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NEW PHYTOSEIID MITES OF THE FRENCH WEST INDIES, WITH DESCRIPTION OF A NEW SPECIES, AND NEW RECORDS (ACARI: MESOSTIGMATA)

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ABSTRACT — The authors report results of several surveys carried out to collect phytoseiid mites, between April 2008 and January 2009, in crops and natural surrounding vegetation in several locations of Guadeloupe, La Désirade, Les Saintes and Martinique. A catalogue of 11 new species for Guadeloupe, La Désirade, Les Saintes and Martinique is provided with some information on their biology, when available, and biogeography. New locations for six additional species rarely recorded in the West Indies are also provided. Among the 11 new species, one species new to Science, named *Transeius mariae-angeae*, is described.

KEYWORDS — survey, collection, taxonomy, systematics, *Transeius mariae-angeae*

INTRODUCTION

Several species in the family Phytoseiidae are important natural enemies controlling phytophagous mite in several crops (McMurtry and Croft, 1997). This family is widespread all over the world and consists of about 2,200 valid species dispatched in three sub-families (Kreiter and Tixier, 2006; Chant and McMurtry, 2007; Kreiter and Tixier, 2010).

The Carribean area constitutes one of the world's hotspots of biodiversity. The hotspot of biodiversity concept was defined by Myers (1988) in order to identify the most immediately important areas for conservation of biodiversity. These hotspots hold high endemism levels and have lost at least 70 % of their original natural vegetation (Myers *et al.*, 2000). The characterization of the phytoseiid mite diversity in the Carribean area is thus contributing to this general topic of conservation.

Nine species of phytoseiid mites were found in a first survey conducted in various locations in Guadeloupe and Martinique (Kreiter and Moraes, 1997). In a second survey, 41 additional species were recorded from all islands of the French Antilles (Moraes *et al.*, 2000), including three new species to Science. In a third survey, conducted mainly in Guadeloupe and Martinique, six additional species were added to the French Antilles

fauna, including a new species to Science (Kreiter *et al.*, 2006). The present known number of species from the French Antilles is 56.

This paper focuses on results of several surveys in Guadeloupe, La Désirade, Les Saintes and Martinique carried out from April 2008 to February 2011.

Materials and methods

Plant inhabiting mites were collected from various cultivated (mainly citrus in Guadeloupe and bananas in Martinique) or uncultivated plants from April 2008 to February 2011. Depending on the plants considered, mites were directly collected on leaves with a brush using a stereoscopic microscope, or by using the leaf dipping-shaking-washing-filtering method (Boller, 1984), or by beating shrubs and trees. Mites were then transferred with a fine brush into small plastic vials containing 70° alcohol.

Plant species were identified according to nomenclature in Fournet (2002).

Mites were then mounted on slides using Hoyer's medium and identified using a phase and interferential contrast microscope (Leica DMLB, Leica Microsystèmes SAS, Nanterre, France).

Taxonomy follows Chant and McMurtry (1994, 2007), and the catalogue of Moraes *et al.* (2004b) was used for faunistical and biogeographical aspects. The chaetotaxy terminologies used in this paper followed those proposed by Lindquist and Evans (1965) as adapted by Rowell *et al.* (1978) for Phytoseiidae for dorsal and by Chant and Yoshida-Shaul (1991) for ventral idiosomal setae, respectively. Adenotaxy and poroidotaxy terminologies are those proposed by Athias-Henriot (1975).

Specimens of each species are deposited in the mite collections of Montpellier SupAgro conserved in UMR CBGP.

All measurements are given in micrometers (μm).

The following abbreviations are used in this paper: CBGP (Centre de Biologie pour la Gestion des Populations); CIRAD (Centre International de Recherche Agronomique pour le Développement); FREDON (Fédération Régionale de Défense contre les Organismes Nuisibles); MSA (Montpellier SupAgro, France); UMR (Unité Mixte de recherche); IRD (Institut de Recherche pour le Développement); INRA (Institut National de la Recherche Agronomique; Centre de recherche de Montpellier, France).

Results and discussion

Eleven new species for French Antilles were found from April 2008 to February 2011 in these surveys. The catalogue of the 11 sp is completed by the available information on the biology and the distribution, along with taxonomical data. New locations for six rarely collected species in the French Antilles are provided and the new to Science species, *Transeius marieae-angeae* n. sp., is described here below.

New species for Guadeloupe, La Désirade and Martinique

Sub-family Amblyseiinae
Tribe Amblyseiini Wainstein
Sub-tribe Amlyseiina Chant and McMurtry
***Transeius* Chant and McMurtry**

Transeius mariae-angeae Kreiter **n.sp.**

Description

Adult Female (Figs. 1-3) (n = 2)

Dorsum (Fig. 1) — Dorsal shield 305 – 313 long and 205 – 215 wide, strongly reticulated on the whole dorsum, with 5 solenostomes (gd1, 2, 6, 8 and 9), 9 pairs of poroids, 17 pairs of dorsal setae and 2 pairs of sub-lateral setae: j1 20 – 23, j3 36 – 38, j4 15 – 18, j5 16 – 19, j6 15 – 18, J2 13 – 14, J5 8 – 9, z2 33 – 26, z4 29 – 33, z5 9, Z1 16 – 18, Z4 54 – 55, Z5 74 – 75, s4 58 – 60, S2 28 – 30, S4 14 – 15, S5 14 – 16, r3 23 – 25, R1 21. All setae smooth except Z4 and Z5 which are moderately serrated.

Peritreme (Fig. 1) — Extending to the level of j1.

Venter (Fig. 2) — Sternal shield smooth. Other shields smooth. Sternal shield not very large, with 3 pairs of setae and 2 pairs of pores; 1 pair (st4) out of the sternal shield, on a small metasternal shield;

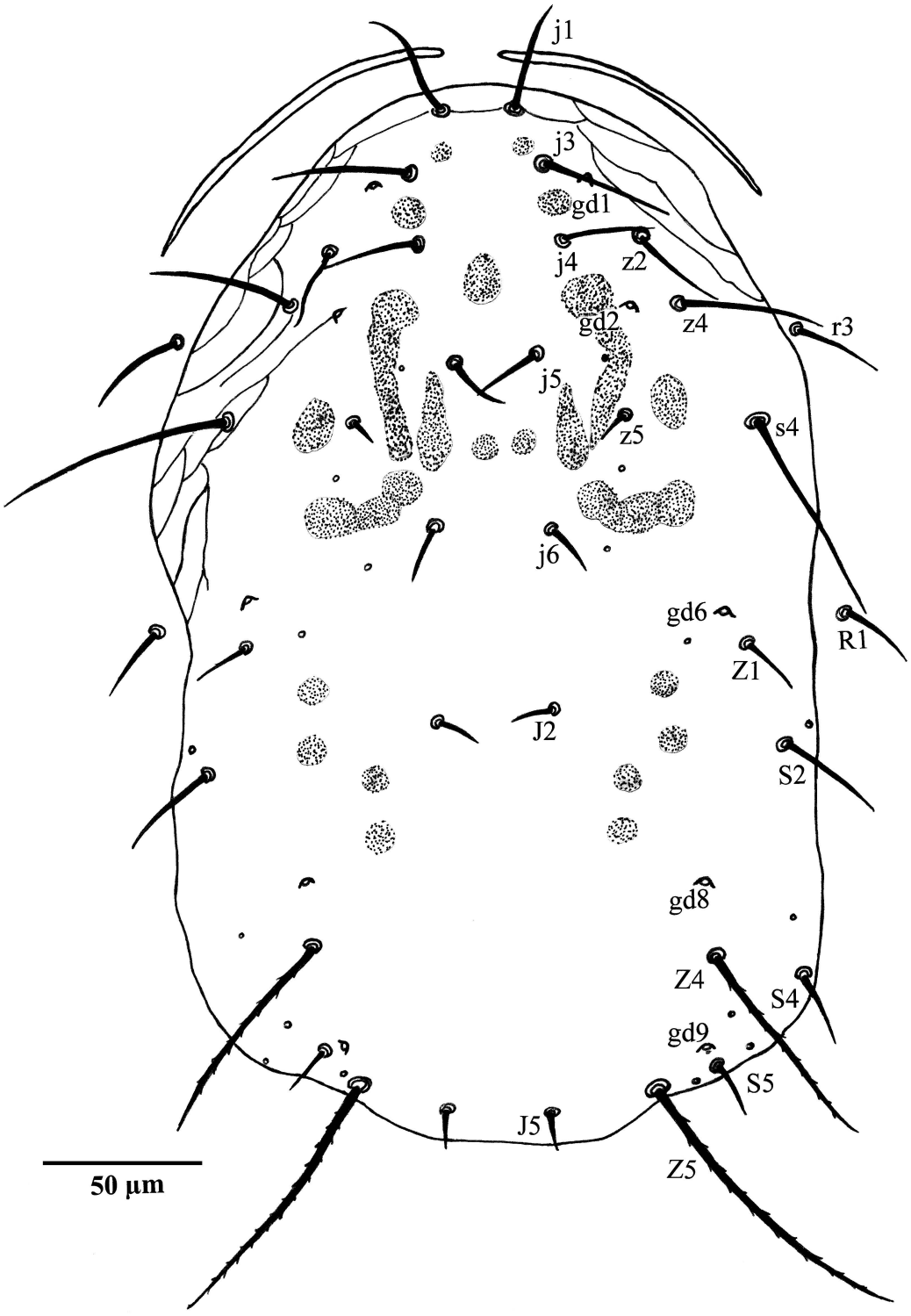


FIGURE 1: Dorsal shield of the female of *Transeius marieae-angeae* **n. sp.** (from the holotype)

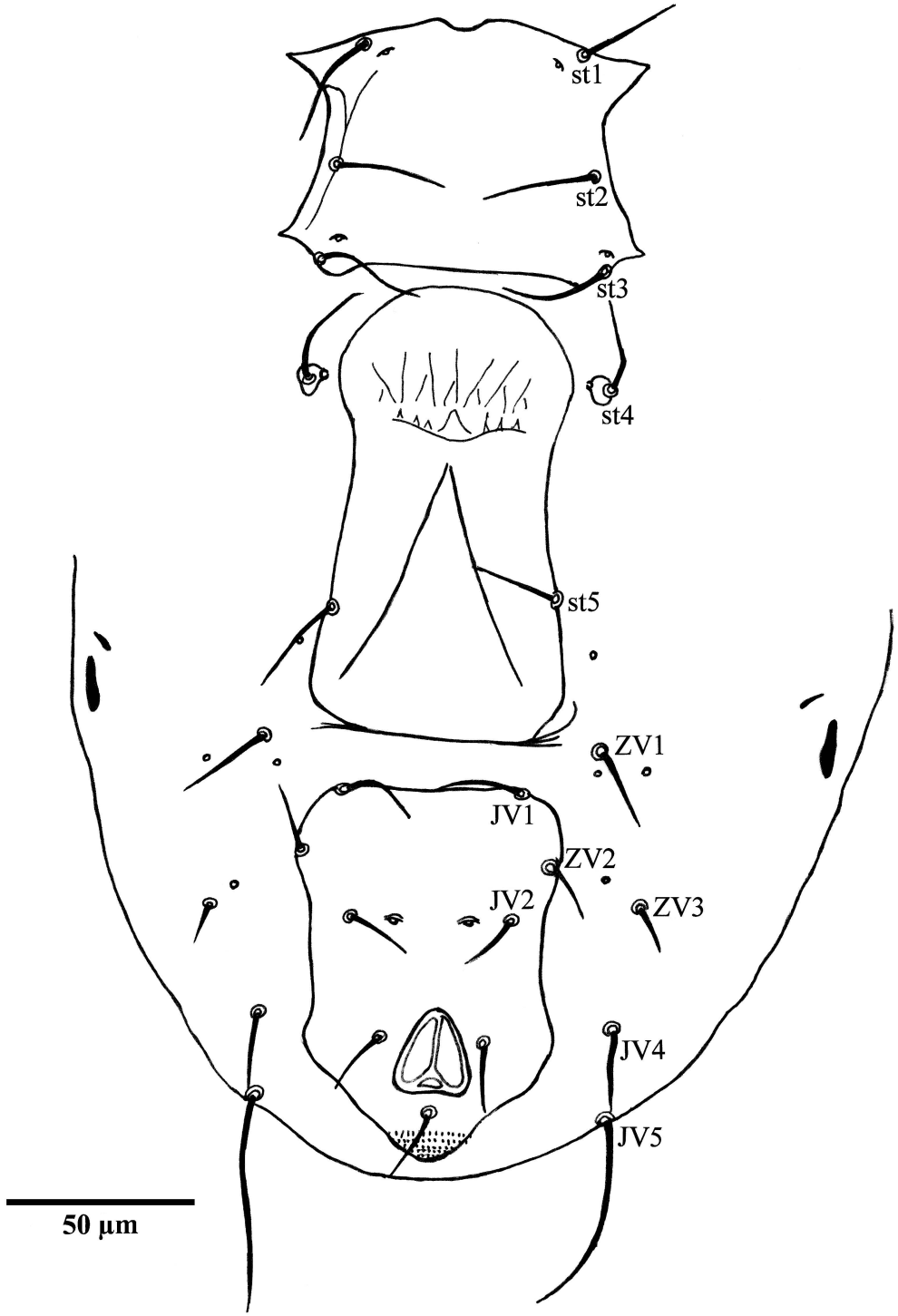


FIGURE 2: Ventral shields of the female of *Transeius marieae-angeae* **n. sp.** (from the holotype)

posterior margin straight. Distances between st1-st3 55, st2-st2 64 – 65, st5-st5 55 – 56. Two pairs of metapodal shields 15 long and 1 – 3 wide for the largest, 6 – 8 long and very thin for the smallest one. Ventrianal shield with 3 pairs of pre-anal setae, JV1, JV2 and ZV2 and one pair of large elliptical pre-anal solenostomes. Membrane surrounding ventrianal shield with 4 pairs of setae ZV1, ZV3, JV4 and JV5 and 4 pairs of poroids; ventrianal shield 90 – 98 long, 63 – 64 wide at level of anterior corners and 58 – 60 wide at level of anus. JV5 43 – 50 long and smooth. Legs — Macrosetae on all legs: SgeI 16 – 18, SgeII 18, SgeIII 15 – 18, StiIII 23 – 25, SgeIV 36 – 40, StiIV 19 – 23, StIV 38. All macrosetae whip-like. Chaetotactic formula of genu II: 2-2/0, 2/0-1; genu III: 1-2/1, 2/0-1. Length of legs I: 310 – 318, II: 223 – 238, III: 235 – 245, IV: 320 – 325.

Chelicera — Fixed digit 30 – 31 with 9 – 10 teeth and movable digit 33 – 34 with four teeth.

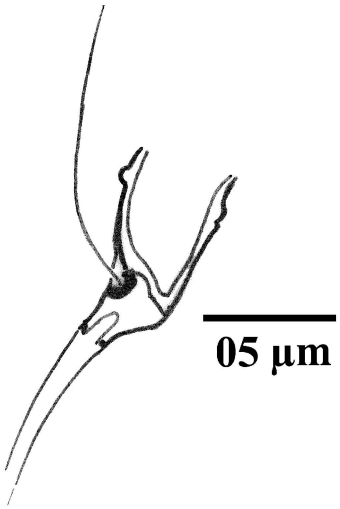


FIGURE 3: Calyx of spermatheca of the female of *Transeius marieae-angeae* **n. sp.** (from the holotype)

Spermatheca (Fig. 3) — Calyx of spermatheca pocular (Denmark *et al.* 1999) with the cervix elongate, 4 – 6 wide and 6 – 8 long, with a big atrium at the basis and a visible long ductus minor on the paratype female.

Adult Male: unknown.

Holotype — 1 female (on one preparation), La Désirade, Parc Eolien, 16°11'N, 61°39'W, alt. 184 m, on *Coccoloba pubescens*, Kreiter coll., 5 January 2008, deposited in the Montpellier SupAgro Acarology Collection in UMR CBGP.

Paratype — 1 female (on a separate preparation), same location deposited in the same collection.

Etymology — the name of the species refers to the first name of the first author's wife of this paper and describer of this new species, Marie-Ange Burgell, to whom this species is dedicated.

Diagnosis — the two specimens of *Transeius mariae-angeae* **n. sp.** found are close to *Transeius bellotti* (Moraes and Mesa) but differ in having: the shape of spermatheca very different (both pocular sensu denmark *et al.* (1999) but with an open cervix and with a small atrium at the basis of the cervix for *T. bellotti* and a more closed cervix, a strong large atrium and swollen edges of the cervix for *T. mariae-angeae* **n. sp.**); the presence of macrosetae on all legs and not only of leg IV; the setae length longer in the new species except Z4, S4, SgeIV and StIV; the dorsum smooth and not imbricate; the setae j3 and s4 not serrated and the number of teeth on movable/fixed digits = 9-10/4 (against 9/3 in *T. bellotti*).

It resembles also to *T. rufus* (Denmark and Evans) but differs in having: several setae much longer except for j1, Z4, SgeIV and StIV which are longer in *T. rufus*; the dorsal shield not reticulated in the new species and slightly reticulated in *T. rufus*; the number of teeth on movable/fixed digits of chelicerae = 9-10/4 against 7/0. It is also close to *T. sanblasensis* (De Leon) but setae are longer in the new species except for some (j1, z4, s4, r3, S2) which are very much longer and all macrosetae of the four legs are smaller in the new species. It resembles also to *T. aciculus* (De Leon) but differs in having j4 shorter (15-18 instead of 36) and S5 longer (14-16 instead of 9); and to *T. cristobalensis* (De Leon) but differs in having a shorter StIV (38 instead of 88).

Transeius rufus (Denmark and Evans)

Neoseiulus rufus Denmark and Evans, in Denmark *et al.*, 1999: 73.

The biology of this species found only once in Honduras by Denmark and Evans (in Denmark *et*

al., 1999) on the giant thatching grass *Hyparrhenia rufa* (Poaceae), a hairy plant, is unknown.

Previous Records — Honduras (Denmark *et al.*, 1999).

Specimens examined — Martinique, Montagne Pelée, Parking, 14°48'N, 61°09'W, alt. 825 m, 2 ♀ on *Urena lobata*, Kreiter coll., 21 November 2010.

Remarks — this is the first record of this species in the West Indies. The measurements of the two specimens collected fit very well the measurements given by Denmark *et al.* (1999), except setae r3 and R1 (30 μm in our two specimens instead of 16 in Denmark *et al.* (1999) on a single specimen). The average measurements of the two adult females presently found are as follow: dorsal shield sclerotized, five solenostomes (gd 1, 2, 4, 8 and 9), j1 23 – 24, j3 27 – 35, j4 9 – 10, j5 9, j6 9 – 10, J2 10 – 14, J5 8 – 10, z2 11 – 15, z4 20 – 30, z5 8 – 9, Z1 11 – 15, Z4 63, Z5 71 – 75, s4 47 – 50, S2 24 – 27, S4 12 – 14, S5 13 – 14, r3 16, R1 16, Z4 and Z5 serrated, st1-st1 53 – 59, st2-st2 62 – 65, st1-st3 60 – 62, posterior margin of the sternal shield concave, metapodal 1 length 23 – 28, width 3, metapodal 2 length 10 – 13, width 1, ventrianal shield 98 – 115 long, 90 – 92 wide at level of anterior corners and 80-88 wide at level of anus, 5 poroids around the ventri-aan shield and the genital shield, JV5 55 – 60, spermatheca 19 – 20 long and 5 – 7 width, SgeIV 44 – 45, StiIV 18 – 25, StIV 47 – 50, macrosetae all whip-like, fixed digit of chelicerae 30 with 7 denticles, mobile digit of chelicerae 32 without denticle.

Amblyseius Berlese

Amblyseius fernandezi Chant and Baker

Amblyseius fernandezi Chant and Baker, 1965: 19.

The biology of this species, found in Central America, is unknown.

Previous Records — Honduras, Nicaragua and Costa Rica (Chant and Baker, 1965; Denmark *et al.*, 1999; Moraes *et al.*, 2004b; Castro *et al.*, 2010), El Salvador, Mexico and Venezuela (Castro *et al.*, 2010).

Specimens examined — Guadeloupe, Basse-Terre, Rivière Corossol, Cascade des Ecrevisses, 16°11'N, 61°39'W, alt. 177 m, 1 ♀ on an unknown Melastomataceae, Kreiter coll., 26 Dec. 2008.

Remarks — this is the first record of this species in the West Indies. The measurements of the single specimen collected fit rather well the measurements given by Denmark and Muma (1989). All the setae are however slightly longer, but at maximum less than 10 % of variation, which is less than the threshold of 20 % around the mean defined by Tixier (2012) to characterize intraspecific variations.

The measurements of the adult female presently found are as follow: dorsal shield smooth, dorsal shield length 368, width 288, 1 solenostome visible (gd 9), j1 30, j3 41, j4 3, j5 5, j6 5, J2 5, J5 8, z2 15, z4 12, z5 3, Z1 10, Z4 112, Z5 190, s4 90, S2 10, S4 10, S5 10, r3 12, R1 10, all setae smooth, st1-st1 65, st2-st2 75, st1-st3 63, posterior margin of the sternal shield concave, metapodal 1 length 25, width 3, metapodal 20 length 10, width 2, ventrianal shield 115 long, 78 wide at level of anterior corners and 78 wide at level of anus, 4 poroids around the ventrianal shield and genital shield, JV5 80, spermatheca 17 long and 5 width, SgeI 40, SgeII 40, SgeIII 50, StiIII 35, SgeIV 75, StiIV 62, StIV 75, macrosetae whip-like, fixed digit of chelicerae 37, mobile digit of chelicerae 40, 13-14 denticles on fixed digit and 4 on mobile digit.

Amblyseius sakalava Blommers

Amblyseius sakalava Blommers, 1976: 96; suspected junior synonym of *Amblyseius largoensis* (according to Ueckermann and Loots, 1988).

Biology — *Amblyseius sakalava* was first found in Madagascar on *Corchorus trilocularis* (Blommers, 1976) and then in a search for native natural enemies of *Tetranychus urticae* Koch in Sri-Lanka, collected on *Manihot esculenta* and identified by Dr Viebergen (Wijesekara, 2006). Its life history, reproductive performance on different foods and functional response to the prey were studied in the laboratory. At an average temperature of 29°C, when fed on pollen, *A. sakalava* completed its life cycle (egg to adult) in 4.5 days on average. The mean preovipositional period is 4.1 days and a female lays an average of 2.2 eggs per day when fed on *T. urticae* and 1.9 eggs per day when fed on pollen of *Tridax procumbens* (Asteraceae). The predatory mite reproduces equally when fed on this pollen and a mixture of *T. procumbens* pollen and the prey mite. But the

reproductive performance was significantly lower when the predatory mite was fed on *Tetranychus urticae* Koch mite alone or pollen of *Tithonia diversifolia* or a mixture of *T. diversifolia* pollen and the latter prey mite. Study of functional response showed a typical type 2 response (Wijesekara, 2006).

Previous Records — Madagascar (Blommers, 1976; Moraes *et al.*, 2004b), Sri Lanka (Viebergen, in Wijesekara, 2006).

Specimens examined — Guadeloupe, Basse-Terre, Rivière Corossol, Route des Mamelles, 16°10'N, 61°41'W, alt. 221 m, 1 ♀ on *Syngonium podophyllum*, Kreiter coll., 22 Dec. 2008.

Remarks — this is the first record of this species in the West Indies. The measurements of the single specimen collected fit rather well the measurements given by Blommers (1976). This species was considered as a junior synonym of *Amblyseius largoensis* (Muma) by Ueckermann and Loots (1988). We fully disagree with this claimed synonymy as to our knowledge it was not demonstrated and as several characters are different between the two species: *A. sakalava* has 30 % longer measurements for several setae, especially Z5, nearly two times longer cervix of the spermatheca, at least 7 poroids on the dorsal shield to up to 15 compared to none to three maximum in *A. largoensis*, and the posterior limit of the sternal concave instead of straight in *A. largoensis*. However as we have collected only one specimen, all these differences have to be examined carefully on more individuals and the potential synonymy studied with modern analysis means.

The measurements of the adult female presently found are as follow: dorsal shield smooth, dorsal shield length 365, width 258, 7 solenostomes (gd 1, 2, 3, 4, 5, 8 and 9), j1 35, j3 52, j4 5, j5 8, j6 8, J2 8, J5 13, z2 15, z4 13, z5 8, Z1 10, Z4 100, Z5 264, s4 93, S2 10, S4 8, S5 8, r3 10, R1 8, all setae smooth, st1-st1 65, st2-st2 70, st1-st3 68, posterior margin of the sternal shield straigth, metapodal 1 length 20, width 5, metapodal 2 length 15, width 1, ventrianal shield 108 long, 55 wide at level of anterior corners and 68 wide at level of anus, 4 poroids around the ventrianal shield and genital shield, JV5 63, spermatheca 33 long and 5 width, SgeI 45, SgeII 38, SgeIII 43, StiIII 40, SgeIV 118, StiIV 83, StIV 70, macrosetae whip-like, fixed digit of chelicerae 33, mobile digit of chelicerae 33, 11 denticles on fixed digit and 5 on mobile digit.

Sub-tribe Proprioseiopsina Chant and McMurtry *Proprioseiopsis* Muma

Proprioseiopsis penai Denmark and Evans

Proprioseiopsis penai Denmark and Evans, *in* Denmark *et al.*, 1999: 17.

The biology of this species found only once in Honduras on *Citrus* sp. by Denmark *et al.* (1999) is unknown.

Previous Records — Honduras (Denmark *et al.*, 1999; Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Rivière Corossol, Route du Col des Mamelles, 16°10'N, 61°41'W, alt. 221 m, 1 ♀ on an unknown small mauve flowering plant, Rault coll., 22 December 2008; Basse-Terre, Petit-Bourg, Domaine Duclos de l'INRA Antilles-Guyane, 16°12'N, 61°39'W, alt. 85 m, 2 ♀ on *Centrosema pubescens*, Kreiter coll., 31 December 2008 and 1 ♀ on *Clidemia hirta*, Kreiter coll., 3 January 2009.

Remarks — this is the first record of this species in the West Indies. The measurements of three of the four specimens collected fit very well the measurements given by Denmark *et al.* (1999).

The average measurements of these three adult females are as follow: dorsal shield sclerotized and reticulated, dorsal shield length 449 (439-464), width 332 (321-342), 5 solenostomes (gd 1, 2, 5, 8 and 9), j1 34 (33 – 35), j3 48 (47 – 49), j4 4, j5 6 (5 – 6), j6 8 (8 – 9), J2 5, J5 4, z2 26 (25 – 27), z4 22 (20 – 24), z5 5 (5 – 6), Z1 7 (6 – 8), Z4 93 (83 – 108), Z5 103 (102 – 105), s4 121 (121 – 122), S2 7 (5 – 8), S4 7 (6 – 7), S5 7 (7 – 8), r3 26 (19 – 33), R1 8 (7 – 9), all setae smooth, st1-st1 66, st2-st2 84 (84 – 85), st1-st3 64 (63 – 64), posterior margin of the sternal shield concave, metapodal 1 length 33 (32 – 35), width 6 (5 – 7), metapodal 2 length 16 (13 – 19), width 1, ventrianal shield 121 (120 – 123) long, 120 (119 – 120) wide at level of anterior corners and 99 (95 – 102) wide at level of anus, 5 poroids around the ventrianal shield and genital shield, JV5 68, spermatheca 20 (18 – 21) long and 11 (9 – 13) width, SgeI 32 (30

– 33), SgeII 34 (33 – 35), SgeIII 39 (38 – 40), StiIII 28, SgeIV 79 (78 – 79), StiIV 53 (50 – 58), StIV 66 (61 – 68), macrosetae whip-like, fixed digit of chelicerae 35 (33 – 37), mobile digit of chelicerae 35 (35 – 37), 13 denticles on fixed digit and 3 on mobile digit.

Sub-tribe Arrenoseiina Chant and McMurtry
Arrenoseius Wainstein

Arrenoseius crassipes (Denmark)

Paraamblyseius crassipes Denmark, 1988: 37.

The biology of this species found only once in Mexico on *Eichomia crassipes* by Denmark (1988) is unknown.

Previous Records — Mexico (Denmark, 1988; Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Vernou, Route du Col des Mamelles, 16°11'N, 61°39'W, alt. 184 m, 2 ♀ and 1 ♂ on *Ricinus communis*, Kreiter coll., 26 December 2008.

Remarks — this is the first record of this species in the West Indies. The measurements of the specimens collected fit well the measurements given by by Denmark (1988). Macrosetae are present on all legs but were not mentioned and measured in Denmark (1988).

The average measurements of the two adult females presently found are as follow: dorsal shield sclerotized and reticulated, dorsal shield length 353-422, width 300 – 325, 3 solenostomes (gd 1, 8 and 9), j1 20, j3 25, j4 4, j5 5, j6 5, J5 9 – 12, z2 8 – 10, z4 10 – 13, z5 5, Z1 8, Z4 85 – 100, Z5 95 – 100, s4 87, S2 12, S4 10, S5 10, r3 10, R1 12, all setae smooth, st1-st1 53 – 55, st2-st2 64 – 75, st1-st3 40 – 43, posterior margin of the sternal shield concave, metapodal 1 length 28, width 10, metapodal 2 length 8, width 5, ventrianal shield 150 – 153 long, 210 – 212 wide at level of anterior corners and 150 wide at level of anus, 2 poroids around the ventrianal shield, JV5 40, spermatheca 23 – 25 long and 5 – 7 width, StIV 40, macrosetae whip-like, fixed digit of chelicerae 38 – 40, mobile digit of chelicerae 38 – 40, 11 – 12 denticles on fixed digit and 2 on mobile digit.

Tribe Euseiini Chant and McMurtry
Sub-tribe Typhlodromalina Chant and McMurtry
Amblydromalus Chant and McMurtry

Amblydromalus higuilloae (Denmark and Muma)

Typhlodromalus higuilloae Denmark and Muma, 1975: 292.
Typhlodromalus higuilloae Denmark *et al.*, 1999: 59.

The biology of this species found only two times in Puerto Rico (Denmark and Muma, 1975) on "higuillo" leaves (*Piper marginatum*) and in Honduras by Denmark *et al.* (1999) on *Calea urticifolia* remains unknown.

Previous Records — Puerto Rico (Denmark and Muma, 1975; Moraes *et al.*, 2004b), Honduras (Denmark *et al.*, 1999; Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Petit-Bourg, Domaine Duclos de l'INRA Antilles-Guyane, 16°12'N, 61°39'W, alt. 85 m, 1 ♀ on *Vigna* sp., Kreiter coll., 21 December 2008; Basse-Terre, Route Forestière, Jules-Grosse Montagne, 16°12'N, 61°39'W, alt. 90 m, 1 ♀ on *Vigna* sp., Kreiter coll., 24 December 2008; Basse-Terre, rivière Corossol, Cascade des Ecrevisses, 16°11'N, 61°39'W, alt. 184 m, 1 ♀ on an unknown Melastomataceae, Kreiter coll., 21 December 2008; Basse-Terre, Vernou, Route du Col des Mamelles, 16°11'N, 61°39'W, alt. 184 m, 1 ♀ on *Vigna* sp., Kreiter coll., 26 December 2008; Grande-Terre, Porte d'Enfer, beach, 16°31'N, 61°28'W, alt. 2 m, 2 ♀ on *Pluchea symphytifolia*, Kreiter coll., 27 December 2008; Basse-Terre, 1ère Chute du Carbet, 16°03'N, 61°39'W, alt. 890 m, 1 ♂ on *Clidemia umbrosa*, Kreiter coll., 29 December 2008; Martinique, Basse-Pointe, Jardins Clément, 14°50'N, 61°05'W, alt. 91 m, 2 ♀ on *Panicum maximum*, Kreiter coll., 16 November 2010.

Remarks — this is the first record of this species in the French West Indies. The measurements of five (4 ♀ and 1 ♂) of the nine specimens collected fit rather well the measurements given by Denmark *et al.* (1999). All setae are however slightly shorter, between 1 and 5 for the greater, which represent less than 10 % of variation, which is less than the intraspecific of 20 % around the mean defined by Tixier (2012).

The average measurements of the four adult females presently found are as follow: dorsal shield sclerotized and reticulated, dorsal shield length 351 (350 – 352), width 232 (223 – 250), 5 solenostomes (gd 1, 2, 6, 8 and 9), j1 25 (22 – 28), j3 42 (40 – 44), j4 12 (9 – 13), j5 11 (10 – 14), j6 11 (11 – 14), J2 13 (12 – 14), J5 11 (9 – 14), z2 18 (16 – 21), z4 31 (30 – 33), z5 9 (7 – 9), Z1 12 (11 – 13), Z4 43 (42 – 44), Z5 67 (65 – 71), s4 66 (63 – 68), S2 26 (21 – 30), S4 16 (13 – 18), S5 11 (11 – 17), r3 30 (27 – 34), R1 14, all setae smooth except Z4 and Z5, st1-st1 60 (58 – 61), st2-st2 63 (61 – 65), st1-st3 62 (58 – 64), posterior margin of the sternal shield with a convex lobe, metapodal 1 length 17 (16 – 18), width 4, metapodal 2 length 7 (6 – 8), width 1, ventrianal shield 98 (94 – 104) long, 58 (55 – 58) wide at level of anterior corners and 57 (55 – 58) wide at level of anus, 4 poroids around the ventrianal shield and genital shield, JV5 41, spermatheca 16 (13 – 22) long and 5 width, SgeI 31 (30 – 32), SgeII 26, SgeIII 27 (25 – 29), StiIII 19, SgeIV 59 (56 – 63), StiIV 31 (29 – 32), StIV 63 (61 – 67), macrosetae whip-like, fixed digit of chelicerae 32 (29 – 33), mobile digit of chelicerae 31, 12 denticles on fixed digit and 5 on mobile digit.

The measurements of the single adult male presently found are as follow: dorsal shield sclerotized and reticulated, dorsal shield length 245, width 162, 2 solenostome (gd 1, 2, 6, 8 and 9), j1 15, j3 25, j4 7, j5 7, j6 9, J2 10, J5 8, z2 10, z4 12, z5 7, Z1 9, Z4 38, Z5 58, s4 32, S2 14, S4 12, S5 9, r3 13, R1 8, all setae smooth except Z4 and Z5, st1-st1 49, st2-st2 55, st1-st3 59, st1-st5 103.

Quadromalus Moraes, Denmark and Guerrero

Quadromalus colombiensis Moraes, Denmark and Guerrero

Quadromalus columbiensis Moraes, Denmark and Guerrero, 1982: 17

The biology of this species found only once in Colombia on *Tanicum paniculatum* (Moraes *et al.*, 1982) remains totally unknown.

Previous Records — Colombia (Moraes *et al.*, 1982; Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Petit-Bourg, Domaine Duclos de l'INRA Antilles-Guyane, 16°12'N, 61°39'W, alt. 85 m, 3 ♀ + 1 ♂ on *Cissus verticilata*, Kreiter coll., 18 December 2008.

Remarks — this is the first record of this species in the West Indies. The measurements and description of the three female specimens collected fit very well those given by Moraes *et al.* (1982). No measurement for the male was given in Moraes *et al.* (1982). Diagnosis proposed by Moraes *et al.* (1982) corresponds very well to the specimens collected in Guadeloupe: Z4 and Z5 not serrated, only one macroseta on leg IV, 3-4 teeth on fixed and 3 on movable digits, respectively, and moreover 4 extra-long setaceous setae on the tarsus 1 (Moraes *et al.*, 1982).

The average measurements of three adult females presently found are as follow: dorsal shield smooth, dorsal shield length 370 (361 – 385), width 246 (239 – 2555), 6 solenostomes (gd 1, 2, 4, 6, 8 and 9), j1 29 (28 – 30), j3 38 (37 – 40), j4 13 (12 – 13), j5 14 (13 – 15), j6 12, J2 19 (17 – 20), J5 13 , z2 37, z4 41 (40 – 42), z5 17 (15 – 20), Z1 27 (25 – 3), Z4 34 (33 – 35), Z5 33, s4 44 (42 – 45), S2 34 (33 – 35), S4 31 (28 – 32), S5 28 (25 – 30), r3 34 (33 – 35), R1 30, all setae smooth, st1-st1 56 (55 – 58), st2-st2 66 (60 – 75), st1-st3 70 (60 – 75), posterior margin of the sternal shield not straight, metapodal 1 length 25, width 7 (6 – 8), metapodal 2 not visible, ventrianal shield 103 (100 – 108) long, 57 (48 – 67) wide at level of anterior corners and 68 (60 – 75) wide at level of anus, 4 poroids around the ventrianal shield, JV5 41 (40 – 43), spermatheca 24 (20 – 28) long and 3 width, SgeI 25 (23 – 28), SgeII 22 (20 – 23), SgeIII 24 (23 – 25), StiIII 21 (20 – 23), SgeIV 29 (28 – 30), StiIV 26 (24 – 28), StIV 41 (40 – 42), macrosetae very slightly knobbed, fixed digit of chelicerae 31 (28 – 32), mobile digit of chelicerae 32 (30 – 35), 3 large strong denticles on fixed digit and 3 large strong denticles on mobile digit.

The measurements of one adult male are: dorsal shield smooth, dorsal shield length 298, width 225, 6 solenostome (gd 1, 2, 4, 6, 8 and 9), j1 20, j3 25, j4 10, j5 9, j6 10, J2 15, J5 9, z2 25, z4 28, z5 12, Z1 23, Z4 25, Z5 25, s4 35, S2 25, S4 23, S5 23, r3 25, R1 23, all setae smooth, st1-st1 48, st2-st2 63, st1-st3 58, st1-st5 120, ventrianal shield 100 long, 167 wide at level of

anterior corners and 60 wide at level of anus,JV5 25, SgeI 23, SgeII 23, SgeIII 15, StiIII 15, SgeIV 23, StiIV 24, StIV 28, schaft of the spermatodactyl 23.

Sub-tribe Typhlodromalina Chant and McMurtry

Typhlodromalus peregrinus (Muma)

Typhlodromus peregrinus Muma, 1955: 270;
Typhlodromalus peregrinus Muma and Denmark, 1970: 88; Moraes *et al.*, 1986: 132, 2004: 202; Zacarias and Moraes, 2001: 582;
Typhlodromus (*Amblyseius*) *peregrinus* Chant, 1959: 97;
Amblyseius peregrinus McMurtry, 1983: 255. Moraes *et al.*, 1991: 130;
Typhlodromus (*Amblyseius*) *robineae* Chant, 1959: 98;
Typhlodromus (*Amblyseius*) *evansi* Chant, 1959: 99;
Typhlodromus (*Amblyseius*) *primulae* Chant, 1959: 99 (synonymy, according to Muma, 1964)

This species is very common on citrus (Muma, 1955, 1967; Peña, 1992; Childers, 1994; Villanueva and Childers, 2004, 2005; Fadamiro *et al.*, 2008, 2009) and solanaceous plants (McMurtry, 1983; Fiaboe *et al.*, 2007) in several countries and is very often reported as the most abundant species.

Typhlodromalus peregrinus can be found at the underside of mature citrus leaves, inside tree canopy, under empty scale armor, clump and dead scale insects whitefly exuvia, sooty mold and mine of *Phyllocnistis citrella* Stainton (Muma, 1967; Childers, 1994; Villanueva and Childers, 2011). Muma (1969) reported that *T. peregrinus* was able to reproduce and develop on *Panonychus citri* (McGregor) but did perform better on eggs and crawlers of chaff scale, *Parlatoria pergandii* Comstock, and six-spotted spider mite, *Eotetranychus sexmaculatus* (Riley). This phytoseiid was also reported to feed on *Phyllocoptruta oleivora* (Ashmead), providing some degree of rust mite suppression on lime (Peña, 1992). Thus, *T. peregrinus* seems to be a generalist species with the ability to reproduce and develop on the two key pests on Guadeloupe and Martinique citrus, *P. citri* and *P. oleivora* and probably several occasional pests. Its optimal preys were evaluated as Aleyrodidae, Coccidae, and Tetranychidae by Muma (1971). Fouly *et al.* (1995) have studied the biology of *T. peregrinus* in the laboratory at 26°C. Each of the following organisms was evaluated as suitable diet: all stages of *T. urticae*; immature stages of *P. citri*; and pollens of *Malephora crocea*, *Quercus virginiana*, and *Typha latifolia*. The combination of *T. urticae* with pollen was also tested. Total developmental time ranged between 5.73 and 7 days for females and between 5.67 and 6.93 days for males. The percentage of females in the total population ranged between 53 and 61 %. A diet of *T. urticae* provided the shortest generation time (T), greatest female longevity, and mean total fecundity (F) which resulted in the highest net reproductive rate (Ro) value (25.31 expected females per female), intrinsic rate of increase (r_m = 0.224), and finite rate of increase (λ = 1.25) per day for *T. peregrinus*. Diets of only *P. citri* or *M. crocea* resulted in close values of T = 8.67, 8.91; F = 47.11, 49.47; R_0 = 24.00, 26.65; r_m = 0.210, 0.219; and λ = 1.23, 1.24, respectively. *Quercus virginiana* and *T. latifolia* were the less favorable food sources, with results of T = 8.78, 9.41; F = 30.38, 24.25; R_0 = 14.20, 12.04; r_m = 0.193, 0.170, and λ = 1.21, 1.18, respectively.

The occurrence of high densities of this species on ground cover vegetation (weeds) is explained in Alabama citrus orchard (Fadamiro *et al.*, 2008, 2009) by the possibility that grasses may serve as overwintering sites and alternative food sources, which is probably the most important factors in French West Indies citrus orchards as there is no overwintering in citrus crop in this tropical area.

Typhlodromalus peregrinus was collected from 64 ground cover plants or vines in Florida citrus fields (Childers and Denmark, 2011) with highest numbers found on the following plants: *Bidens alba*, *Solanum americanum* (which is one plant of the ground cover on which *T. peregrinus* was collected in Guadeloupe), *Amaranthus spinosus*, *Gnaphalium pensylvanicum*, *Lantana camara* and *Chenopodium ambrosioides*). In Florida, the highest numbers of *T. peregrinus* in ground cover corresponded with peaks in thrips numbers, suggesting possible predation on one or more species of thrips occurring. Childers and Denmark (2011) suggest that this species should therefore be evaluated as a predator of thrips larvae and/or adults. Significant in-

creases in numbers of *T. peregrinus* were also correlated with increased levels of several pollen species on citrus leaves (Villanueva and Childers, 2004).

Thus, considering all these elements, it is possible that *T. peregrinus* may constitute a key species in citrus orchards in French West Indies.

Previous Records — Brazil, Colombia, Costa Rica, Ecuador, Guatemala, Guyana, Hawaii, Honduras, Mexico, Nicaragua, Puerto Rico, Suriname, USA (Florida, Alabama, Missouri), Venezuela (Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Vieux-Habitants, Station Le Bouchu du CIRAD, 16°03'N, 61°45'W, alt. 21 m, 9 ♀ and 7 ♂ extracted froom a mixture of various herbaceous plants collected in an experimental citrus crop (*Achyranthhes aspera*, *Centrosema* sp., *Chamaescye hypericifolia*, *Chloris inflata*, *Croton lobatus*, *Echinochloa colona*, *Ipomea hederifolia, Macroptilium lathyroides*, *Merremia umbellata*, *Neonotonia wightii, Rhynchosia minima*, *Solanum americanum*, *Tridax procumbens*, *Urena lobata*, *Vernonia cinerea*), Mailloux coll., April to December 2008.

Remarks — this is the first record of this species in the West Indies. The measurements and description of the specimens collected fit very well those given by Moraes and Mesa (1988).

The average measurements of the nine adult females presently found are: dorsal shield strongy reticulated on the whole dorsum, 344 (329 – 350) long and 219 (184 – 285) wide, with 5 solenostomes (gd1, 2, 6, 8 and 9), 10 pairs of poroids, 17 pairs of dorsal setae and 2 pairs of sub-lateral setae: j1 25 (22 – 29), j3 37 (34 – 42), j4 15 (11 – 20), j5 17 (14 – 20), j6 20 (16 – 27), J2 20 (17 – 23), J5 8 (6 – 11), z2 21 (20 – 25), z4 33 (28 – 41), z5 17 (11 – 20), Z1 32 (29 – 35), Z4 48 (47 – 51), Z5 59 (57 – 61), s4 45 (38 – 50), S2 31 (28 – 34), S4 25 (20 – 30), S5 13 (10 – 19), r3 18 (12 – 22), R1 17 (13 – 20). All setae smooth, except Z4 and Z5 which are moderately serrated. Peritreme extending to the level of j1. Ventral shields smooth. Sternal shield large, with 3 pairs of setae and 2 pairs of pores; 1 pair (st4) out of the sternal shield, on a small metasternal shield; posterior margin with a convex lobe overlapping the genital shield. Distances between st1-st3 66 (63 – 71), st2-st2 63 (60 – 65), st5-st5 76 (73 – 78). Two pairs of metapodal shields 16 (14 – 18) long, 4 (3 – 6) wide for the largest, 5 – 8 long and very thin for the smallest one. Ventrianal shield with 3 pairs of pre-anal setae, JV1, JV2 and ZV2 and one pair of elliptical pre-anal pores. Membrane surrounding ventrianal shield with 4 pairs of setae ZV1, ZV3, JV4 and JV5 and 4 pairs of round to oblong poroids; ventrianal shield 93 (88 – 103) long, 64 (60 – 68) wide at level of anterior corners and 61 (57 – 74) wide at level of anus. JV5 42 (37 – 45) long and smooth. All legs with smooth macrosetae: SgeI 17 (13 – 23), SgeII 20 (18 – 25), SgeIII 30 (28 – 30), StiIII 20 (15 – 25), SgeIV 42 (34 – 44), StiIV 3 (18 – 25), StIV 62 (58 – 65). All macrosetae are whip-like with a small bulbous tip. Chaetotactic formula of genu II: 2-2/0, 2/0-1; genu III: 1-2/1, 2/0-1. Length of legs I: 342 (278 – 369), II: 253 (226 – 282), III: 251 (214 – 286), IV: 341 (275 – 388). Chelicerae with fixed digit 32 (30 – 36) with 7 teeth and movable digit 30 (28 – 32) with 3-4 teeth. Calyx of spermatheca fundibular (Denmark *et al.* 1999) with the cervix elongate, 5 (3 – 7) wide and 16 (9 – 22) long, with a big atrium at the basis.

The average measurements of the seven adult males presently found are: dorsal shield like in the female, 256 (243 – 275) long and 143 (134 – 149) wide. Setae j1 19 (18 – 20), j3 29 (25 – 30), j4 11 (7 – 13), j5 12 (8 – 16), j6 14 (12 – 16), J2 11 (7 – 16), J5 7 (5 – 8), z2 16 (13 – 17), z4 27 (25 – 29), z5 11 (10 – 12), Z1 18 (16 – 22), Z4 34 (31 – 37), Z5 39 (34 – 42), s4 35 (33 – 36), S2 17 (16 – 18), S4 14 (12 – 16), S5 9 (7 – 12), r3 17 (15 – 19), Rl 13 (12 – 16). Peritreme extending to the level of j1. All venter shields smooth. Sternogenital shield with 5 pairs of setae and 2 pairs of pores. Distances between st1-st3 58 (56 – 59), st2-st2 54 (50 – 56), st5-st5 37 (32 – 40). Ventrianal shield not fused with peritremal shields with 3 pairs of pre-anal setae, JV1, JV2 and ZV2, one pair of elliptical preanal solenostomes and 2 pairs of poroids. Membrane surrounding ventrianal shield with one pair of setae JV5 in level with anal opening, and no visible pair of oblong poroids; ventrianal shield 93 (85 – 100) long, 132 (127 – 146) wide at level of anterior corners and 59 (54 – 65) at level of anus. Macrosetae on all legs: SgeI 15 (13 – 18), SgeII 16 (15 – 20), SgeIII 22 (20 – 25), StiIII 15,

SgeIV 31 (27 – 36), StiIV 17 (15 – 21), StIV 46 (40 – 51). Chaetotactic formula of genu II and genu III are identical to the female. Length of leg I: 250 (228 – 276), II: 202 (182 – 228), III: 218 (193 – 253), IV: 304 (275 – 326). Spermatodactyl of cheliecerae with a large toe terminating the foot, shaft 19 (18 – 20) long.

Tribe Typhlodromipsini Chant and McMurtry

Typhlodromips amilus De Leon

Typhlodromips amilus De Leon, 1967: 28, senior synonym of *Typhlodromips bhoraii* De Leon, in Denmark *et al.*, 1999: 37-38.

The biology of this species found only two times, in Trinidad Island on *Cedrela* sp. and on an unknown Bromeliaceae by De Leon (1967) and on *Hevea brasiliensis* by Ferla and Moraes (2002) is unknown. This species is mentioned and indicated as a senior synonym of *T. bhoraii* De Leon in the catalogue of Denmark *et al.* (1999).

Previous Records — Brazil, Trinidad (De Leon, 1967; Denmark *et al.*, 1999; Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Petit-Bourg, Domaine Duclos de l'INRA Antilles-Guyane, 16°12'N, 61°39'W, alt. 85 m, 1 ♀ on *Spathodea campanulata*, Kreiter coll., 3 January 2009.

Remarks — this is the first record of this species in the West Indies. The measurements of the single specimen collected fit rather well the measurements given by De Leon (1967) and by Denmark *et al.* (1999). All setae are however slightly shorter, between 1 and 5 μm, which represent less than 10 % of variation, which is less than the intraspecific variation of 20 % around the mean defined by Tixier (2012). In addition, Denmark *et al.* (1999) mentioned that *T. amilus* is a species submitted to variation in lengths of setae.

The measurements of the single adult female presently found are as follow: dorsal shield reticulated, dorsal shield length 355, width 183, six solenostomes (gd 1, 2, 3, 5, 8 and 9), j1 18, j3 20, j4 10, j5 13, j6 10, J2 13, J5 8, z2 15, z4 15, z5 11, Z1 13, Z4 33, Z5 53, s4 20, S2 16, S4 15, S5 10, r3 10, R1 13, Z4 and Z5 serrated, st1-st1 52, st2-st2 63, st1-st3 58, posterior margin of the sternal shield straight, metapodal 1 length 15, width 5, metapodal 2 length 10, width 2, ventrianal shield 100 long, 90 wide at level of anterior corners and 80 wide at level of anus, 3 poroids around the ventrianal shield, JV5 28, spermatheca 18 long and 8 width, SgeI 15, SgeII 13, SgeIII 13, StiIII 20, SgeIV 28, StiIV 13, StIV 30, macrosetae all knobbed, fixed digit of chelicerae 28, mobile digit of chelicerae 28, 8-9 denticles on fixed digit and 3 on mobile digit.

Sub-Family Typhlodrominae
Tribe Typhlodromini Wainstein
***Typhlodromus* Scheuten**
***Typhlodromus* (*Anthoseius*) De Leon**

Typhlodromus (Anthoseius) moraesi
Kreiter and Ueckermannn

Typhlodromus (*Anthoseius*) *moraesi* Kreiter and Ueckermann, *in* Kreiter *et al.*, 2002: 338.

The biology of this species found only one time in La Réunion Island by Kreiter *et al.* (2002) on various host plants (Kreiter *et al.*, 2002) remains unknown.

Previous Records — La Réunion Island (Kreiter *et al.*, 2002).

Specimens examined — Guadeloupe, Basse-Terre, Vieux-Habitants, Station Le Bouchu du CIRAD, 16°03'N, 61°45'W, alt. 21 m, 18 ♀, 2 ♂ and 1 immature extractred from a mixture of herbaceous plants collected in an experimental citrus crop (*Achyranthhes aspera*, *Chamaescye hypericifolia*, *Chloris inflata*, *Cleome rutidosperma*, *Croton lobatus*, *Dicanthium annulatum*, *Echinochloa colona*, *Indigofera tinctoria*, *Macroptilium lathyroides*, *Merremia umbellata*, *Panicum maximum*, *Rhynchosia minima*, *Solanum americanum*, *Tridax procumbens*, *Urena lobata*, *Vernonia cinerea*), Mailloux coll., April to December 2008.

Remarks — this is the first record of this species in the West Indies. Several species are found both in La Réunion Island (in the Indian Ocean) and in the West Indies, probably because of reciprocal introductions certainly long time ago with slaves and commercial exchanges between the two areas or because of introduction of plants in Antilles and La Réunion coming from the same African area than

Slaves. The measurements and description of the specimens collected fit very well those given by Kreiter *et al.* (2002).

The average measurements of five adult females among the 18 presently found are: dorsal shield sclerotized and reticulated, dorsal shield length 369 (350 – 397), width 221 (194 – 260), 6 solenostomes (gd 1, 2, 4, 6, 8 and 9), j1 22 (20 – 23), j3 16 (14 – 17), j4 10 (7 – 12), j5 10 (8 – 12), j6 13 (12 – 14), J2 14 (12 – 17), J5 11 (10 – 13), z2 14 (12 – 16), z3 16 (14 – 19), z4 16 (14 – 17), z5 12 (11 – 13), Z4 19 (17 – 22), Z5 35 (29 – 38), s4 18 (16 – 21), s6 19 (17 – 21), S2 21 (18 – 23), S4 24 (20 – 26), S5 23 (18 – 26), r3 16 (13 – 20), R1 18 (16 – 23), some setae serrated, st1-st1 50 (49 – 52), st2-st2 57 (55 – 58), st1-st3 68 (66 – 70), posterior margin of the sternal shield concave, metapodal 1 length 26 (24 – 27), width 4 (2 – 5), metapodal 2 length 12, width 1, ventrianal shield 114 (100 – 118) long, 93 (92 – 93) wide at level of anterior corners and 77 (76 – 78) wide at level of anus, 4 poroids around the ventrianal shield, JV5 33 (30 – 35), spermatheca 17 long and 8 width, StIV 24 (23 – 25), macrosetae knobbed, fixed digit of chelicerae 30 (28 – 31), mobile digit of chelicerae 31 (29 – 32), 2 denticles on fixed digit and 2 on mobile digit.

New records of species rarely recorded from West Indies

Sub-Family Amblyseiinae
Tribe Amblyseiini Wainstein
Sub-tribe Amblyseiina Chant and McMurtry
Amblyseius Berlese

Amblyseius segregans De Leon

Amblyseius segregans De Leon, 1966: 90; McMurtry, 1983: 252; Denmark and Muma, 1989: 126 ; Denmark *et al.*, 1999 : 30 ; Moraes *et al.*, 2000: 241.

The biology of this species found only four times in British Guyana (2 females), Guatemala and Honduras (2 females), Guadeloupe (1 female) and Martinique (1 female) on various plants (De Leon, 1966; McMurtry, 1983; Denmark and Muma, 1989; Moraes *et al.*, 2000; Moraes *et al.*, 2004b) remains unknown.

Previous Records — British Guyana (De Leon, 1966), Guadeloupe and Martinique (Moraes *et al.*, 2000), Honduras and Guatemala (Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Rivière Corossol, Cascade des Ecrevisses, 16°11'N, 61°39'W, alt. 177 m, 4 ♀ on a small schrub, Kreiter coll., 26 Dec. 2008; Basse-Terre, 1ère Chute du Carbet, 16°03'N, 61°39'W, alt. 890 m, 2 ♀ on *Miconia furfuracea*, Kreiter coll., 30 December 2008; Grande-Terre, Porte d'Enfer, beach, 16°31'N, 61°28'W, alt. 2 m, 1 ♀ on *Pluchea symphytifolia*, Kreiter coll., 27 December 2008.

Remarks — the measurements and description of the specimens collected fit very well those mentioned by Moraes *et al.* (2000).

Tribe Euseiini Chant and McMurtry
Sub-tribe Euseiina Chant and McMurtry
Euseius Wainstein

Euseius ovaloides (Blommers)

Amblyseius (*Amblyseius*) *ovaloides* Blommers, 1974: 147.
Amblyseius ovaloides Schicha and McMurtry, 1986: 177; Gutierrez and Etienne, 1986: 88.
Euseius ovaloides Quilici *et al.*, 1997: 284; Moraes *et al.*, 2000; Quilici *et al.*, 2000: 100; 242; Moraes *et al.*, 2001: 43.

The biology of this species found only a few times in Madagascar (Blommers, 1974), Papua-New Guinea (Schicha and Gutierrez 1985), Seychelles (Schicha, 1987), Reunion Island, (Quilici *et al.*, 1997, 2000), Guadeloupe, Martinique and Marie-Galante (Moraes *et al.*, 2000 ; Kreiter *et al.*, 2006) on various plants remains unknown. It was suspected to be a poorly active predator of tetranychid mites (Gutierrez and Etienne, 1986).

Previous Records — French Antilles (Guadeloupe and Marie-Galante) (Moraes *et al.*, 2000), Madagascar, Papua New Guinea, Reunion Island (Kreiter *et al.*, 2000), Seychelles (Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Vieux-Habitants, Station Le Bouchu du CIRAD , 16°03'N, 61°45'W, alt. 21 m, 1 ♀ on *Spondias*

monbim, Kreiter coll., 19 June 2008; Grande-Terre, Vieux Bourg, Port, 16°21'N, 61°31'W, alt. 2m, 1 ♀ on *Carica papaya*, Kreiter coll., 29 december 2008; Basse-Terre, Viard, beach, 16°10'N, 61°35'W, alt. 4 m, 1 ♀ *on Ricinus communis*, Kreiter and Rault coll., 1 January 2009; Martinique, Saint-Esprit, Quartier Régal, 14°32'N, 60°58'W, alt. 112 m, 1 ♀ on *Spondias dulcis*, Kreiter coll., 15 November 2010; Le Marin, 14°28'N, 60°51'W, alt. 112 m, 3 ♀ on *Annona muricata*, Kreiter coll., 16 November 2010; Le Lorrain, Morne Dégras, 14°48'N, 61°05'W, alt. 355 m, 2 ♀ on *Carica papaya*, Kreiter coll., 22 November 2010.

Remarks — the measurements and description of the specimens collected fit very well those given by Moraes *et al.* (2000).

Tribe Neoseiulini Chant and McMurtry
***Neoseiulus* Hughes**

Neoseiulus longispinosus (Evans)

Typhlodromus longispinosus Evans, 1952: 413; Evans, 1953: 465; Womersley, 1954: 177; Ehara, 1958: 55.
Typhlodromus (*Amblyseius*) *longispinosus*, Chant, 1959: 74.
Amblyseius longispinosus, Corpuz and Rimando, 1966: 129; Schicha, 1975: 103.
Neoseiulus longispinosus, Moraes *et al.*, 2000: 245.

This species was already mentioned from Guadeloupe and other Islands of the French Antilles (Moraes *et al.*, 2000) but only in very few localities on various host plants. It is distributed in many countries of the world, mainly in tropical areas.

The biology of this species has been studied for pest control purposes including side effects of acaricides (Bin Ibrahim and Tan, 2000). The activity, feeding, development, predation, cannibalism, intra-guild predation and behaviour have been extensively studied by several authors (Schausberger and Croft, 1999a, b; Croft et *al.*, 1999a, b; Schausberger and Croft, 2000 a, b; Blackwood *et al.*, 2001).

Previous Records — French Antilles (Guadeloupe, Les Saintes, Marie-Galante, Martinique, Saint-Barthélémy) (Moraes *et al.*, 2000), Australia, China, Egypt, Hawaii, Hong-Kong, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Papua New Guinea, Philippines, Russia, South Korea, Taïwan, Thailand (Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Vieux-Habitants, Station Le Bouchu du CIRAD, 16°03'N, 61°45'W, alt. 21 m, 14 ♀ and 1 ♂ on *Neonotonia wightii* and *Tridax procumbens* within an experimental citrus crop, Mailloux coll., April to December 2008; Basse-Terre, Petit-Bourg, Domaine Duclos de l'INRA Antilles-Guyane, 16°12'N, 61°39'W, alt. 85 m, 1 ♂ on *Vigna* sp., Kreiter coll., 21 December 2008.

Remarks — the measurements and description of the specimens collected fit very well those given by Moraes *et al.* (2000).

Neoseiulus paspalivorus (De Leon)

Typhlodromus paspalivorus De Leon, 1957: 143
Neoseiulus paspalivorus Muma and Denmark, 1970: 110; Moraes *et al.*, 2000: 248.
Amblyseius paspalivorus Schicha, 1981: 210.

The biology of this species was only recently studied. It seems to be common on various herbaceous plants (Moraes *et al.*, 1986) and could be a Gondwanian species because of its currently known area of distribution: Caribbean, India, Oriental region and Africa (Ueckermann and Lawson-Balagbo, pers. comm.). This species predominates in the dry areas of states of Ceará and Pernambuco in Brazil on coconuts (Lawson-Balagbo et *al.*, 2008a). This species thrived on the coconut eriophyid, *Aceria guerreronis* Keifer as primary food source resulting in shorter developmental time, higher oviposition rate and higher intrinsic rate of increase than on any other diet (Lawson-Balagbo *et al.*, 2007). *Neoseiulus paspalivorus* is dorso-ventrally flattened giving it an advantage in accessing the area under the bracts (Lawson-Balagbo *et al.*, 2008b). This species is thus cited as a promising candidate for the biological control of the coconut eriophyid (Lawson-Balagbo *et al.*, 2008a). This latter pest was recently introduced in Sri Lanka and southern India where it is causing considerable damage to coconut. *Neoseiulus paspalivorus* was found only on coconut in the area of production and on fruits, in association with *A. guerreronis* (Fernando *et al.*, 2003; Moraes *et al.*,

2004a). Its presence on coconut in French West Indies contaminated by *A. guerreronis* is thus not surprising. The specimens collected were found very close from coconuts.

Previous Records — Guadeloupe (Moraes *et al.*, 2000), India and Sri Lanka (Fernando *et al.*, 2003; Moraes *et al.*, 2004a), Jamaica, Philippines, USA (Florida) (Moraes *et al.*, 2004b), Cuba (Cabrera *et al.*, 2008), USA Florida (Muma and Denmark, 1970), Brazil (Lawson-Balagbo et *al.*, 2008a).

Specimens examined — Guadeloupe, Basse-Terre, Vieux-Habitants, Station Le Bouchu du CIRAD, 16°03′N, 61°45′W, alt. 21 m, 2 ♀ collected on various herbaceous plants covering the soil of an experimental citrus crop (*Alysicarpus vaginalis, Chloris inflata*, *Cleome rutidosperma*, *Dicanthium annulatum*, *Echinochloa colona*, *Vernonia cinerea*), Mailloux coll., April to December 2008.

Remarks — the measurements and description of the specimens collected fit very well those given by Moraes *et al.* (2000).

Sub-Family Phytoseiinae
Phytoseius Ribaga

Phytoseius woodburyi De Leon

Phytoseius woodburyi De Leon, 1965: 130; De Leon, 1967: 12; Prasad, 1968: 1461; Denmark and Muma, 1975: 295; Denmark and Muma, 1978: 15; Moraes *et al.*, 1991: 133; Kreiter and Moraes, 1997; 380; Moraes *et al.*, 2000: 260.

The biology of this species remains unknown.

Previous Records: Brazil, Colombia, French Antilles (Guadeloupe, Marie-Galante, Martinique) (Moraes *et al.*, 2000), Hawaii, India, Jamaica, Puerto Rico, Trinidad (Moraes *et al.*, 2004b).

Specimens examined — Guadeloupe, Basse-Terre, Volcan La Soufrière, 16°02′45.19″N, 61°31′55.65″W, alt. 1300 m, 6 ♀ on *Centropogon cornutus*, Kreiter coll., 21 June 2008; Vieux-Habitants, Station CIRAD de Le Bouchu, 16°03′N, 61°45′W, alt. 21 m, 1 ♀ on *Erythrina* sp. and 1 ♀ on *Psidium guajava*, Kreiter and Rault coll., 19 December 2008; Les Saintes, Terre de Bas, L'Etang, 15°51′N, 61°37′W, alt. 239 m, 18 ♀ on *Cordia alliodora*, Kreiter coll., 2 January 2009 ; Martinique, Lamentin, 14°39′N, 60°58′W, alt. 46 m, 1 ♀ on *Psidium guajava*, Kreiter coll., 15 November 2010; Case-Pilote, 14°39′N, 61°07′W, alt. 176 m, 1 ♀ on *Psidium guajava*, Kreiter coll., 22 November 2010.

Remarks — the measurements and description of the specimens collected fit very well those given by Kreiter and Moraes (1997).

Sub-Family Typhlodrominae
Tribe Typhloseiopsini
Typhloseiopsis De Leon

Typhloseiopsis pritchardi (Chant and Baker)

Amblyseius pritchardi Chant and Baker, 1965: 15.
Amblyseius pritchardi Chant and Yoshida-Shaul, 1983: 1037.
Typhloseiopsis pritchardi Moraes *et al.*, 2000: 259.

The biology of this species remains unknown.

Previous Records — Costa Rica (Moraes *et al.*, 2004b), French Antilles (Gualeloupe, Marie-Galante, Martinique, Saint-Martin) (Moraes *et al.*, 2000).

Specimens examined — La Désirade, Parc Eolien, 16°19′N, 61°02′W, 269 m, 3 ♀ and 1 ♂ on *Coccoloba pubescens*, Kreiter coll., 5 January 2009.

Remarks — the measurements and description of the specimens collected fit very well those given by Moraes *et al.* (2000)

Conclusion

The number of species from the French Antilles was of 56 before the present study. Thanks to surveys conducted from April 2008 to February 2011, eleven species are herein added to the fauna of French Antilles. In conclusion, a total of 67 species belonging to 22 genera are thus now known from the French Antilles. These species belong to the three subfamilies: Amblyseiinae (51 species), Typhlodrominae (12 species) and Phytoseiinae (4 species) and a catalogue of these 67 species will be published soon (Kreiter, in prep.) with a key to identification. Some new collections and localities for rare species are added. Among these 11 species, *T. peregrinus* and *N.*

paspalivorus may constitute key species in citrus and coconut orchards in French Antilles, respectively.

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