima, 1956
	Piper sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
Rubiaceae	*Hoffmannia* sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005

Continued Table 1.

Host plant family (n = 28)	Host plant species (n = 76)	Number of gall morphotypes (n = 81)	Gall distribution	Biome	Reference
	Psychotria sp.	01	Brazil	Atlantic forest	Costa-Lima, 1956
Sapindaceae	*Serjania erecta* Radlk.	01	Brazil	Swamp	Julião *et al.*, 2002
	Serjania sp.	01	Brazil	Swamp	Julião *et al.*, 2002
Solanaceae	*Capsicum parvifolium* Sendtn.	01	Brazil	Dry tropical forest	Coelho *et al.*, 2009
	Solanum grandiflorum Ruiz & Pav.	01	Brazil	Cerrado	Costa-Lima, 1956
	Solanum sp.	01	Brazil	Cerrado	Costa-Lima, 1956
	Pouteria gardneri (Mart. & Miq.) Baehni	01	Brazil	Swamp	Julião *et al.*, 2002
	Not determined	01	Brazil	Tropical dry forest (caatinga)	Santos *et al.*, 2001
Sterculiaceae	*Helicteres guazumaefolia* H.B.K.	02	Brazil	Swamp	Julião *et al.*, 2002
Viscaceae	*Phoradendron* sp.	01	Costa Rica	No data	Hanson & Gómez-Laurito, 2005
Vitaceae	*Cissus spinosa* Camb.	01	Brazil	Swamp	Julião *et al.*, 2002
	Cissus verticillata (L.) Nicolson & Jarvis	01	Belize, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Panama	No data	Ulmer *et al.*, 2010

TABLE 2: Distribution of coleopterous galls per plant part in the Neotropics.

Plant organ	Gall morphotypes (n = 76)	
	Number	%
Stem or bud	47	61.8
Leaf	22	28.9
Leaf and bud	1	1.3
Leaf and stem	2	2.6
Root	2	2.6
Flower	1	1.3
Tendril	1	1.3
Fruit	0	0

TABLE 3: Distribution of galling species per taxonomic category in the Neotropics.

Taxonomic category	Gall morphotypes (n = 82)	
	Number	%
Order	38	46.3
Family	18	21.9
Subfamily	5	6.1
Genus	5	6.1
Species	16	19.5

Obenberger 1923 (1 sp.); Curculionidae – *Collabismus* Schoenherr, 1837 (1 sp.); *Conotrachelus* Dejean, 1835 (2 spp.); *Craspedotus* Schönh., 1844 (1 sp.); *Cyrionyx* Faust 1896 (1 sp.); *Eurhinus* Illiger 1807; *HexacoIus* Hagedorn, 1909 (1 sp.); *Pacholenus* Schoenherr, 1826 (2 spp.); *Prospoliata* Hustache, 1949 (1 sp.); *Pseudomopsis* Champion, 1905 (1 sp.); and Erirhinidae – *Hypselus* Schoenherr, 1843 (1 sp.). All of them were included in the same superfamily Curculionoidae. The identified galling species were associated with only one host plant species or with two congeneric species. Five galling weevils have been identified at the genus level: *Apion* (4 spp.) and *Camptocheirus* Lacordaire 1863 (1 sp.).

Coleopterous galls from the Neotropics had been recorded in 11 countries, most of them in Brazil (n = 53), followed by Costa Rica (n = 14), Argentina (n = 10), and Panama (n = 5). The other countries had one to three records, while no information was available for the other Neotropical localities (Table 5). The number of records (n = 93) was higher than the number of gall morphotypes (n = 82) because some galls had been recorded in two or more countries.

Data from Brazil was restricted to seven states, with Minas Gerais showing the majority of records (about 45%), followed by Mato Grosso do Sul, São Paulo, Rio de Janeiro, Pernambuco, Goiás and Bahia (Table 6). Data show the greatest number of gall

TABLE 4: Distribution of coleopteran species per host plant, plant part and locality in the Neotropics.

Galling species	Host plant	Plant part	Distribution	Reference
Apionidae:				
Apion angustatum Philippi, 1864	*Nothofagus obliqua*	Stem	Chile	Kieffer & Herbst, 1905
Apion prosopides Kieffer & Jörgensen, 1910	*Prosopis alba*	Stem	Argentina	Jörgensen, 1916
	Prosopis alpataco	Leaf	Argentina	Kieffer & Jörgensen, 1910
Apion sp.1	*Croton antisyphiliticus*	Leaf	Brazil	Maia & Oliveira, 2004
Apion sp.2	*Portulaca oleracea*	Flower	Argentina	Houard, 1933
Apion sp.3	*Dahlstedtia pinnata*	Stem	Brazil	Costa-Lima, 1956
Apion sp.4	*Diospyros hispida*	Stem	Brazil	Souza *et al.,* 2006
*Noterapion candyae** (Whitehead, 1978)	*Erythrina berteroana*	Leaf	El Salvador	Whitehead, 1978
Buprestidae:				
Hylaeogena thoracica Waterhouse, 1889	*Amphilophium paniculatum*	Leaf	Panama	Medianero *et al.,* 2007
Curculionidae:				
Camptocheirus sp.	*Cinnamomum cinnamomifolium*	Stem	Costa Rica	Hanson & Gómez-Laurito, 2005
Craspedotus psychotriae (Bondar, 1946)	*Psychotria* sp.	Leaf and bud	Brazil	Costa-Lima, 1956
Collabismus clitellae Boheman, 1837	*Solanum grandiflorum*	Stem	Brazil	Costa-Lima, 1956
	Solanum sp.	Stem	Brazil	Costa-Lima, 1956
Conotrachelus albocinereus Fiedler 1940	*Parthenium hysterophorus*	Stem	Argentina	Fiedler, 1940
Conotrachelus reticulatus Champion	*Chromolaena odorata*	Stem	Brazil, Venezuela, probably Colombia	Zachariades *et al.,* 2007
Cyrionyx turbidus Hustache, 1938	*Piper (Arthante) luschnathianum*	No data	Brazil	Costa-Lima, 1956
Eurhinus magnificus Gyllenhal 1836	*Cissus verticillata*	Stem	Belize, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, Panama	Ulmer *et al.,* 2010
HexacoIus bruchi Hagedorn, 1909	*Agasicles vittata*	Stem	Argentina	Costa-Lima, 1956
Pacholenus monteiroi Vanin, 2008	*Calyptranthes brasiliensis*	Stem	Brazil	Vanin, 2008
Pacholenus pelliceus Boheman, 1836	*Gomidesia fenzliana*	Stem	Brazil	Monteiro *et al.,* 1993; Vanin *et al.,* 2000
	Gomidesia martiniana	Stem	Brazil	Monteiro *et al.,* 1993; Vanin *et al.,* 2000
Pseudomopsis peckolti Costa-Lima, 1945	*Apodanthera smilacifolia*	Stem	Brazil	Costa-Lima, 1956
Prospoliata bicolorata Hustache, 1950	*Miconia prasina*	Leaf	Brazil	Almeida-Cortez *et al.,* 2006
Erirhinidae:				
Hypselus ater Boehman, 1843 (= *Anchonoides bonariensis* Brèthes, 1910)	*Sagittaria montevidensis Immaculata*	Root	Argentina and Brazil	Houard, 1933; Costa-Lima, 1956

* Data on *Noterapion candyae* are controversial. This species was cited as a gall maker in El Salvador (Whitehead, 1978) and as a gall inquiline in Argentina and Chile (Kissinger & Linda, 2002).

TABLE 5: Distribution of coleopterous galls per country in the Neotropics.

Country	Gall morphotypes	
	Number	%
Brazil	53	57.0
Costa Rica	14	15.0
Argentina	10	10.7
Chile	3	3.2
Panama	1	1.07
Belize	1	1.07
El Salvador	1	1.07
Colombia (probably)	1	1.07
Guatemala	1	1.07
Honduras	1	1.07
Nicaragua	1	1.07
Venezuela	1	1.07
South America (country not specified)	1	1.07

TABLE 6: Distribution of coleopterous galls per Brazilian state.

Brazilian state	Gall morphotypes (n = 51)	
	Number	%
Minas Gerais	23	45.1
Mato Grosso do Sul	8	15.7
São Paulo	7	13.7
Rio de Janeiro	7	13.7
Pernambuco	4	7.8
Goiás	1	1.9
Bahia	1	1.9

morphotypes in the southeastern region of this country (Minas Gerais, São Paulo and Rio de Janeiro), which could be explained by the high amount of research in this area.

Eighteen species of Coleoptera were inquilines of galls. They were associated with 14 plant species (distributed in 14 genera and 10 different families), being more frequent on Asteraceae (n = 4), Fabaceae (n = 3) and Melastomataceae (n = 3). Two inquilines have been recorded on Myrtaceae and only one on Bignoniaceae, Boraginaceae, Clusiaceae, Fagaceae, Lamiaceae and Solanaceae (Table 7).

Inquilines have been recorded on leaf, stem and bud galls, and the majority (about 83%) on specific organs of host plant. Most inquilines were associated with leaf galls (72%), followed by stem and bud galls (Table 8). This reveals a difference between galling weevils and inquilines: the former occur mainly on buds and the latter preferentially on leaves.

Inquilines occurred mainly on galls induced by Cecidomyiidae (Diptera) (about 78%), while only one record has been associated with hymenopterous, lepidopterous and coleopterous galls (Table 9). This

TABLE 7: Distribution of inquilines per host plant family in the Neotropics.

Host plant family	No. of records of inquilines
Asteraceae	4
Bignoniaceae	1
Boraginaceae	1
Clusiaceae	1
Fabaceae	3
Fagaceae	1
Lamiaceae	1
Melastomataceae	3
Myrtaceae	2
Solanaceae	1

TABLE 8: Distribution of gall inquilines per plant organ in the Neotropics.

Plant organ	Nº. of records of inquilines
Leaf	10
Stem	4
Bud	1
Leaf or stem	2
Leaf, stem or bud	1

TABLE 9: Distribution of gall inquilines per galling insect in the Neotropics.

Galling insect group	Nº. of records of inquilines
Cecidomyiidae (Diptera)	14
Curculionidae (Coleoptera)	1
Cynipidae	1
Momphidae (Lepidoptera)	1
Not determined	1

can be explained by the fact that the majority of insect galls in the world are induced by gall midges (Felt, 1940).

Inquilinous weevils were mainly identified at the family level (about 83%). (Table 10) There are two records at the species level and one at the order level, again demonstrating poor knowledge about the taxonomy of this group.

CONCLUSION

A total of 82 coleopterous galls are known in the Neotropical region. The majority is associated with Fabaceae. Most galls are induced on stems or buds. The taxonomy of galling weevils is poorly known, as well as data on their geographical distribution. Inquiline weevils of galls have been recorded in the Neotropics, but their identification is also deficient.

TABLE 10: Distribution of inquilines per host plant, plant part, galling species and locality in the Neotropics.

Inquiline	Host plant	Plant part	Galling species	Locality
Anthonomus sp.	*Leandra aurea* (Cham.) Cogn. (Melastomataceae)	Stem	Momphidae (Lepidoptera)	Brazil
Noterapion meorrhynchum (Philippi and Philippi, 1864)	*Nothofagus dombeyi* (Mirb.) Oerst. (Fagaceae)	Leaf	*Paraulax* sp. (Cynipidae: Hymenoptera)	Argentina and Chile
Philides anthonomoides Champion, 1906	*Amphilophium paniculatum* (L.) H.B.K (Bignoniaceae)	Leaf	Curculionidae (Coleoptera)	Panama
Curculionidae	*Copaifera langsdorffii* Desf. (Fabaceae)	Leaf	Cecidomyiidae (Diptera)	Brazil
Curculionidae	*Neomitranthes obscura* (DC) N.J.E.Silveira (Myrtaceae)	Stem	*Neomitranthella robusta* Maia, 1995 (Cecidomyiidae)	Brazil
Curculionidae	*Eugenia rotundifolia* Casar (Myrtaceae)	Stem	*Stephomyia rotundifoliorum* Maia, 1993 (Cecidomyiidae)	Brazil
Curculionidae	*Mikania* cf. *biformis* DC. (Asteraceae)	Leaf or stem	*Liodiplosis spherica* Gagné, 2001 (Cecidomyiidae)	Brazil
Curculionidae	*Mikania* cf. *biformis* DC. (Asteraceae)	Leaf	*Asphondylia glomeratae* Gagné, 2001 (Cecidomyiidae)	Brazil
Curculionidae	*Mikania* cf. *biformis* DC. (Asteraceae)	Bud	*Perasphondylia mikaniae* Gagné, 2001 (Cecidomyiidae)	Brazil
Curculionidae	*Piptocarpha* cf. *cinerea* Baker (Asteraceae)	Leaf, stem or bud	*Asphondylia* sp. (Cecidomyiidae)	Brazil
Curculionidae	*Cordia curassavica* (Jacq.) Roem. & Schult. (Boraginaceae)	Leaf	Lopesiini (Cecidomyiidae)	Brazil
Coleoptera	*Calophyllum brasiliense* Cambess. (Clusiaceae)	Leaf	*Lopesia elliptica* Maia, 2003 (Cecidomyiidae)	Brazil
Curculionidae	*Andira fraxinifolia* Benth. (Fabaceae)	Leaf	*Andirodiplosis* sp. (Cecidomyiidae)	Brazil
Curculionidae	*Andira fraxinifolia* Benth. (Fabaceae)	Leaf	Asphondyliina (Cecidomyiidae)	Brazil
Curculionidae	*Hyptis fasciculata* Benth. subsp. *fasciculata* (Lamiaceae)	Leaf or stem	Cecidomyiidae	Brazil
Curculionidae	*Tibouchina trichopoda* (DC.) Baill. (Melastomataceae)	Leaf	Not determined	Brazil
Curculionidae	*Tibouchina trichopoda* (DC.) Baill. (Melastomataceae)	Stem	Cecidomyiidae	Brazil
Curculionidae	*Aureliana fasciculata* (Vell.) Sendtn. (Solanaceae)	Leaf	*Clinodiplosis* sp. (Cecidomyiidae)	Brazil

RESUMO

Informações sobre galhas induzidas por Coleoptera na região neotropical foram compiladas a partir da literatura. Oitenta e duas galhas foram assinaladas em 77 espécies de plantas. Fabaceae e Asteraceae foram as famílias botânicas que apresentaram maior riqueza de galhas. A maioria das galhas desenvolveu-se em caule ou gema; as folhas foram o segundo órgão vegetal mais atacado. Apenas 16 indutores estão identificados em nível de espécie, estando a maior parte dos registros em nível de ordem. As espécies identificadas pertencem a quatro famílias: Apionidae, Buprestidae, Curculionidae e Erirhinidae. As galhas foram coletadas na Argentina, Brasil, Belize, Chile, Colômbia (provavelmente), Costa Rica, El Salvador, Guatemala, Honduras, México, Nicarágua, Panamá e Venezuela. Dezoito espécies de Coleoptera são inquilinas de galhas e estão associadas com 18 espécies de planta, sendo mais freqüentes em are Asteraceae, Melastomataceae e Fabaceae. Os inquilinos ocorreram principalmente em galhas foliares induzidas por Cecidomyiidae (Diptera). O conhecimento taxonômico desses besouros é escasso, indicando a carência de estudos na região neotropical.

PALAVRAS-CHAVE: Coleoptera; Diversidade; Galhador; Inquilino; Neotropical.

ACKNOWLEDGEMENT

I am grateful to the Conselho Nacional de Desenvolvimento Científico e Tecnológico for financial support (Proc. 300237/2010-3).

REFERENCES

Abrahamson, W.G.; Melika, G.; Scravord, R. & Csóka, G. 1998. Gall inducing insects provide insights into plant systematic relationships. American Journal of Botany, 85:1159-1165.

Almeida-Cortez, J.S.; Alves-Araújo, A.G.; Silva, S.C.L. & Iannuzzi, L. 2006. Nota biológica e novo registro de Prospoliata bicolorata (Coleoptera, Curculionidae, Baridinae) em um fragmento de Mata Atlântica de Pernambuco. Biociências, 14(2):228-230.

Carneiro, M.A.A.; Borges, R.A.X.; Araújo, A.P.A. & Fernandes, G.W. 1996. Insetos indutores de galhas da porção sul da Cadeia do Espinhaço, Minas Gerais, Brasil. Revista Brasileira de Entomologia, 53(4):570-592.

Coelho, M.S.; Almada, E.D.; Fernandes, G.W.; Carneiro, M.A.A.; Santos, R.M. dos; Quintino, A.V. & Sanchez-Azofeifa, A. 2009. Gall inducing arthropods from a seasonally dry tropical forest in Serra do Cipó, Brazil. Revista Brasileira de Entomologia, 53(3):404-441.

Costa-Lima, A. 1956. Insetos do Brasil. Coleópteros, 4ª parte. Escola Nacional de Agronomia: Rio de Janeiro. v. 10, 373 p. (Série Didática nº 12).

Fagundes, M. & Fernandes, G.W. 2011. Insect herbivores associated with Baccharis dracunculifolia (Asteraceae): responses of gall-forming and free-feeding insects to latitudinal variation. Revista de Biologia Tropical, 59(3):1419-32.

Felt, E.P. 1940. Plant Galls and Gall Makers. Comstock Publishing Co., Ithaca, N.Y. viii + 364p.

Fernandes, G.W. & Price, P.W. 1988. Biogeographical gradients in galling species richness: tests of hypotheses. Oecologia, 76:161-167.

Fernandes, G.W. & Price, P.W. 1991. Comparisons of tropical and temperate galling species richness: the roles of environmental harshness and plant nutrient status. In: Price, P.W.; Lewinsohn, T.M.; Fernandes, G.W. & Benson, W.W. (Eds.). Plant-animal interactions: evolutionary ecology in tropical and temperate regions. Wiley, New York. p. 91-115.

Fernandes, G.W.; Araújo, R.C.; Araújo, S.C.; Lombardi, J.A.; Paula, A.S. de; Loyola-Júnior, R. & Cornelissen, T.G. 1997. Insect galls from savanna and rocky fields of the Jequitinhonha Valley, Minas Gerais, Brazil. Naturalia, 22:221-244.

Fernandes, G.W.; Boecklen, W.J.; Martins, R.P. & Castro, A.G. 1989. Ants associated with a coleopterous leaf-bud gall on Xylopia aromatica (Annonaceae). Proceedings of the Entomological Society of Washington, 91(1):81-87.

Fernandes, G.W.; Carneiro, M.A.A.; Lara, A.C.F.; Alain, L.R.; Andrade, G.I.; Julião, G.R.; Reis, T.R. & Silva, I.M. 1996. Galling insects on neotropical species of Baccharis (Asteraceae). Tropical Zoology, 9:315-332.

Fernandes, G.W.; Lara, C.F.L. & Price, P.W. 1994. The geography of galling insects and the mechanisms that result in patterns. In: Price, P.W.; Mattson, W. J & Baranchikov, Y. (Eds.).The ecology and evolution of gall-forming insects. Forest Service – U.S. Department of Agriculture, St. Paul. p. 42-48.

Fernandes, G.W.; Tameirão Neto, E. & Martins, R.P. 1988. Ocorrência e Caracterização de galhas entomógenas na vegetação do campus Pampulha da Universidade Federal de Minas Gerais. Revista Brasileira de Zoologia, 5(1):11-29.

Fernandes, G.W.; Varela, O.; Bucher, E.H.; Chan, J.M.; Echevarria, P.A.L.; Espírito Santo, M.M.; Lirna, J.; Negreiros, D. & Toledo, C.S. 2002. Gall-forming insects on woody and herbaceous plant species of the semi-arid chaco Forest, Argentina. Lundiana, 3(1):61-66.

Fernandes, S.P.C.; Castelo-Branco, B.P.; Albuquerque, F.A. de; Ferreira, A.L.N.; Brito-Ramos, A.B.; Braga, D.V.V. & Almeida-Cortez, J. 2009. Galhas entomógenas em um fragmento urbano de Mata Atlântica no centro de endemismo de Pernambuco. Revista Brasileira de Biociências, 7(3):240-244.

Fiedler, C. 1940. Monograph of the South American weevils of the genus Conotrachelus. British Museum (Natural History), London. 365p.

Fleck, T. & Fonseca, C.R. 2007. Hipóteses sobre a riqueza de insetos galhadores: uma revisão considerando os níveis intraespecífico, interespecífico e de comunidade. Neotropical Biology and Conservation, 2(1):36-45.

Gagné, R.J. 1994. The gall midges of the Neotropical Region. Cornell University Press, Ithaca. 352p.

Gonçalves-Alvim, S.J. & Fernandes, G.W. 2001. Comunidades de insetos galhadores (Insecta) em diferentes fisionomias do cerrado em Minas Gerais, Brasil. Revista Brasileira de Zoologia, 18(Supl. 1):289-305.

Hanson, P.E. & Gómez-Laurito, J. 2005. Diversity of gall-inducing Arthropods of Costa Rica. In: Raman, A.; Schaefer, C.W. & Withers, T.M., (Eds). Biology, ecology, and evolution of gall-inducing arthropods. Science Publishers Inc., New Hampshire. v.2, p. 673-692.

Houard, C. 1933. Les Zoocécidies des Plantes de L'Amérique du Sud et de L'Amérique Centrale. Hermann et Cie, Paris. 549 p.

Jörgensen, P. 1916. Zoocecidios argentinos. Physis, 2:349-365.

Julião, G.R.; Amaral, M.E.C. do & Fernandes, G.W. 2002. Galhas de insetos e suas plantas hospedeiras no pantanal sul matogrossense. Naturalia, 27:47-74.

Kieffer, J.J. & Herbst, P. 1905. Ueber Gallen und Gallenerzeuger aus Chile. Zeitschrift für wissenschaftliche Insekten-Biologie, 10:63-66.

Kieffer, J.J. & Jörgensen, P. 1910. Gallen und Gallentiere aus Argentinien. Centralblatt für Bakteriologie und Parasitenkunde, 2(27):362-444.

Kissinger, D.G. & Linda, L. 2002. Review of Noterapion kissinger from Chile and Argentina (Coleoptera: Apionidae). Insecta Mundi, 16(4):221-246.

Lawton, J.H. 1983. Plant architecture and the diversity of phytophagous insects. Annual Review of Entomology, 28:23-29.

Maia, V.C. 2006. Galls of hemiptera, lepidoptera and thysanoptera from Central and South America. Publicações Avulsas do Museu Nacional, 110:3-22.

Maia, V.C. & Fernandes, G.W. 2004. Insect galls from Serra de São José (Tiradentes, MG, Brazil). Brazilian Journal of Biology, 64(3A):423-445.

Maia, V.C. & Oliveira, J.C. de 2004. Coleoptera associated with galls from South America with new records. Arquivos do Museu Nacional, 62(2):179-184.

Maia, V.C.; Magenta, M.A.G. & Martins, S.E. 2008. Ocorrência e caracterização de galhas de insetos em áreas de restinga de Bertioga (São Paulo, Brasil). Biota Neotropica, 8(1):167-197.

Medianero, E.; Paniagua, M.C. & Barrios, H. 2007. Galls Produced by Hylaeogena thoracica (Coleoptera: Buprestidae) and the Effect of the Inquiline Philides anthonomoides (Coleoptera: Curculionidae). The Coleopterists Bulletin, 61(4):568-572.

Monteiro, R.F.; Ferraz, F.F.; Maia, V.C. & Azevedo, M.A.P. 1993. Galhas entomógenas em restinga: uma abordagem preliminar. *In:* Simpósio de Ecossistemas da Costa Brasileira,3º, São Paulo. *Anais.* ACIESP, São Paulo. p. 210-220.

Moreira, R.G.; Fernandes, G.W.; Almada, E.D. & Santos, J.C. 2007. Galling insects as bioindicators of land restoration in an area of Brazilian Atlantic Forest. *Lundiana,* 8(2):107-112.

Price, P.W.; Waring, G.L. & Fernandes, G.W. 1986. Hypotheses on the adaptive nature of galls. *Proceedings of the Entomological Society of Washington,* 88:361-363.

Raman, A. 1996. Nutritional diversity in gall-inducing insects and their evolutionary relationships with flowering plants. *International Journal of Ecology & Environmental Sciences,* 22:133-143.

Santos, J.C.; Almeida-Cortez, J.S. de & Fernandes, G.W. 2001. Richness of gall-inducing insects in the tropical dry Forest (caatinga) of Pernambuco. *Revista Brasileira de Entomologia,* 55(1):45-54.

Shorthouse, J.D. & Rohfritsch, O. 1992. *Biology of insect-induced galls.* Oxford University Press, New York.

Southwood, T.R.E. 1960. The abundance of the Hawaiian trees and the number of their associated insect species. *Proceedings of Hawaiian Entomology Society,* 17:299-303.

Southwood, T.R.E. 1961.The number of insect associated with various trees. *Journal of Animal Ecology,* 30:1-8.

Souza, R.A.; Nessim R.; Santos, J.C. & Fernandes, G.W. 2006. Influence of *Apion* sp. (Brentidae, Apioninae) stem-galls on induced resistance and leaf area of *Diospyros hispida* (Ebenaceae). *Revista Brasileira de Entomologia,* 50(3):433-435.

Tavares, J.S. 1917. Cecídias brasileiras que se criam em plantas das famílias das Compositae, Rubiaceae, Tiliaceae, Lythraceae e Artocarpaceae. *Brotéria (Série Zoológica),* 15:113-181.

Ulmer, B.J.; Duncan, R.E.; Pena, J.E. 2010. A Weevil, *Eurhinus magnificus* Gyllenhal (Insecta: Coleoptera: Curculionidae). Disponível em: www.edis.ifas.ufl.edu/pdffiles/IN/IN75100.pdf, 2010.

Vanin, S.A. 2008. A new species of *Pacholenus* Schoenherr from southeastern Brazil (Coleoptera, Curculionidae, Molytinae), and new occurrences of species of the genus. *Papéis avulsos de Zoologia,* 48(30):345-351.

Vanin, S.A.; Monteiro, R.F. & F.F. Ferraz, 2000. Ecological notes of *Pacholenus pelliceus* Boheman, 1836, a stem gall-former, with description of full grown larva (Curculionidae, Molytinae). *Papéis Avulsos de Zoologia,* 41(17):247-257.

Whitehead, D.R. 1978. *Apion (Trichapion) candyae,* New Species (Coleoptera: Curculionidae), a Gall-Maker on Leaf Petioles of *Erythrina berteroana* Urban (Fabaceae) in El Salvador. *The Coleopterists Bulletin,* 32(3):193-201.

Zachariades, C.; Strathie, L.; Delgado, O. & Retief, E. 2007. Pre-release research on biocontrol agents for *Chromolaena* in South Africa. *In:* Lai, P.-Y.; Reddy, G.V.P. & Muniappan R. (Eds). International Workshop on Biological Control and Management of *Chromolaena* and *Mikania,* 7º. *Proceedings.* National Pingtung University, Taiwan. p. 68-80.

Aceito em: 01.03.2012
Publicado em: 29.06.2012

EDITORIAL COMMITTEE

INSTRUCTIONS TO AUTHORS - (April 2007)

General Information: *Papéis Avulsos de Zoologia (PAZ)* and *Arquivos de Zoologia (AZ)* cover primarily the fields of Zoology, publishing original contributions in systematics, paleontology, evolutionary biology, ontogeny, faunistic studies, and biogeography. *Papéis Avulsos de Zoologia* and *Arquivos de Zoologia* also encourage submission of theoretical and empirical studies that explore principles and methods of systematics.

All contributions must follow the International Code of Zoological Nomenclature. Relevant specimens should be properly curated and deposited in a recognized public or private, non-profit institution. Tissue samples should be referred to their voucher specimens and all nucleotide sequence data (aligned as well as unaligned) should be submitted to GenBank (www.ncbi.nih.gov/Genbank) or EMBL (www.ebi.ac.uk).

Peer Review: All submissions to *Papéis Avulsos de Zoologia* and *Arquivos de Zoologia* are subject to review by at least two referees and the Editor-in-Chief. All authors will be notified of submission date. Authors may suggest potential reviewers. Communications regarding acceptance or rejection of manuscripts are made through electronic correspondence with the first or corresponding author only. Once a manuscript is accepted providing changes suggested by the referees, the author is requested to return a revised version incorporating those changes (or a detailed explanation of why reviewer's suggestions were not followed) within fifteen days upon receiving the communication by the editor.

Proofs: Page-proofs with the revised version will be sent to e-mail the first or corresponding author. Page-proofs *must be returned to the editor, preferentially within 48 hours.* Failure to return the proof promptly may be interpreted as approval with no changes and/or may delay publication. Only necessary corrections in proof will be permitted. Once page proof is sent to the author, further alterations and/or significant additions of text are permitted only at the author's expense or in the form of a brief appendix (note added in proof).

Submission of Manuscripts: Manuscripts should be sent to the **SciELO Submission** (http://submission.scielo.br/index.php/paz/login), along with a submission letter explaining the importance and originality of the study. Address and e-mail of the corresponding author must be always updated since it will be used to send the 50 reprints in titled by the authors. Figures, tables and graphics **should not** be inserted in the text. Figures and graphics should be sent in separate files with the following formats: ".JPG" and ".TIF" for figures, and ".XLS" and ".CDR" for graphics, with 300 DPI of minimum resolution. Tables should be placed at the end of the manuscript.

Manuscripts are considered on the understanding that they have not been published or will not appear elsewhere in substantially the same or abbreviated form. The criteria for acceptance of articles are: quality and relevance of research, clarity of text, and compliance with the guidelines for manuscript preparation.

Manuscripts should be written preferentially in English, but texts in Portuguese or Spanish will also be considered. Studies with a broad coverage are encouraged to be submitted in English. All manuscripts should include an abstract and key-words in English and a second abstract and key-words in Portuguese or Spanish.

Authors are requested to pay attention to the instructions concerning the preparation of the manuscripts. Close adherence to the guidelines will expedite processing of the manuscript.

Manuscript Form: Manuscripts should not exceed 150 pages of double-spaced, justified text, with size 12 and source Times New Roman (except for symbols). Page format should be A4 (21 by 29.7 cm), with 3 cm of margins. The pages of the manuscript should be numbered consecutively.

The text should be arranged in the following order: **Title Page, Abstracts with Key-Words, Body of Text, Literature Cited, Tables, Appendices,** and **Figure Captions.** Each of these sections should begin on a new page.

(1) **Title Page:** This should include the **Title, Short Title, Author(s) Name(s)** and **Institutions.** The title should be concise and, where appropriate, should include mention of families and/or higher taxa. Names of new taxa should not be included in titles.

(2) **Abstract:** All papers should have an abstract in **English** and another in **Portuguese or Spanish.** The abstract is of great importance as it may be reproduced elsewhere. It should be in a form intelligible if published alone and should summarize the main facts, ideas, and conclusions of the article. Telegraphic abstracts are strongly discouraged. Include all new taxonomic names for referencing purposes. Abbreviations should be avoided. It should not include references. Abstracts and key-words should not exceed 350 and 5 words, respectively.

(3) **Body of Text:** The main body of the text should include the following sections: **Introduction, Material and Methods, Results, Discussion, Conclusion, Acknowledgments,** and **References at end.** Primary headings in the text should be in capital letters, in bold and centered. Secondary headings should be in capital and lower case letters, in bold and centered. Tertiary headings should be in capital and lower case letters, in bold and indented at left. In all the cases the text should begin in the following line.

(4) **Literature Cited:** Citations in the text should be given as: Silva (1998) *or* Silva (1998:14-20) *or* Silva (1998: figs. 1, 2) *or* Silva (1998a, b) *or* Silva & Oliveira (1998) *or* (Silva, 1998) *or* (Rangel, 1890; Silva & Oliveira, 1998a, b; Adams, 2000) *or* (Silva, *pers. com.*) *or* (Silva *et al.*, 1998), the latter when the paper has three or more authors. The reference need not be cited when authors and date are given only as authority for a taxonomic name.

(5) **References:** The literature cited should be arranged strictly alphabetically and given in the following format:

- **Journal Article** - Author(s). Year. Article title. *Journal name,* volume: initial page-final page. Names of journals must be spelled out in full.
- **Books** - Author(s). Year. *Book title.* Publisher, Place.
- **Chapters of Books** - Author(s). Year. Chapter title. *In:* Author(s) ou Editor(s), *Book title.* Publisher, Place, volume, initial page-final page.
- **Dissertations and Theses** - Author(s). Year. *Dissertation title.* (Ph.D. Dissertation). University, Place.
- **Electronic Publications** - Author(s). Year. *Title.* Available at: <electronic address>. Access in: date.

Tables: All tables must be numbered in the same sequence in which they appear in text. Authors are encouraged to indicate where the tables should be placed in the text. They should be comprehensible without reference to the text. Tables should be formatted with vertical (portrait), not horizontal (landscape), rules. In the text, tables should be referred as Table 1, Tables 2 and 4, Tables 2-6. Use "TABLE" in the table heading.

Illustrations: Figures should be numbered consecutively, in the same sequence that they appear in the text. Each illustration of a composite figure should be identified by capital letters and referred in the text as: Fig. 1A, Fig. 1B, for example. When possible, letters should be placed in the left lower corner of each illustration of a composite figure. Hand-written lettering on illustrations is unacceptable. Figures should be mounted in order to minimize blank areas between each illustration. Black and white or color photographs should be digitized in high resolution (300 DPI at least). Use "Fig(s)." for referring to figures in the text, but "FIGURE(S)" in the figure captions and "fig(s)." when referring to figures in another paper.

For other details of manuscript preparation of format, consult the CBE Style Manual, available from the Council of Science Editors (www.councilscienceeditors.org/publications/style).
Papéis Avulsos de Zoologia and *Arquivos de Zoologia* are publications of the Museu de Zoologia da Universidade de São Paulo (www.mz.usp.br).
Always consult the Instructions to Authors printed in the last issue or in the electronic home pages: www.scielo.br/paz or www.mz.usp.br/publicacoes.