

## NEW DATA ABOUT THE COSTA RICAN APHID FAUNA (HEMIPTERA, APHIDIDAE)

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### ABSTRACT

D. Zamora Mejías, N. Pérez Hidalgo, W. Villalobos & P. Hanson. 2012. New data about the Costa Rican aphid fauna (Hemiptera, Aphididae). *Graellsia*, 68(2): 305-312.

Aphids were collected from 39 locations throughout Costa Rica, representing a wide altitudinal range, and from both crops and native plants. In total, 48 species of aphids were identified, associated with 62 families and 111 species of plants, many of these representing new host plant records. *Aphis nasturtii* Kaltenbach, 1843 is reported here for the first time in Central America and *Trichosiphonaphis (Xenomyzus) polygoni* (van der Goot, 1917) for the first time in Costa Rica. This brings the total number of aphid species known from the country to 91, representing 77,8% of all the known species in Central America.

**Key words:** Costa Rica; *Aphis nasturtii*; *Trichosiphonaphis (Xenomyzus) polygoni*; Costa Rica; aphids.

### RESUMEN

D. Zamora Mejías, N. Pérez Hidalgo, W. Villalobos & P. Hanson. 2012. Nuevos datos acerca de la fauna de áfidos de Costa Rica (Hemiptera, Aphididae). *Graellsia*, 68(2): 305-312 (en inglés).

Los áfidos fueron colectados en 39 diferentes localidades en Costa Rica, sobre plantas nativas y cultivos, abarcando un amplio ámbito de altitud. En total, 48 especies de áfidos fueron identificadas, asociadas a 62 familias y 111 especies de plantas, varias representan nuevas asociaciones áfido-planta. *Aphis nasturtii* Kaltenbach, 1843 se cita por primera vez para América Central y *Trichosiphonaphis (Xenomyzus) polygoni* (van der Goot, 1917) por primera vez para Costa Rica. El total de especies de áfidos conocidas dentro del país se aumenta a 91, representando el 77,8% de todas las especies citadas en América Central.

**Palabras claves:** Costa Rica; *Aphis nasturtii*; *Trichosiphonaphis (Xenomyzus) polygoni*; Costa Rica; áfidos.

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## Introduction

A large proportion of the aphids occurring in Central America are a result of human activities and natural invasions from the northern and southern hemispheres (Ortego *et al.*, 2004; Villalobos Muller *et al.*, 2010). Many species have arrived via introduced crops, ornamental plants and nursery seedlings, thereby increasing the number of aphid species present in the region (e.g. Pérez Hidalgo *et al.*, 2009). In tropical regions aphid diversity increases with altitude (Eastop, 1998) and in mountainous countries such as Costa Rica a wide range of altitudes results in a diversity of microclimates, which in turn facilitates the successful establishment of new aphid species (Pérez Hidalgo *et al.*, 2012). The study of this ever-changing aphid fauna is essential, since it contributes to our knowledge of their distribution and taxonomy, as well as strategies for the management and control of pest species (Ortego *et al.*, 2004).

Work on the Central American aphid fauna began in the seventies and eighties (Holman, 1974; Smith & Cermeli, 1979; Saunders *et al.*, 1983) and in recent years research has increased considerably (Sánchez *et al.*, 2001; Etienne, 2005; Evans & Halbert, 2007; Quirós *et al.*, 2009; Pérez Hidalgo *et al.*, 2009; Zamora Mejías *et al.*, 2010; Villalobos Muller *et al.*, 2010; Pérez Hidalgo *et al.*, 2012). Nonetheless, there is still much to be learned about the distribution and trophic relationships of the aphid species occurring in Central America. Costa Rica is one of the countries in which knowledge of aphids has increased significantly; as of early 2002 there were relatively few aphid species cited from the country and these were mainly from crops (Calvo, 1978; Chacón, 1980; Gómez, 1987; Hernández & Meneses, 1988; Meneses & Amador, 1987; Meneses & Amador, 1990; Meneses *et al.*, 1990; Rivera *et al.*, 1994; Sánchez *et al.*, 2001), but since the publication of the first list of aphids in the country (Voegtlin *et al.*, 2003) sampling has increased and regular updates have appeared (Pérez Hidalgo *et al.*, 2009; Zamora Mejías *et al.*, 2010; Villalobos Muller *et al.*, 2010; Sánchez-Monge *et al.*, 2010). The recent publications have treated not only aphids of agricultural crops (which are often more susceptible to infestation), but also non-crop trees, shrubs, herbaceous plants and bryophytes.

Among the goals and challenges in the coming years of research on tropical aphids is the genera-

tion of more information about their diversity, behavior and trophic relationships. Thus, the aim of the present study is to undertake a comprehensive survey of aphids in different locations in Costa Rica, identify the aphids and their host plants, and begin documenting the distribution of aphid species.

## Materials and methods

The sampling was undertaken during 2008 and 2009 in several locations at different elevations in Costa Rica (Table 1), and these locations included both croplands and protected areas. Geographic data were taken using a GPS Garmin Etrex.

Aphid sampling was done by direct examination of plants, and aphid host plants were pressed and dried for later identification. Fern identifications were done by Alexander Rojas (Universidad Nacional de Costa Rica) and the remaining plants were identified by Jeffrey Vásquez and Jorge Gómez-Laurito (Universidad de Costa Rica); plant names are based on those used in the Manual of Costa Rican Plants (Hammel *et al.*, 2003, 2004, 2007, 2010).

Pieces of host plants harboring aphid colonies were placed in plastic boxes 10 cm long on each side and 10 cm in height, with a ventilation hole covered with nylon fabric. Adult wingless and winged aphids were extracted daily from the boxes, and the aphids were preserved in 70% ethanol.

Specimens from each sample were mounted in Canada balsam on microscope slides following the methodology described in Voegtlin *et al.* (2003). Blackman & Eastop (1994, 2000, 2006) and Voegtlin *et al.* (2003) were used to identify the aphids. Specimens in 70% ethanol and on microscope slides are deposited in the Museum of Zoology at the University of Costa Rica (MZUCR) and in the Aphidological collection at the University of León, Spain (CRI)

## Results

In this study 48 species of aphids were identified, associated with 111 species and 62 families of plants (Table 2). Most of these host plant records involve polyphagous or oligophagous aphid species.

Table 1.— Sampling locations of aphids in Costa Rica.

Tabla 1.— Localidades de colecta de áfidos en Costa Rica.

	Province	Location	Elevation in meters
1	Alajuela	Grecia	1963
2	Alajuela	La Garita	857
3	Alajuela	Palmares	1100
4	Alajuela	Poás	1588
5	Alajuela	San Ramón	1098
7	Alajuela	Zarcero	1648
8	Alajuela	Volcán Arenal	532
9	Cartago	Cervantes	1513
10	Cartago	Coris	1424
11	Cartago	Cot	1895
12	Cartago	La Unión	1843
13	Cartago	Oreamuno	1946
14	Cartago	Paraíso	1079
15	Cartago	Taras	1598
16	Cartago	Tierra Blanca	2380
17	Cartago	Turrialba	680
18	Cartago	Volcán Irazú	3203
19	Guanacaste	Cañas	26
20	Guanacaste	La Cruz	2
21	Guanacaste	Liberia	133
22	Guanacaste	Tilarán	548
23	Heredia	Cariblanco	848
24	Heredia	San Miguel	1165
25	Heredia	Sarapiquí	172
26	Limón	Colorado	86
27	Puntarenas	Buenos Aires	150
28	Puntarenas	Coto Brus	1311
29	Puntarenas	Esparza	160
30	Puntarenas	Garabito	60
31	Puntarenas	Monteverde	1382
32	Puntarenas	Osa	10
33	Puntarenas	Sardinal	161
34	San José	Cerro Buena Vista	3161
35	San José	Coronado	1758
36	San José	Desamparados	1199
37	San José	Montes de Oca	1214
38	San José	Mora	1016
39	San José	Pérez Zeledón	1706

## NEW RECORDS FOR CENTRAL AMERICA AND COSTA RICA

*Aphis nasturtii* Kaltenbach is reported here for the first time in Central America and *Trichosiphonaphis (Xenomyzus) polygoni* (van der Goot) is a new record for Costa Rica. These species are discussed in greater detail below, including the locality where they were collected, the geographic coordinates, elevation (in meters above sea level), date and lot number.

***Aphis nasturtii*** Kaltenbach, 1843 (Aphidinae: Aphidini: Aphidina)

STUDIED MATERIAL: Apterous viviparous females were present on *Xanthosoma mexicanum* Liebm. (Araceae): Guanacaste province, Tilarán, 10° 28.413'N, 84° 57.961'W, 561 m, 17-IX-09 (MZUCR cra 216; CRI-800); mixed with *Pentalonia nigronervosa* Coquerel.

They were collected on both sides of the leaves. The wingless females are pale green in life including the cauda and siphunculi. The legs and antennae show a slight dark pigmentation. The body is 0.9 to 2.4 mm in length. The antennae have 5-6 segments and are 0.4 to 0.8 times the body length. The terminal process of VI antennal joint is 1.2 to 3.5 times the length of the basal part. The apical rostral segment is 0.08 to 0.12 mm long the length of the second posterior tarsal segment, and has 1-3 secondary setae. The siphunculi are 0.13 to 0.30 mm in length. The abdomen lacks pigmentation, except for the stigmatic sclerites.

*Aphis nasturtii* is a species mentioned as present mainly in the Palearctic; in America it has been cited in Chile, Argentina, Canada, USA and Mexico (Blackman & Eastop, 2006). It is cited as holocyclic on *Rhamnus* sp. (Rhamnaceae) and polyphagous on its secondary host plants, where it may sometimes be anholocyclic (Blackman & Eastop, 2006), a phenomenon that may be occurring in Costa Rica.

***Trichosiphonaphis (Xenomyzus) polygoni*** (van der Goot, 1917) (Aphidinae: Macrosiphini)

STUDIED MATERIAL: *Polygonum acuminatum* Kunth (Polygonaceae): San José province, Herradura, Rivas, Pérez Zeledón, 9° 30.057'N, 84° 36.817'W, 1721 m, 20-IX-09 (MZUCR cra 154; CRI-771).

Wingless and winged females are yellow or dark green, sometimes almost black. The body length is 1.3-2.2 mm. Secondary sensoria are present on antennal segments III, IV, V (20-41, 8-21, and 1-11, respectively), and the antennal tubercles are well developed. The cauda is long, without constrictions at the base, and has 4-15 hairs. The basal diameter of the siphunculi is at least 0.5 times the apical diameter.

*Trichosiphonaphis (Xenomyzus) polygoni* lives on *Polygonum* spp. in E. Asia (Japan, China, Taiwan, India, Pakistan and Java) and introduced in the USA (Smith & Denmark, 1982) and Panama (Remaudière *et al.*, 1992), but its life cycle is unknown (Blackman & Eastop, 2006).

Table 2.— New host plant records of aphids. For locality codes see Table 1; \* indicates a new host plant record for the world (based primarily on Blackman & Eastop, 1994, 2000, 2006); \*\* indicates a new host plant record for Costa Rica.

Tabla 2.— Nuevas citas de plantas hospedadoras. Los códigos de localidades se encuentran en la Tabla 1; \* indica una nueva cita de planta hospedadora para el mundo (basado principalmente en Blackman & Eastop, 1994, 2000, 2006); \*\* indica un nuevo reporte de planta hospedadora para Costa Rica.

Aphid Species	Host Plant Family	Host Plant Species	Locality Code	
<i>Aphis coreopsidis</i>	Asteraceae	<i>Bidens pilosa</i> L.	2, 5, 11, 14	
	Brassicaceae	<i>Brassica campestris</i> L. (vagrant)	11	
<i>Aphis craccivora</i>	Fabaceae	** <i>Vicia sativa</i> L.	11	
		* <i>Trifolium amabile</i> Kunth	11	
<i>Aphis gossypii</i>	Asteraceae	* <i>Vernonia arborescens</i> (L.) Sw.	12	
	Bignoniaceae	* <i>Jacaranda mimosifolia</i> D. Don	37	
	Caryophyllaceae	** <i>Drymaria cordata</i> (L.) Willd. Ex Schult.	37	
	Commelinaceae	* <i>Tradescantia zebrina</i> Hort. ex Bosse	5	
	Lythraceae	** <i>Cuphea appendiculata</i> Benth.	4	
	Malvaceae	** <i>Hibiscus mutabilis</i> L.	8	
	Piperaceae	<i>Piper</i> sp.	37	
	Solanaceae	** <i>Cyphomandra betaceae</i> (Cav.) Sendtn	7, 15, 16, 39	
	Solanaceae	<i>Lycopersicon sculentum</i> L.	27	
	<i>Aphis helianthi</i>	Agavaceae	* <i>Furcraea cabuya</i> Trel.	4, 37
<i>Yucca guatemalensis</i> Hort ex Baker			37	
<i>Aphis illinoisensis</i>	Vitaceae	<i>Vitis tiliifolia</i> Humb. & Bonpl.	28	
<i>Aphis nasturtii</i>	Araceae	* <i>Xanthosoma mexicanum</i> Liebm.	22	
<i>Aphis nerii</i>	Apocynaceae	* <i>Tabernaemontana alba</i> Mill.	24, 37	
	Asclepiadaceae	<i>Asclepias curassavica</i> L.	9, 27, 31, 17	
<i>Aphis sp.</i>	Asteraceae	<i>Gonolobus edulis</i> Hemsl.	19, 20, 37	
		* <i>Gomphocarpus physocarpus</i> E. Mey	35	
		<i>Vernonia arborescens</i> (L.) Sw.	1	
		* <i>Achyranthes aspera</i> L.	2	
		* <i>Schefflera arboricola</i> (Hayata) Merr.	5	
		* <i>Eleutheranthera ruderalis</i> (Sw.) Sch. Bip.	21	
		** <i>Bursera simaruba</i> (L.) Sarg.	26	
		* <i>Drymaria cordata</i> (L.) Willd. Ex Schult.	37	
		* <i>Bauhinia purpurea</i> L.	15, 23	
		* <i>Lonchocarpus</i> sp.	23	
<i>Aphis spiraecola</i>	Asteraceae	** <i>Indigofera hirsuta</i> L.	32	
		** <i>Malphigia emarginata</i> D. C.	2	
		** <i>Monina</i> sp.	1	
		** <i>Bougainvillea glabra</i> Choisy	14	
		Onagraceae	<i>Ludwigia</i> sp.	39
		Piperaceae	** <i>Piper</i> sp.	12, 37
		Rubiaceae	* <i>Warszewiczia coccinea</i> (Vahl) Klotzsch	8
			<i>Hamelia patens</i> Jacq.	31, 35
			** <i>Zanthoxylum</i> sp.	5
			** <i>Citrus aurantium</i> L.	7
<i>Aulacorthum solani</i>	Sapindaceae	<i>Citrus sinensis</i> L.	21	
		* <i>Cupania glabra</i> Sw.	37	
		** <i>Cestrum</i> sp.	2	
		** <i>Solanum</i> sp.	2	
		Urticaceae	* <i>Phenax mexicanus</i> Wedd.	39
		Zingiberaceae	<i>Alpinia purpurata</i> (Vieill.) K. Schum.	19
		Asteraceae	** <i>Emilia sonchifolia</i> (L.) DC.	36
		Geraniaceae	* <i>Perlagonium hortorum</i> L.H. Bailey	7, 34
		Lythraceae	* <i>Cuphea appendiculata</i> Benth.	5, 38
		Orchidaceae	* <i>Oncidium</i> sp.	37
<i>Brachycaudus helichrysi</i>	Papaveraceae	** <i>Bocconia frutescens</i> L.	35	
	Solanaceae	* <i>Cyphomandra betaceae</i> (Cav.) Sendtn	7	
<i>Brachycaudus helichrysi</i>	Asteraceae	* <i>Agerantum microcarpum</i> (Benth. Ex Oerst) Hemsl.	9, 11, 31, 39	
		** <i>Bidens pilosa</i> L.	31, 36	
		** <i>Emilia sonchifolia</i> (L.) DC.	10, 4, 5, 14, 36, 39	
		<i>Erechtites valerianifolia</i> (Wolf) DC.	9	
		* <i>Gamochoaeta americana</i> (Mill.) Wedd.	18, 37	
		** <i>Gnaphalium</i> sp.	34	
		* <i>Senecio oerstedianus</i> Benth.	18	
		* <i>Taraxacum officinale</i> L.	31, 36	

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Table 2.– Cont.

Aphid Species	Host Plant Family	Host Plant Species	Locality Code
		Unknow host plant	34
	Cyperaceae	<i>Cyperus hermaphroditus</i> (Jacq.) Standl.	39
	Loasaceae	* <i>Nasa triphylla</i> Juss.	35
	Lythraceae	* <i>Cuphea appendiculata</i> Benth.	5
	Ranunculaceae	** <i>Ranunculus repens</i> L.	35
	Solanaceae	<i>Solanum</i> sp.	34
	Valerianaceae	* <i>Valeriana prionophylla</i> Standl.	34
<i>Brevicoryne brassicae</i>	Brassicaceae	** <i>Brassica campestris</i> L.	9, 10, 11,
<i>Cerataphis brasiliensis</i>	Arecaceae	* <i>Washingtonia filifera</i> (Linden) H.Wenc	5, 26
		<i>Chamaedorea costaricana</i> Oerst	37
<i>Cerataphis orchidearum</i>	Orchidaceae	* <i>Cattleya skinneri</i> Bateman	5
	Zingiberaceae	<i>Alpinia purpurata</i> (Vieill.) K. Schum.	30
<i>Cinara fresai</i>	Cupressaceae	** <i>Cupressus lusitanica</i> Mill.	1, 7, 16, 34, 35
<i>Cinara watsoni</i>	Pinaceae	* <i>Pinus devoniana</i> Lindl.	34
<i>Greenidea psidii</i>	Myrtaceae	<i>Psidium guajava</i> L.	1, 5, 14, 22, 23, 28, 31
<i>Hyperomyzus caduellinus</i>	Asteraceae	* <i>Taraxacum officinale</i> L.	9, 37
<i>Hysteroneura setariae</i>	Cyperaceae	* <i>Rhynchospora polyphylla</i> Valh	37
	Poaceae	** <i>Pennisetum purpureum</i> Schumach.	33
		** <i>Paspalum</i> sp.	37
		** <i>Cynodon nlemfuensis</i> Vanderyst	37
<i>Idiopterus nephrolepidis</i>	Blechnaceae	<i>Blechnum schiedeanum</i> (Schldt. ex) C. Pres H	35
	Lomariopsidaceae	<i>Nephrolepis cordifolia</i> (L.)C. Presl	23
<i>Illinoia morrisoni</i>	Cupressaceae	<i>Cupressus lusitanica</i> Mill.	35
<i>Lipaphis erysimi</i>	Brassicaceae	** <i>Brassica campestris</i> L.	34
		<i>Brassica oleraceae</i> L.	39
	Unknown family	Unknown host plant	29
	Loasaceae	* <i>Nasa triphylla</i> Juss.	35
<i>Lizerius</i> sp.	Lauraceae	** <i>Ocotea</i> sp.	2
<i>Macrosiphoniella sanborni</i>	Asteraceae	<i>Chrysanthemum</i> sp.	37
<i>Macrosiphum euphorbiae</i>	Solanaceae	<i>Lycopersicum sculentum</i> L.	13
<i>Macrosiphum rosae</i>	Rosaceae	** <i>Rosa chinensis</i> Jacq.	34, 37
<i>Macrosiphum salviae</i>	Lamiaceae	** <i>Ocimum sanctum</i> L.	2
	Myricaceae	* <i>Morella pubescens</i> (Willd.) Wilbur	34
<i>Microparsus pojani</i>	Polypodiaceae	* <i>Phlebodium pseudoaureum</i> (Cav.) Lellinger	11
<i>Myzodium modestum</i>	Polytrichaceae	** <i>Polytrichum juniperinum</i> Hedw.	34
<i>Myzus ascalonicus</i>	Ranunculaceae	** <i>Ranunculus repens</i> L.	35
<i>Myzus hemerocallis</i>	Liliaceae	** <i>Hemerocallis fulva</i> (L.) L.	37
<i>Myzus ornatus</i>	Araliaceae	* <i>Oreopanax pycnocarpus</i> Donn. Sm.	34
	Asteraceae	Unknow host plant	37
		* <i>Gamochaeta americana</i> (Mill.) Wedd.	37
	Lamiaceae	<i>Salvia</i> sp.	34
	Polygonaceae	<i>Rumex</i> sp.	34
	Ranunculaceae	* <i>Ranunculus repens</i> L.	35
	Rosaceae	* <i>Rubus urticifolius</i> Poir.	34
	Rutaceae	** <i>Citrus sinensis</i> L.	4
	Scrophulariaceae	* <i>Digitalis purpurea</i> L.	34
	Solanaceae	** <i>Cyphomandra betaceae</i> (Cav.) Sendtn	9, 15
		<i>Solanum</i> sp.	34
	Valerianaceae	* <i>Valeriana prionophylla</i> Standl.	34
<i>Myzus persicae</i>	Apocynaceae	<i>Catharanthus roseus</i> (L.) G. Don.	37
	Asteraceae	** <i>Bidens pilosa</i> L.	36
	Brassicaceae	** <i>Brassica campestris</i> N/D	10, 11
	Caryophyllaceae	** <i>Drymaria cordata</i> (L.) Willd. Ex Schult.	37
	Loasaceae	* <i>Nasa triphylla</i> Juss.	35
	Lythraceae	* <i>Cuphea appendiculata</i> Benth.	4
	Polygonaceae	* <i>Polygonum acuminatum</i> Kunth	35
	Solanaceae	<i>Lycopersicum esculentum</i> L.	7
<i>Neomyzus circumflexum</i>	Fabaceae	* <i>Trifolium amabile</i> Kunth	11
	Rubiaceae	** <i>Hamelia patens</i> Jacq.	35
<i>Neophyllaphis araucariae</i>	Araucariaceae	* <i>Araucaria excelsa</i> (Lamb.) R. Br	23, 28
<i>Pentalonia nigronervosa</i>	Araceae	* <i>Xanthosoma mexicanum</i> Liebm.	22
	Costaceae	* <i>Costus pulverulentus</i> C. Presl.	37
	Heliconiaceae	* <i>Heliconia rostrata</i> Ruiz & Pavón	3, 25
	Musaceae	* <i>Musa acuminata x balbisiana</i>	21
	Zingiberaceae	** <i>Elettaria cardomomum</i> (L.) Maton	5
		** <i>Alpinia purpurata</i> (Vieill.) K. Schum.	22, 25, 30
<i>Rhodobium porosum</i>	Solanaceae	<i>Solanum</i> sp.	34

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Table 2.– Cont.

Aphid Species	Host Plant Family	Host Plant Species	Locality Code
<i>Rhopalosiphum maidis</i>	Poaceae	<i>Zea mays</i> L.	11, 39
<i>Schizaphis rotundiventris</i>	Cyperaceae	* <i>Cyperus odoratus</i> L.	13
<i>Sipha flava</i>	Cyperaceae	* <i>Cyperus odoratus</i> L.	13
	Polygonaceae	<i>Rumex</i> sp.	13
	Rosaceae	<i>Rubus urticifolius</i> Poir. (vagrant)	34
<i>Sitobion luteum</i>	Orchidaceae	* <i>Oerstedella schummaniana</i>	8
<i>Sarucallis kahawaluokalani</i>	Myrtaceae	* <i>Eugenia uniflora</i> L.	37
<i>Toxoptera aurantii</i>	Anacardiaceae	* <i>Spondias purpurea</i> L.	31
	Chrysobalanaceae	* <i>Licania platypus</i> (Hemsl.) Fritsch	2
	Clusiaceae	* <i>Calophyllum inophyllum</i> L.	26
	Ericaceae	* <i>Cavendishia</i> sp.	11
		* <i>Cavendishia bracteata</i> Ruiz & Pav. ex J.St.-Hi Hoerold	34
	Lythraceae	* <i>Cuphea appendiculata</i> Benth.	38, 39
	Myrtaceae	* <i>Psidium friedrichsthalianum</i> (O. Berg) Nied.	5
	Passifloraceae	** <i>Passiflora edulis</i> Sims	1
	Polygonaceae	** <i>Coccoloba</i> sp.	26
	Rutaceae	<i>Citrus sinensis</i> L.	26
	Sapindaceae	* <i>Litchi chinensis</i> Sonn.	2
	Solanaceae	** <i>Cestrum</i> sp.	26
	Winteraceae	* <i>Drymis granadensis</i> L.	34
<i>Toxoptera citricidus</i>	Myrcinaceae	* <i>Ardisia</i> sp.	5
	Rubiaceae	* <i>Hamelia patens</i> Jacq.	25
	Rutaceae	** <i>Citrus aurantium</i> L.	5
		<i>Citrus sinensis</i> L.	4, 5, 25, 30, 37
		** <i>Zanthoxylum</i> sp.	5
<i>Trichosiphonaphis polygoni</i>	Polygonaceae	* <i>Polygonum acuminatum</i> Kunth	39
<i>Tuberolachnus salignus</i>	Salicaceae	** <i>Salix humboldtiana</i> Willd.	39
<i>Uroleucon ambrosiae</i>	Asteraceae	* <i>Agerantum microcarpum</i> (Benth. Ex Oerst) Hemsl.	39
		* <i>Emilia sonchifolia</i> (L.)DC.	5
		<i>Verbesina gigantea</i> Jacq.	4, 38
	Unknown family	Unknown host plant	37
<i>Uroleucon gravicorne</i>	Asteraceae	<i>Conyza canadensis</i> (L.) Cronquist	4, 37
		* <i>Milleria quinqueflora</i> L.	9
	Rosaceae	<i>Rubus</i> sp.	34

The genus *Trichosiphonaphis* is closely related to *Myzus* and its origin is mainly in the Palaearctic and East Asia, where it alternates between *Lonicera* (Caprifoliaceae) and *Polygonum* (Polygonaceae) (Blackman & Eastop, 2006). Remaudière *et al.* (1992) provided a review of the genus and a key to the species.

## Discussion

As of 2010 the number of aphid species (Aphididae) cited from Costa Rica was 88 (Villalobos Muller *et al.*, 2010) and later this number increased to 89 (Pérez Hidalgo *et al.*, 2012). With the new records from the present study the number is now 91 species, compared with a total of 62 species reported by Voegtlin *et al.* (2003), and representing 77,8% of the 117 species known in Central America. This is the highest number of aphid species reported from any country or territo-

ry in Central America and the Caribbean, surpassing the 71 species in Panama (Quirós *et al.*, 2009), 26 in Nicaragua (Smith & Cermeli, 1979; Saunders *et al.*, 1983), 44 in Honduras (Evans & Halbert, 2007), 82 in Cuba (Holman, 1974; Etienne 2005), 41 in Puerto Rico (Étienne, 2005), and 58 in Guadeloupe (Etienne, 2005).

The species that were most frequently collected during this study were *Aphis gossypii* Glover, *Aphis spiraeicola* Patch, *Myzus ornatus* Laing, *Toxoptera aurantii* (Boyer de Fonscolombe) and *Toxoptera citricidus* (Kirkaldy), which indicates a stable and extensive presence in the country. Other species that were also frequently collected were *Aphis coreopsidis* (Thomas), *Aulacorthum solani* (Kaltenbach), *Brachycaudus helichrysi* (Kaltenbach), *Myzus persicae* (Sulzer) and *Hysteroneura setariae* (Thomas) which, like the above species, are not native to Central America (Cermeli, 2006), but are now widely distributed and present on a wide range of host plant species.

Aphid-plant relationships are of vital importance when studying aphid population dynamics and how they might modify the dynamics of plant communities. Among the aphid-plant associations that deserve special attention are some that were previously known and which directly impact crops throughout the country. *Aphis spiraeicola* and *Toxoptera citricidus* were frequently collected, mainly on *Citrus*, although the latter aphid is highly polyphagous (Voegtlin *et al.*, 2003; Villalobos Muller *et al.*, 2010). *Greenidea psidii* van der Goot has been widely distributed, especially on plants in the family Myrtaceae (Pérez Hidalgo *et al.*, 2009). *Toxoptera aurantii* is also widely distributed throughout the country (Voegtlin *et al.*, 2003; Villalobos Muller *et al.*, 2010) and it feeds on many native plants (Table 2), which suggests that it has adapted to natural ecosystems; for example, *Coccoloba uvifera* L., a common plant on both coasts (Zuchowski, 2005), was sometimes highly infested. *Pentalonia nigronervosa* (Coquerel), originally on Musaceae, is also found on Zingiberaceae and Heliconiaceae in Costa Rica, both of which are native families with species of economic importance as ornamentals (Voegtlin *et al.*, 2003; Villalobos Muller *et al.*, 2010). *Cerataphis brasiliensis* (Hempel) on palms and *Cerataphis orchidearum* (Westwood) on orchids also affect ornamental plants, as do *Brachycaudus helichrysi* and the polyphagous species comprising the *Aphis* and *Uroleucon* complexes.

While some aphid species are restricted to just a few species of host plants, many are both crop pests and present in native ecosystems. The less frequently collected species, including the new records presented here, can potentially provide information that is useful in the monitoring and management of aphids in the country. More research is needed on the aphids of native plants in order to identify the native species (undoubtedly a minority of the aphid fauna), how the introduced species become adapted and how they might affect native plants, and whether some native plants provide reservoirs for crop pests.

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