

# New records of phytoseiid mites (Acari: Mesostigmata) of Grande Comore Island (Comoros Archipelago)

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## Original research

### ABSTRACT

Grande Comore is the larger Island of the four main islands constituting Comoros Archipelago. It is the fourth Island starting from Madagascar after Mayotte, Anjouan and Mohéli and closer to the African coast (Mozambique and Tanzania). So far, only five species of the mite family Phytoseiidae had been reported from this island. We report in this paper the results of a survey conducted at the end of 2018 in Grande Comore Island, in which 29 species have been recorded.

**Keywords** survey; collection; taxonomy; systematics; predatory mites

## Introduction

Mites of the family Phytoseiidae are all predatory species on phytophagous mites and small insects like thrips and whiteflies, on commercial plants and the wild vegetation. Several species are biological control agents for the control of pest organisms in both open and protected crops all around the world (McMurtry and Croft 1997; McMurtry *et al.* 2013; Knapp *et al.* 2018).

This family is widespread around the world, present on all continents except Antarctica, and consists of about 2,500 valid species in 94 genera and three subfamilies (Demite *et al.* 2021).

Biodiversity surveys in poorly investigated areas is still an urgent need and might result in the discovery of additional species potentially useful for biological control as well as having more information on the biodiversity of these areas (Kreiter *et al.* 2018a, b, c, 2020a, b, c, d, 2021a, b, c; Kreiter and Abo-Shnaf 2020a, b).

In these perspectives, the more interesting areas are probably those with a high level of biodiversity. Most of the Indian Ocean constitutes one of the highest world biodiversity areas, those areas being called hotspots, concept defined by Myers (1988) in order to identify the most immediately important areas for biodiversity conservation. The common characteristics of these hotspots is that they hold high endemism levels and have lost at least 70% of their original natural vegetation (Myers *et al.* 2000). Knowledge of the phytoseiid diversity in these high interest areas in the context of global climate changes may contribute to identify potential biological control agents (BCA) and future establishment of conservation programs.

Located in the Indian Ocean at about 1,000 km from the northern coast of Madagascar, about only 70 km from Mohéli Islands and 300 kms from Mozambique coast in the Africa continent, Grande Comore (Ngazidja in Shicomori language) Island is one of the four main

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islands constituting Comoros Archipelago, with Mayotte, Anjouan and Mohéli and the largest of the four with more than 1,000 km<sup>2</sup>.

Only five phytoseiid species are known from this island (Kreiter *et al.* 2018b), namely: *Amblyseius herbicolus* (Chant), *Euseius baetae* (Meyer and Rodrigues), *Iphiseius degenerans* (Berlese), *Neoseiulus longispinosus* (Evans) and *Phytoseius amba* (Pritchard and Baker).

The objective of this paper is to present the phytoseiid species reported in a survey conducted in December 2018 in Grande Comore Island.

## Material and methods

The survey took place in Grande Comore from 6 to 11<sup>th</sup> of December, 2018. Plant inhabiting mites were collected from cultivated and wild plants in few locations mainly in the eastern and southern parts of the island.

Mites were directly collected on leaves with a fine brush with or without a pocket lens or a stereoscopic microscope when available (large leaves and herbaceous plants) or by beating the plants (mainly shrubs and trees with very small or spiny leaves) and collecting the mites in a black plastic rectangular saucer 45 x 30 cm (Ref. STR 45, BHR, 71370 Saint-Germain-du-Plain, France). Collected mites were then transferred with a fine brush into small plastic vials containing 1.5 ml of 70% ethanol.

The mites were then all slide-mounted in Hoyer's medium (Walter and Krantz 2009), the slides were dried at 45–50°C for at least two weeks and then all examined and identified using a phase and interferential contrast microscope (DMLB, Leica Microsystèmes SAS, Nanterre, France). Characters of specimens were measured using a graded eyepiece (Leica, see above).

Chant and McMurtry's (1994, 2007) concepts of the taxonomy of the family Phytoseiidae for identification and the world catalogue database of Demite *et al.* (2014, 2021) for distribution and information on descriptions and re-descriptions were used. World distribution indicated for each species is the world distribution prior to this study. The setal nomenclature system adopted was that of Lindquist & Evans (1965) and Lindquist (1994) as adapted by Rowell *et al.* (1978) and Chant & Yoshida-Shaul (1989) for the dorsal surface and by Chant & Yoshida-Shaul (1991) for the ventral surface. Pore (= solenostome) and poroid (= lyrifissure) notations are that of Athias-Henriot (1975). Macrosetal notation (*Sge* = genual macroseta; *Sti* = tibial macroseta; *St* = tarsal macroseta) are that of Muma and Denmark (1970). Numbers of teeth on the fixed and movable cheliceral digits do not include the respective apical teeth. Setae not referred to in Results section should be considered as absent. All measurements are given in micrometres (μm) and presented with the mean in bold followed by the range in parenthesis. Type of spermatheca or insemination apparatus are that of Denmark and Evans (2011). Only some species with only few measurements mentioned in the literature are provided in this paper. Classification of plants follows the APG IV classification of 2016 (ex. Byng *et al.* 2018).

Specimens of each species are deposited in the mite collections of Montpellier SupAgro conserved in UMR CBGP INRA/IRD/CIRAD/SupAgro/University of Montpellier.

The following abbreviations are used in this paper for morphological characters: **dsl** = dorsal shield length just above *j1* to just below *J5* in the middle line; **dsw** = dorsal shield width at the level of *s4*; **Z4 ser., Z5 ser.** = *Z4*, *Z5* serrated (if *Z4* and *Z5* without ser. = not serrated); **gensl** = genital shield length; **gensw st5** = genital shield width at level of steae *st5*; **gensw post. cor.** = genital shield width at level of posterior corners; **lisl** = primary or largest inguinal sigilla (= "metapodal plate") length; **lisw** = primary or largest inguinal sigilla (= "metapodal plate") width; **sisl** = secondary or smallest inguinal sigilla (= "metapodal plate") length; **vsl** = ventrianal shield length; **gv3 – gv3** = distance between centres of solenostomes *gv3* on the ventrianal shield; **vsw ZV2 & vsw anus** = ventrianal shield width at *ZV2* level and at paranal setae level; **scl** = calyx total length; **scw** = calyx widest width; **Fdl** = fixed digit length; **Mdl** = movable digit length; **Nb teeth Fd** = number of teeth on the fixed digit; **Nb teeth Md** = number of teeth on the movable digit; **Shaft** = length of the shaft of spermatodactyl; **toe** = length of the toe; **BCA** = Biological control agent; **aasl** = altitude above sea level; **imm.**: immature.

The following abbreviations are used in this paper for institutions: **CBGP** = Centre de Biologie pour la Gestion des Populations; **CIRAD** = Centre International de Recherche Agronomique pour le Développement; **IA** = Institut Agro; **INRAE** = Institut National de Recherche pour l’Agriculture, l’Alimentation et l’Environnement; **INRAPE** = Institut National de Recherche pour l’Agriculture, la Pêche et L’Environnement; **IRD** = Institut de Recherche pour le Développement; **MSA** = Montpellier SupAgro, France; **UMR** = Unité Mixte de Recherche; **UR** = Unité de Recherche.

## Results and discussion

A total of 29 species had been found during this study, 25 presented thereafter (two new species, one *Amblyseius n. sp.* of the Tribe Amblyseiini and one *Ueckermannseius n. sp.* of the Tribe Euseiini, will be described in a following paper. One male of *Aristadromips* sp. and 1 male of *Neoseiulus* sp. were collected alone without any females, are both impossible to identify (probably males of undescribed species as they do not correspond to any male of described species) and are not presented in this paper. Eight species have new measurements compared to only few references already available in the literature.

### Subfamily Amblyseiinae Muma

Amblyseiinae Muma 1961: 273.

### Tribe Neoseiulini Chant & McMurtry

Neoseiulini Chant & McMurtry 2003a: 6.

### Genus *Neoseiulus* Hughes

*Neoseiulus* Hughes 1948: 141.

### *Neoseiulus teke* (Pritchard & Baker)

*Amblyseius (Amblyseius) teke* Pritchard & Baker 1962: 239.

*Amblyseius teke*, Meyer & Rodrigues 1966: 30, Moraes *et al.* 1989a: 83, 1989b: 97.

*Neoseiulus teke*, Moraes *et al.* 1986: 98, 2004b: 147, Chant & McMurtry 2003a: 37, 2007: 31.

*Amblyseius (Amblyseius) bibens* Blommers 1973: 111 (synonymy according to Ueckermann & Loots 1988).

*Neoseiulus teke* belongs to the *barkeri* species group and the *womersleyi* species subgroup (Chant and McMurtry 2003a). This species is found in sub-Saharan Africa often associated with *Mononychellus tanajoa* (Bondar), the cassava green mite (CGM). It has been studied for its potential as BCA against the CGM. Nwilene and Nachman (1996) studied its reproduction characteristics on *M. tanajoa*. It was more efficient than *I. degenerans*, but seems not efficient enough in field conditions (Nwilene and Nachman 1996).

**World distribution:** Burundi, DR Congo, Ghana, Kenya, Malawi, Mayotte Island, Mohéli Island, Mozambique, La Réunion Island, Rwanda, Sierra Leone, South Africa, Tanzania, Zimbabwe.

**Specimens examined:** three specimens (2 ♀♀ and 1 imm.) collected during this study. **Moroni** (171 m aasl, lat. 11°40'47" S, long. 43°16'27" E), 1 ♀ on *Bidens pilosa* L. (Asteraceae), 9/XII/2018; **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on *Psidium guajava* L. (Myrtaceae) and 1 imm. on *Carica papaya* L. (Caricaceae), 11/XII/2018.

**Remarks:** measurements of morphological characters of *N. teke* female and male specimens from Grande Comore Island are very close to measurements of specimens from neighbouring countries, especially from specimens from La Réunion (Quilici *et al.* 2000; Kreiter *et al.* 2020d), Mayotte (Kreiter *et al.* 2020a) and Mohéli (Kreiter *et al.* 2021b) Islands and from

specimens of various countries in Africa, except for the holotype (Zannou *et al.* 2006) and specimens from South Africa which are larger (van der Merwe 1965).

## Tribe Kampimodromini Kolodochka

Kampimodromini Kolodochka 1998: 59, Chant & McMurtry 2003b: 189, 2006: 137, 2007: 33.

## Subtribe Kampimodromina Chant & McMurtry

Paraphytoseiina Chant & McMurtry 2003b: 193.

### Genus *Okiseius* Ehara

*Okiseius* Ehara 1967: 77

#### *Okiseius subtropicus* Ehara

*Okiseius subtropicus* Ehara 1967: 77, 1975: 33, Ehara & Hamaoka 1980: 6, Wu & Qian 1983: 75, Moraes *et al.* 1986: 102, 2004b: 155, Corpuz-Raros & Garcia 1994: 366, Ehara *et al.* 1994: 136, Wu *et al.* 1997: 142, Chant & McMurtry 2003b: 202, 2007: 43.

*Platyseiella (Noeledius) subtropicus*, Tseng 1976: 102.

*Proprioseius (Okiseius) subtropicus*, Karg 1983: 302.

*Amblyseius (Kampimodromos) subtropicus*, Ueckermann & Loots 1985: 195.

*Amblyseius subtropicus*, Chant & Yoshida-Shaul 1989: 1020.

*Okiseius (Okiseius) subtropicus*, Kolodochka & Denmark 1996: 235.

*Amblyseius (Okiseius) subtropicus*, Ehara & Amano 1998: 45.

*Okiseius wui* Denmark & Kolodochka in Kolodocka & Denmark 1996: 235 (synonymy according to Walter 1999).

There are 17 species in the genus *Okiseius* (Chant and McMurtry 2003b, 2007) divided in two species group based on the situation of seta R1, on or off dorsal shield, the *subtropicus* and the *maritimus* species groups. With setae *R1* inserted on the dorsal shield of females, *O. subtropicus* belongs to the first one. Nothing is known about the biology of this species. This is the first record of *O. subtropicus* outside Asia and Oceania. This species is reported to be a predator of the eriophyoid mites *Aculops pelekassi* (Keifer) on citrus in Japan (Ehara *et al.* 1994) and *Phyllocoptrus oleivora* in China (Yang 1986). Although originally described from a single adult female mite from Okinawa Island (Ehara 1967), *O. subtropicus* is now known from Japan (Honshu) (Ehara and Hamaoka 1980; Ehara *et al.* 1994), China (Shanghai, Zhejiang, Jiangxi, Fujian, Guangdong, Hainan, Guangxi) (Wu *et al.* 1997), Taiwan (Tseng 1976), the Philippines (Leyete) (Corpuz-Raros & Garcia 1994), Russia (Kolodochka and Denmark 1996; Wu *et al.* 1997), and Australia (Walter 1999).

**World distribution:** Australia, China, Japan, Malaysia, Philippines, Taiwan.

**Specimens examined:** five specimens (4 ♀♀ and 1 ♂) collected during this study. **Moroni**, Le Kalyptus Hotel (24 m aasl, lat. 11°40'58" S, long. 43°15'45" E), 3 ♀♀ and 1 ♂ on *Lantana camara* L. (Verbenaceae) with eriophyid galls and 1 ♀ on *Solanum torvum* Swartz (Solanaceae), 7/XII/2018.

**Remarks:** measurements of morphological characters of *O. subtropicus* female and male specimens from Grande Comore Island (Tables 1 and 2) are very close to measurements of specimens from countries of South-East and Eastern Asia (China, Japan, Taiwan, Malaysia, Philippines) and specimens from Australia.

## Subtribe Paraphytoseiina Chant & McMurtry

Paraphytoseiina Chant & McMurtry 2003b: 211.

**Table 1** Character measurements of adult females of *Okiseius subtropicus* collected in this study with those obtained from previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (4) (this study)	Australia -3	China (?)	Japan -1	Malaysia -8	Philippines -2	Taiwan -2
Dsl	<b>286</b> (283 – 288)	285 – 300	290 – 325	300	–	270	513 ?
Dsw	<b>153</b> (150 – 155)	–	175 – 190	170 – 177	–	200	191
j1	<b>21</b> (19 – 23)	–	17 – 23	17 – 20	17 (16 – 17)	17	23
j3	<b>21</b> (20 – 23)	–	19 – 25	21	17 (17 – 18)	20	30
j4	<b>13</b> (11 – 13)	–	11 – 14	14 – 15	12	14	18
j5	<b>11</b> (10 – 13)	–	10 – 14	16	13 (12 – 13)	14	18
j6	<b>24</b> (23 – 25)	–	23 – 30	26 – 27	20 (19 – 20)	24	27
J5	<b>5</b> (4 – 5)	–	5 – 6	5	6 (5 – 6)	7	5
r3	<b>28</b> (25 – 30)	–	22 – 25	24 – 25	19	20	25
R1	<b>23</b> (22 – 24)	–	22 – 25	24 – 25	18	20	28
s4	<b>30</b> (28 – 30)	–	27 – 32	29 – 30	22	31	33
S2	<b>35</b> (33 – 38)	–	33 – 38	37 – 38	29 (28 – 29)	31	40
S5	<b>17</b> (16 – 18)	14 – 17	10 – 18	14 – 16	14	14	18
z2	<b>24</b> (23 – 26)	–	21 – 25	24	19 (19 – 20)	20	30
z4	<b>24</b> (24 – 25)	–	22 – 28	25 – 26	19 (19 – 20)	24	–
z5	<b>15</b> (14 – 15)	–	13 – 18	19 – 20	15 (15 – 16)	24	20
Z1	<b>31</b> (29 – 33)	–	27 – 34	33	24	27	35
Z4	<b>44</b> (43 – 45)	–	41 – 50	44 – 45	36 (35 – 37)	41	47
Z5	<b>50</b> (47 – 53)	–	44 – 50	44 – 45	35 (35 – 36)	?	52
st1-st1	<b>38</b> (36 – 38)	–	–	–	–	–	–
st2-st2	<b>48</b>	–	–	–	–	–	–
st3-st3	<b>57</b> (55 – 63)	–	–	–	–	–	–
st1-st3	<b>55</b> (53 – 56)	–	–	–	–	–	–
st4-st4	<b>65</b> (55 – 70)	–	–	–	–	–	–
Gensl	<b>98</b> (85 – 105)	–	–	–	–	–	–
Gensw st5	<b>60</b> (58 – 63)	–	–	–	–	–	–
Gensw post. corn.	<b>55</b> (48 – 60)	–	–	–	–	–	–
st5-st5	<b>54</b> (53 – 56)	–	–	–	–	–	–
Lisl	<b>20</b>	–	–	–	–	–	25
Lsiw	<b>4</b> (3 – 4)	–	–	–	–	–	2
Sisl	–	–	–	–	–	–	–
Vsl	<b>97</b> (90 – 105)	–	95 – 98	97	–	–	–
vsw ZV2	<b>52</b> (48 – 55)	–	52 – 55	54	–	–	–
Vsw anus	<b>56</b> (53 – 60)	–	–	–	–	–	–
gv3 – gv3	<b>44</b> (41 – 47)	–	39	40	–	–	–
JV5	<b>26</b> (23 – 30)	–	23	18 – 20	16	–	25
StIV	<b>9</b> (9 – 10)	–	14	15	12	17	–
SttIV	<b>10</b> (9 – 10)	–	–	13	13	14	–
scl	<b>9</b> (8 – 10)	–	4	–	–	–	–
scw	<b>8</b> (7 – 8)	–	–	–	–	–	–
Fdl	<b>18</b> (16 – 19)	–	–	–	–	–	–
No teeth Fdl	<b>3</b>	–	3 – 4	3	–	–	–
Mdl	<b>19</b> (18 – 20)	–	–	–	–	–	–
No teeth Mdl	<b>1</b>	–	1	1	–	1	–

Sources of measurements – Australia: Walter (1999); China: Wu *et al.* (1997) and Kolodochka & Denmark (1996) (identified as *Okiseius wui* but synonymized by Walter 1999); Japan: Ehara (1967) and Kolodochka & Denmark (1996); Malaysia: Ehara (2006); Philippines: Corpuz-Raros & Garcia (1994); Taiwan: Tseng (1976); -: not provided.

**Genus *Paraphytoseius* Swirskii & Shechter**

*Paraphytoseius* Swirski & Shechter 1961: 113, Moraes *et al.* 1986: 104, 2004b: 160; Chant & McMurtry 2003b: 216, 2007: 49.

***Paraphytoseius horrifer* (Pritchard & Baker)**

*Amblyseius (Ptenoseius) horrifer* Pritchard & Baker 1962: 295.

*Amblyseius horrifer*, Meyer & Rodrigues 1966: 30.

*Amblyseius (Paraphytoseius) horrifer*, van der Merwe 1968: 169.

*Proprioseius (Paraphytoseius) horrifer*, Karg 1983: 302.

*Paraphytoseius horrifer*, Moraes *et al.* 1986: 105, 2004b: 161, Beard 2001: 84, Chant & McMurtry 2003a: 37, 2007: 53.

In all our specimens of *Paraphytoseius*, setae S5 are absent. So according to Chant and McMurtry (2003b), they belong to the *orientalis* species group. As the previous authors, and Moraes *et al.* (2007b), we also recognise *P. horrifer* and *P. orientalis* as two valid species. Our specimens with longer setae s4, Z4, Z5, and with no distinctly short, thick, spatulate macroseta on genu I belongs to the former species. This species is widely distributed in Sub-Saharan Africa and Madagascar. The biology of *P. horrifer* remains totally unknown. It was mentioned recently for the first from several countries: Mauritius (Kreiter and Abo-Shnaf 2020b), La Réunion (Kreiter *et al.* 2020c), Rodrigues (Kreiter and Abo-Shnaf 2020a) and Vietnam (Kreiter *et al.* 2020b).

**World distribution:** Benin, DR Congo, Ghana, India, Kenya, La Réunion Island, Madagascar Island, Malawi, Mauritius Island, Mayotte Island, Mozambique, Reunion Island, Rodrigues Island, Senegal, South Africa, Uganda, Vietnam.

**Specimens examined:** 5 specimens (4 ♀♀ and 1 ♂) collected during this study. **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 ♀ on *Rubus rosifolius* Smith (Rosaceae), 6/XII/2018; **Moroni**, Le Kalyptus Hotel (24 m aasl, lat. 11°40'58"

**Table 2** Character measurements of an adult male of *Okiseius subtropicus* collected in this study with those obtained from previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (1) (this study)	China (2?)	Japan (8)	Characters	Grande Comore (1) (this study)	China (2?)	Japan (8)
Dsl	<b>215</b>	225	233	<i>st1-st1</i>	<b>35</b>	—	—
Dsw	<b>113</b>	144	144	<i>st2-st2</i>	<b>41</b>	—	—
<i>j1</i>	<b>19</b>	20	17	<i>st3-st3</i>	<b>46</b>	—	—
<i>j3</i>	<b>19</b>	15	16 (15 – 16)	<i>st1-st5</i>	<b>90</b>	—	—
<i>j4</i>	<b>10</b>	13	12 (11 – 12)	<i>st4-st4</i>	<b>40</b>	—	—
<i>j5</i>	<b>10</b>	13	12 (11 – 12)	<i>st5-st5</i>	<b>33</b>	—	—
<i>j6</i>	<b>16</b>	19	18 (17 – 18)	Vsl	<b>93</b>	—	—
<i>J5</i>	<b>4</b>	5	4	Vsw ZV2	<b>95</b>	—	—
<i>r3</i>	<b>22</b>	20	19 (19 – 20)	Vsw anus	<b>55</b>	—	—
<i>R1</i>	<b>18</b>	18	15 (15 – 16)	<i>gv3 – gv3</i>	<b>35</b>	—	—
<i>s4</i>	<b>23</b>	23	21 (20 – 21)	<i>JV5</i>	<b>15</b>	—	12
<i>S2</i>	<b>26</b>	29	24	<i>StIV</i>	<b>9</b>	15	12 (12 – 13)
<i>S5</i>	<b>13</b>	13	10	<i>SttIV</i>	<b>8</b>	14	13
<i>z2</i>	<b>20</b>	18	18 (18 – 19)	Fdl	<b>15</b>	—	—
<i>z4</i>	<b>20</b>	18	18 (18 – 19)	No teeth Fd	—	—	—
<i>z5</i>	<b>13</b>	14	14 (14 – 15)	Mdl	<b>15</b>	—	—
<i>Z1</i>	<b>23</b>	23	18 (18 – 19)	No teeth Md	—	—	—
<i>Z4</i>	<b>30</b>	31	30 (30 – 31)	Shaft	<b>13</b>	—	—
<i>Z5</i>	<b>33</b>	33	30 (29 – 31)	Branch	—	—	—

Sources of measurements – China: Wu & Qian (1983); Japan: Ehara *et al.* (1994); –: not provided.

S, long.  $43^{\circ}15'45''$  E), 2 ♀♀ on *Annona senegalensis* Persoon (Annonaceae), 7/XII/2018; **Djoumoichongo** (230 m aasl, lat.  $11^{\circ}48'34''$  S, long.  $43^{\circ}17'37''$  E), 1 ♀ and 1 ♂ on *Occimum gratissimum* L. (Lamiaceae), 10/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements fit well measurements from Kreiter *et al.* (2020b, c, d, Kreiter *et al.* 2021a). This species described from Africa (Pritchard and Baker 1962) was first mentioned in the Indian Ocean from La Réunion Island (Kreiter *et al.* 2020d) but is also present in Rodrigues, Mauritius, Mayotte and Anjouan Islands (Kreiter and Abo-Shnaf 2020a, b, Kreiter *et al.* 2020a, Kreiter *et al.* 2021a). It was the more abundant species in Anjouan Island (Kreiter *et al.* 2021a).

### **Paraphytoseius orientalis (Narayanan, Kaur & Ghai)**

*Typhlodromus (Amblyseius) orientalis* Narayanan, Kaur & Ghai 1960: 394.

*Paraphytoseius orientalis*, Moraes *et al.* 1986: 105, 2004b: 162, Chant & McMurtry 2003b: 220, 2007: 53.

*Amblyseius ipomeai*, Narayanan, Kaur & Ghai 1960: 394 (synonymy according to El-Banhawy 1984).

*Paraphytoseius multidentatus*, Swirski & Shechter 1961: 114 (synonymy according to Matthysse & Denmark 1981 in Denmark *et al.* 1999).

*Paraphytoseius narayanani*, Ehara 1967: 67 (synonymy according to Ehara & Ghai, in Ehara 1967).

This species belongs to the *orientalis* species group (Chant and McMurtry 2003b). Our specimens with relatively shorter setae *s4*, *Z4* and *Z5*, having a distinctly short, thick, spatulate macroseta on genu I belong to the species *P. orientalis*. This species is widely distributed in tropical and subtropical areas in South America, Africa and Asia. It belongs to a genus included in the large polyphagous generalist group named type III phytoseiid mites (McMurtry and Croft 1997; McMurtry *et al.* 2013). Navasero and Navasero (2016) had studied the life history of *P. orientalis* on the broad mite (*Polyphagotarsonemus latus*) (Banks) as prey and reported high predation rates on the eggs of *P. latus*, suggesting good potential for the control of this pest.

**World distribution:** Argentina, Brazil, Burundi, India, Japan, Kenya, La Réunion Island, Madagascar Island, Martinique Island, Mauritius Island, Mayotte Island, Mozambique, Reunion Island, Rwanda, Vietnam.

**Specimens examined:** 10 specimens (6 ♀♀, 1 ♂ and 3 imm.) collected during this study. **Moroni**, Le Kalyptus Hotel (24 m aasl, lat.  $11^{\circ}40'58''$  S, long.  $43^{\circ}15'45''$  E), 1 ♂ and 3 ♀♀ on *Lantana camara* L. (Verbenaceae) with eriophyid galls, 7/XII/2018; **Moroni** (51 m aasl, lat.  $11^{\circ}41'01''$  S, long.  $43^{\circ}15'55''$  E), 1 ♀ and 2 imm. on *Averrhoa bilimbi* L. (Oxalidaceae), 9/XII/2018; **Djoumoichongo** (230 m aasl, lat.  $11^{\circ}48'34''$  S, long.  $43^{\circ}17'37''$  E), 1 imm. on *Annona muricata* L. (Annonaceae) and 2 ♀♀ on *Occimum gratissimum* L. (Lamiaceae), 10/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements fit well measurements in Ferragut and Baumann (2019) and Kreiter *et al.* (2020b, d, 2021 b). This species was described from Asia (Narayanan *et al.* 1960) and present also in Mauritius (Ferragut and Baumann 2019; Kreiter *et al.* 2018a; Kreiter and Abo-Shnaf 2020b), Mayotte (Kreiter *et al.* 2020a), Vietnam (Kreiter *et al.* 2020b), La Réunion Island (Kreiter *et al.* 2020d) and Mohéli Island (Kreiter *et al.* 2021b).

### **Tribe Typhlodromipsini Chant & McMurtry**

Typhlodromipsini Chant & McMurtry 2005c: 318.

### **Genus *Typhlodromips* De Leon**

*Typhlodromips* De Leon 1965: 23, Chant & McMurtry 2007: 61.

## **Typhlodromips shi (Pritchard & Baker)**

*Amblyseius (Amblyseius) shi* Pritchard & Baker 1962: 252.

*Typhlodromips shi*, Moraes et al. 1986: 147, 2004: 224, Chant & McMurtry 2005c: 327, 2007: 63.

*Typhlodromips ivoloinae* Blommers 1974: 146 (synonymy according to Ueckermann & Loots 1988).

This species belongs to the *culmulus* species group of the genus *Typhlodromips* with nine other species. It was described under the name *ivoloinae* by Blommers (1974) from Madagascar on *Citrus lemon* (L.) Burman (Rutaceae). Mayotte Island is approximately 340 km away from the Madagascar coast and it is not surprising to find this species on a close by island. But Grand Comore is further from Madagascar but closer to Mozambique than Mayotte. The species was not reported from Mascareignes Archipelago. Its biology is totally unknown.

**World distribution:** Angola, Benin, Cameroon, DR Congo, Ghana, Kenya, Madagascar, Malawi, Mayotte Island, Mozambique, Nigeria, Sierra Leone.

**Specimens examined:** 19 specimens (10 ♀♀, 3 ♂♂) collected during this study. **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 4 ♀♀ *Stachytarpheta jamaicensis* L. (Vahl (Verbenaceae) and 2 ♀♀ on *Rubus rosifolius* Smith (Rosaceae) and 1 ♀ on *Clidemia hirta* L. (Melastomataceae), 6/XII/2018; **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 3 ♂♂ and 3 ♀♀ on *Tristemma mauritianum* L. (Melastomataceae), 10/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements (Tables 3 and 4) fit well with those provided in the literature, except for *s4* and *Z4* for females which are longer in specimens from Grande Comore and *s4*, *Z4* and macrosetae of leg IV which are also longer in specimens collected during this study. The presence of this species on Madagascar and Mayotte Island (Kreiter et al. 2020a) makes Grande Comore the third island of the Indian Ocean known for hosting this species.

## **Tribe Amblyseiini Muma**

*Amblyseiinae* Muma 1961: 273 and *Amblyseiini* Muma, Wainstein 1962: 26.

## **Subtribe Amblyseiina Muma**

*Amblyseiina* Muma, Chant & McMurtry 2004: 179.

## **Genus *Amblyseius* Berlese**

*Amblyseius* Berlese 1914: 143.

## ***Amblyseius duplicesetus* Moraes & McMurtry**

*Amblyseius duplicesetus* Moraes & McMurtry 1988: 13, Moraes et al. 2004a: 143, 2004b: 22, Zannou et al. 2007: 10, El-Banhawy & Knapp 2011: 25.

*Amblyseius duplicesetus* [sic], Chant & McMurtry 2004a: 208, 2007: 78.

This species belongs to the *largoensis* species group as setae *J2* and *Z1* are present, setae *s4* are minute and the ventrianal shield of the female is vase-shaped. It belongs to the *largoensis* species subgroup as setae *Z4* are long, spermatheca has the calyx elongate and the female ventrianal shield is entire (Chant and McMurtry 2004, 2007).

It was described from Kenya (Moraes and McMurtry 1988; Zannou et al. 2007; El-Banhawy and Knapp 2011) and more recently reported from Sri Lanka (Moraes et al. 2004a), its biology is totally unknown. This is the third mention of that species in Indian Ocean Islands after Anjouan and Mohéli Islands (Kreiter et al. 2021a, b).

**World distribution:** Ajouan Island, Kenya, Mohéli Island, Sri Lanka.

**Table 3** Character measurements of adult females of *Typhlodromips shi* collected in this study with those in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (10) (this study)	Mayotte (1)	Africa (20)	Angola (?)	Madagascar (1?)
Dsl	<b>314</b> (300 – 323)	320	332 (310 – 347)	347 – 362	320
Dsw	<b>201</b> (168 – 225)	205	217 (200 – 226)	223 – 246	230
j1	<b>16</b> (15 – 18)	15	16 (13 – 21)	19	15
j3	<b>19</b> (18 – 20)	18	19 (16 – 24)	19	18
j4	<b>10</b> (9 – 12)	8	10 (8 – 13)	11	10
j5	<b>10</b> (9 – 11)	8	10 (8 – 11)	11	10
j6	<b>11</b> (10 – 13)	9	12 (10 – 13)	12	10
J2	<b>14</b> (13 – 15)	10	13 (11 – 14)	16	12
J5	<b>9</b> (8 – 10)	8	8 (8 – 10)	9	8
r3	<b>15</b> (14 – 18)	15	14 (11 – 16)	16	12
R1	<b>12</b> (10 – 13)	9	11 (8 – 13)	13	12
s4	<b>27</b> (25 – 28)	15	21 (16 – 26)	19	18
S2	<b>11</b> (10 – 13)	10	11 (8 – 13)	13	12
S4	<b>9</b> (8 – 10)	8	10 (8 – 13)	11	10
S5	<b>9</b> (8 – 10)	8	9 (8 – 10)	9	10
z2	<b>12</b> (10 – 13)	13	12 (11 – 13)	13	14
z4	<b>12</b> (9 – 13)	10	12 (10 – 13)	13	10
z5	<b>10</b> (9 – 10)	8	10 (8 – 11)	9	10
Z1	<b>13</b> (10 – 15)	11	13 (13 – 14)	14 – 16	10
Z4	<b>37</b> (33 – 40)	23	31 (22 – 37)	29 – 34	26
Z5	<b>71</b> (69 – 75)	68	67 (53 – 74)	72	60
st1-st1	<b>50</b> (48 – 54)	50	–	–	–
st2-st2	<b>61</b> (58 – 63)	60	63 (59 – 66)	–	–
st3-st3	<b>68</b> (65 – 70)	65	–	–	–
st1-st3	<b>54</b> (53 – 55)	50	54 (50 – 58)	–	–
st4-st4	<b>68</b> (58 – 75)	75	–	–	–
Gensl	<b>115</b> (108 – 125)	Not visible	–	–	–
Gensw st5	<b>69</b> (64 – 73)	–	–	–	–
St5-st5	<b>63</b> (58 – 68)	65	65 (59 – 70)	–	–
Gensw post. corn.	<b>88</b> (80 – 98)	Not visible	–	–	–
Lisl	<b>16</b> (14 – 20)	15	–	–	–
Lisw	<b>6</b> (4 – 8)	4	–	–	–
Sisl	<b>8</b> (5 – 10)	8	–	–	–
Vsl	<b>111</b> (105 – 115)	103	108 (94 – 115)	109 – 123	105
Vsw ZV2	<b>89</b> (83 – 95)	65	84 (74 – 94)	85 – 92	80
Vsw anus	<b>80</b> (75 – 90)	68	79 (72 – 86)	–	–
gv3 – gv3	<b>26</b> (23 – 29)	25	–	–	–
JV5	<b>37</b> (33 – 40)	29	–	32 – 39	35
SgeI	<b>29</b> (28 – 30)	20	26 (22 – 30)	28 – 31	–
SgeII	<b>25</b> (24 – 28)	18	23 (19 – 29)	25 – 26	–
SgeIII	<b>31</b> (26 – 33)	23	29 (24 – 32)	33 – 39	28
StiIII	<b>25</b> (23 – 28)	23	23 (19 – 24)	25 – 30	–
SgeIV	<b>49</b> (45 – 50)	43	42 (35 – 48)	47 – 54	40
StiIV	<b>36</b> (33 – 38)	35	33 (26 – 40)	38 – 41	32
StIV	<b>60</b> (55 – 68)	49	52 (42 – 67)	54 – 60	50
Scl	<b>4</b> (3 – 5)	8	6 (5 – 8)	–	–
Scw	<b>8</b>	2	13 (13 – 14)	–	–
Fdl	<b>27</b> (25 – 28)	25	23 (23 – 24)	–	25
No teeth Fd	<b>8</b>	8	8	8	8
Mdl	<b>28</b> (25 – 30)	26	27 (27 – 28)	–	27
No teeth Md	<b>3</b>	3	3	3	3

**Sources of measurements – Africa** (Benin: 3♀♀; Cameroon: 2♀♀; Ghana: 10♀♀; Kenya: 3♀♀; Mozambique: 1♀; Democratic Republic of Congo: holotype); Moraes *et al.* (2007a); **Angola**: Ueckermann & Loots (1988); **Madagascar** (Identified as *Amblyseius ivoloinae* but synonymized by Ueckermann & Loots 1988); Blommers (1974); –: not provided.

**Specimens examined:** 40 specimens (23 ♀♀, 7 ♂♂ and 10 imm.) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 3 ♀♀ and 1 imm. on *Acacia mangium* Willdenow (Mimosaceae), 1 imm. on *Annona muricata* L. (Annonaceae), 1 ♀ on *Artocarpus heterophyllus* Lamarck (Moraceae), 1 ♀ on *Clerodendrum speciosissimum* Van Geert ex. Morren (Verbenaceae), 2 ♀♀ and 1 imm. on *Theobroma cacao* L. (Malvaceae) and 1 ♂ and 2 ♀♀ on *Mangifera indica* L. (Anacardiaceae), 6/XII/2018; **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 ♂, 3 ♀♀ and 1 imm. on *Myristica fragans* Houttuyn (Myristicaceae), 1 ♂, 1 ♀ and 1 imm. on *Citrus sinensis* (L.) Osbeck (Rutaceae), 6/XII/2018; **Dzahani**, village (209 m aasl, lat. 11°46'32" S, long. 43°16'40" E), 1 ♂ on *Carica papaya* L. (Caricaceae), 1 ♂ on *Artocarpus altilis* Parkinson Fosberg (Moraceae) and 2 ♀♀ on *Cananga odorata* (Lamarck) Hooker and Thomson (Annonaceae), 7/XII/2018; **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ on *C. sinensis*, 1 ♀ and 1 imm. on *A. altilis* and 2 imm. on *Clidemia hirta* (L.) Don (Melastomataceae), 10/XII/2018; **Mdjoizezi** (230 m aasl, lat. 11°50'19" S, long. 43°18'29" E), 1 ♀ on *Vitex doniana* Sweet (Lamiaceae) and 1 ♂, 4 ♀♀ and 1 imm. on *M. indica*, 10/XII/2018; **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ and 1 imm. on an unknown host plant, 1 ♂ and 1 imm. on *Spondias dulcis* Solander ex. Parkinson (Anacardiaceae), 1 imm. on *Bombacopsis glabra* Pasquale (Bombacaceae) and 1 imm. on *Psidium guava* L. (Myrtaceae), 11/XII/2018.

**Table 4** Character measurements of an adult male of *Typhlodromips shi* collected in this study with those in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (3) (this study)	Madagascar (2?)	Characters	Grande Comore (3) (this study)	Madagascar (2?)
Dsl	<b>254</b> (250 – 263)	270	st1-st1	<b>45</b> (45 – 46)	–
Dsw	<b>156</b> (148 – 170)	190	st2-st2	<b>52</b> (52 – 53)	–
j1	<b>17</b> (15 – 19)	15	st3-st3	<b>54</b> (54 – 55)	–
j3	<b>25</b>	25	st1-st5	<b>100</b> (99 – 100)	–
j4	<b>9</b> (8 – 9)	9	st4-st4	<b>39</b> (38 – 40)	–
j5	<b>9</b> (8 – 9)	8	st5-st5	<b>33</b> (31 – 35)	–
j6	<b>10</b> (10 – 11)	9	Vsl	<b>107</b> (103 – 113)	95
J2	<b>12</b> (11 – 13)	10	Vsw ZV2	<b>139</b> (135 – 145)	–
J5	<b>7</b> (7 – 8)	7	Vsw anus	<b>63</b> (60 – 65)	–
r3	<b>13</b> (13 – 14)	11	gv3 – gv3	<b>19</b> (19 – 20)	–
R1	<b>10</b> (9 – 10)	10	JV5	<b>24</b> (23 – 24)	25
s4	<b>21</b> (20 – 23)	15	SgeI	<b>24</b> (23 – 25)	
S2	<b>8</b>	10	SgeII	<b>22</b> (21 – 23)	
S4	<b>8</b>	9	SgeIII	<b>26</b> (24 – 28)	
S5	<b>8</b> (7 – 8)	8	StiIII	<b>21</b> (20 – 23)	
z2	<b>10</b> (10 – 11)	10	SgeIV	<b>37</b> (35 – 38)	25
z4	<b>11</b> (11 – 12)	9	StiIV	<b>31</b> (29 – 33)	23
z5	<b>8</b>	8	StIV	<b>52</b> (51 – 53)	38
Z1	<b>12</b> (11 – 13)	10	Fdl	<b>20</b> (18 – 21)	–
Z4	<b>35</b> (33 – 36)	25	No teeth Fd	<b>7</b>	6
Z5	<b>52</b> (50 – 53)	45	Mdl	<b>20</b> (18 – 21)	–
			No teeth Md	<b>1</b>	1
			Shaft	<b>20</b>	19
			Branch	<b>1</b>	1

**Sources of measurements – Madagascar** (but identified as *Typhlodromips ivoloinae* and synonymized by Ueckermann & Loots 1988); Blommers (1974); –: not provided.

**Remarks:** this is the more abundant species found in several sites. All measurement values fit well those already published on this species with only very slight variations (Moraes and McMurtry 1988; Moraes *et al.* 2004a; Zannou *et al.* 2007; El-Banhawy and Knapp 2011; Kreiter *et al.* 2021a, b). Measurement values of female specimens of Grande Comore are very similar to values for specimens from Kenya and Sri Lanka, however with some shorter setae in specimens of Anjouan and Mohéli Islands (Kreiter *et al.* 2021a, b). The male of that species will be redescribed in a following paper.

### ***Amblyseius largoensis* (Muma)**

*Amblyseiopsis largoensis* Muma 1955: 266.  
*Typhlodromus (Amblyseius) largoensis*, Chant 1959: 96.  
*Amblyseius (Amblyseialus) largoensis*, Muma 1961: 287.  
*Typhlodromus largoensis*, Hirschmann 1962: 2.  
*Amblyseius (Amblyseius) largoensis*, Ehara 1966: 22.  
*Amblyseius largoensis*, Swirski & Golan 1967: 225, Moraes *et al.* 1986: 17, 2004b: 33, Chant & McMurtry 2004: 208, 2007: 78.  
*Amblyseius magnolia* Muma 1961: 289 (synonymy by Denmark & Evans 2011).  
*Amblyseius sakalava* Blommers 1976: 96 (synonymy by Ueckermann & Loots 1988).  
*Amblyseius amtalaensis* Gupta 1977: 53 (synonymy by Gupta 1986).

Like the previous species, *A. largoensis* belongs to the *largoensis* species group and to the *largoensis* species subgroup (Chant and McMurtry 2004).

It is widespread in all tropical and subtropical regions of the world and was the most abundant species collected by Moraes *et al.* (2000) in French Caribbean Islands and as a potential BCA of *Raoiella indica* Hirst in La Réunion Island (Moraes *et al.* 2012). Using morphometric analyses of 36 characters, molecular analyses and crossing tests, Navia *et al.* (2014) studied specimens collected in Brazil, La Réunion Island and Trinidad and Tobago to determine whether *A. largoensis* populations from different geographic origins belong to the same taxonomic entity. Though differences in the lengths of some setae were observed, molecular analyses and crossing experiments indicated that populations from Indian Ocean and Caribbean were conspecific. This species was previously recorded from Mauritius Island by Ferragut and Baumann (2019) and Kreiter and Abo-Shnaf (2020b), from Rodrigues Island by Kreiter and Abo-Shnaf (2020a), from Mayotte Island by Kreiter *et al.* (2020a) and Anjouan and Mohéli Islands (Kreiter *et al.* 2021a; Kreiter *et al.*, 2021b).

**World distribution:** this species is widely distributed in the tropical and subtropical regions of Africa, Americas, Asia and the Pacific Islands. It is also present in several Islands of the Indian Ocean (Rodrigues Island, Mauritius Island, Mayotte Island, Anjouan Island and Mohéli Island).

**Specimens examined:** 3 specimens (1 ♀ and 2 ♂♂) collected during this study. **Moroni** (171 m aasl, lat. 11°40'47" S, long. 43°16'27" E), 1 ♀ and 1 ♂ on *Clidemia hirta* (L.) Don (Melastomataceae) and 1 ♂ on *Bidens pilosa* L. (Asteraceae), 9/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of the Grande Comore specimens fit well with those given for specimens from Africa, Brazil, La Réunion, Trinidad & Tobago, Mauritius Island, Rodrigues Island, Mayotte Island, Anjouan Island and from Mohéli Island (Zannou *et al.* 2007; Navia *et al.* 2014; Ferragut & Baumann 2019; Kreiter and Abo-Shnaf 2020a, 2020b; Kreiter *et al.* 2020a, 2021a, 2021b).

### ***Amblyseius herbicolus* (Chant)**

*Typhlodromus (Amblyseius) herbicolus* Chant 1959: 84.  
*Amblyseius (Amblyseius) herbicolus*, Muma 1961: 287.  
*Typhlodromus herbicolus*, Hirschmann 1962: 23.  
*Amblyseius herbicolus*, Moraes *et al.* 1986: 14, 1989a: 79, 2004b: 27, Chant & McMurtry 2004: 208, 2007: 78.

*Amblyseius impactus* Chaudhri 1968: 553 (synonymy according to Daneshvar & Denmark 1982).

*Typhlodromus (Amblyseius) amitae* Bhattacharyya 1968: 677 (synonymy according to Denmark & Muma 1989).

*Amblyseius deleoni* Muma & Denmark 1970: 68 (synonymy according to Daneshvar & Denmark 1982).

*Amblyseius giganticus* Gupta 1981: 33 (synonymy according to Gupta 1986).

*Amblyseius (Amblyseialus) thermophilus* Karg 1991: 12 (synonymy according to El-Banhawy & Knapp 2011).

Like the two previous species, *A. herbicolus* belongs also to the *largoensis* species group and to the *largoensis* species subgroup (Chant and McMurtry 2004).

*Amblyseius herbicolus* is widespread in all tropical and subtropical regions of the world. It is the second most abundant phytoseiid mites on *Coffea arabica* L. in Brazil, associated with *Brevipalpus phoenicis* (Geijskes), vector of the coffee ring spot virus and it was found to be an efficient predator (Reis *et al.* 2007). *Amblyseius herbicolus* is also found associated with the broad mite, *P. latus*, in crops such as chili pepper (*Capsicum annuum* L.) in Brazil and has also a good potential for controlling the pest. Rodriguez-Cruz *et al.* (2013) had studied biological, reproductive and life table parameters of *A. herbicolus* on three different diets: broad mites, castor bean pollen (*Ricinus communis* L.) and sun hemp pollen (*Crotalaria juncea* L.). The predator was able to develop and reproduce on all these three diets. However, its intrinsic growth rate was higher on broad mites and castor bean pollen. Feeding on alternative food such as pollen can facilitate the predator's mass rearing and maintain its population on crops when prey is absent or scarce. Many polyphagous generalist phytoseiid mites are important natural enemies because they can feed on plant provided pollen and various prey species, and thus persist in crops even in the absence of target pests (McMurtry *et al.* 2013). Hence, populations of these predators can be established in a crop by providing alternative food, thus increasing biological control. Alternative food affects *P. latus* control on chili pepper plants by predatory mites (Duarte *et al.* 2015). *Amblyseius herbicolus* had high oviposition and population growth rates when fed with cattail pollen (*Typha latifolia* L.), chili pepper pollen and bee-collected pollen, and a low rate on the alternative prey (*Tetranychus urticae* Koch). Supplementing pepper plants with pollen resulted in better control of broad mite populations (Duarte *et al.* 2015). Release of *A. herbicolus* on young plants with a weekly addition of honeybee pollen or cattail pollen until plants produce flowers seems a viable strategy to sustain populations of this predator (Duarte *et al.* 2015).

**World distribution:** Anjouan Island, Argentina, Australia, Azores, Benin, Brazil, Burundi, Canary Islands, China, Colombia, Grande Comore Island, Costa Rica, Dominican Republic, Dr Congo, El Salvador, Ghana, Guadeloupe Island, Guatemala, Hawaii, Honduras, India, Iran, Kenya, Les Saintes, La Réunion and Madagascar Islands, Malawi, Malaysia, Martinique Island, Mauritius Island, Mohéli Island, New Caledonia Island, Papua New Guinea, Peru, Philippines, Portugal, Puerto Rico, Rodrigues Island, Rwanda, Senegal, Singapore, South Africa, Spain, Taiwan, Thailand, Turkey, USA, Venezuela, West Indies.

**Specimens examined:** two specimens (2 ♀♀) collected during this study. **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 2 ♀♀ on *Rubus rosifolius* Smith (Rosaceae), 7/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements fit well with measurements provided in Kreiter *et al.* (2018b, 2020c, d, 2021a, b) and Kreiter and Abo-Shnaf (2020a, b). *Amblyseius herbicolus* was previously recorded in many countries of the world and especially in French West Indies (Moraes *et al.* 2000, Kreiter *et al.* 2006). It was first reported by Kreiter *et al.* (2018b) in the Comoros Archipelago in Grande Comore Island with two females collected. *Amblyseius herbicolus* was reported in the past from La Réunion Island with only few specimens (Quilici *et al.* 1997, 2000) and more recently many specimens (Kreiter *et al.* 2020d). It is also reported recently from Vietnam (Kreiter *et al.* 2020c), Rodrigues and

Maurice Islands (Kreiter and Abo-Shnaf 2020a, b) but only from females. Males were however found among several females in Mohéli and will be redescribed in a following paper.

### ***Amblyseius parasundi* Blommers**

*Amblyseius (Proprioseiopsis) parasundi* Blommers 1974: 144.

*Amblyseius parasundi*, Moraes et al. 1986: 27, 2004b: 46.

*Amblyseius (Amblyseius) parasundi*, Denmark & Muma 1989: 19.

This species has no setae Z1 and consequently belongs to the *sundi* species group and by having the spermatheca elongate, tub-like, to the *sundi* species subgroup. Although it was mentioned as abundant on fruit trees in Madagascar preying on tetranychid mites (Blommers and Gutierrez 1975), its biology is still not known.

**World distribution:** Madagascar Island, Mayotte Island.

**Specimens examined:** seven specimens (4 ♀♀ and 3 imm.) collected during this study.

**Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 ♀ on *Litchi sinensis* Sonnerat (Sapindaceae) and 1 ♀ and 2 imm. on *Clidemia hirta* L. (Melastomataceae), 6/XII/2018; **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 1 ♀ on *Mangifera indica* L. (Anacardiaceae), 7/XII/2018; **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ on *Psidium guajava* L. (Myrtaceae) and 1 imm. on *Cyathea* sp. (Chytaceae), 10/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements fit quite well with few measurement values from the literature (Blommers 1974, Denmark and Muma 1989) and from specimens from Mayotte Island (Kreiter et al. 2020a). *Amblyseius parasundi* is reported by Blommers (1974) as being a thelytokous species in mass-rearing and field collected specimens and this information is also mentioned in Denmark and Muma (1989). Actually, no males were collected in Grande Comore but 4 males were collected in Mayotte Island (Kreiter et al. 2020a) and will be described in a following paper.

### **Subtribe Proprioseiopsina Chant & McMurtry**

*Proprioseiopsina* Chant & McMurtry, 2004: 219.

### **Genus *Proprioseiopsis* Muma**

*Proprioseiopsis* Muma 1961: 277.

#### ***Proprioseiopsis ovatus* (Garman)**

*Amblyseiopsis ovatus* Garman 1958: 78.

*Typhlodromus (Amblyseius) ovatus*, Chant 1959: 90.

*Amblyseiulus ovatus*, Muma 1961: 278.

*Typhlodromus ovatus*, Hirschmann 1962: 2.

*Proprioseiopsis ovatus*, Moraes et al. 1986: 121, 2004b: 184, Chant & McMurtry 2005a: 15, 2007: 89.

*Proprioseiopsis (Proprioseiopsis) ovatus*, Karg 1989: 208.

*Proprioseiopsis cannaensis* (Muma 1962): 4 (synonymy according to Denmark & Evans 2011).

*Proprioseiopsis peltatus* (van der Merwe: 1968): 119 (synonymy according to Tseng 1983).

*Proprioseiopsis hudsonianus* (Chant & Hansell 1971): 723 (synonymy according to Denmark & Evans).

*Proprioseiopsis parapeltatus* (Wu & Chou 1981): 274 (synonymy according to Tseng 1983).

*Proprioseiopsis antonelli* Congdon 2002: 15 (synonymy according to Denmark & Evans 2011).

*Proprioseiopsis ovatus* belongs to the *belizensis* species group as genu I has no macrosetae. As the spermatheca of that species is saccular, it belongs to the *belizensis* species subgroup (Chant and McMurtry 2005a). This species is known from Guadeloupe, Marie-Galante and

Martinique (Kreiter and Moraes 1997; Moraes *et al.* 2000; Mailloux *et al.* 2010; Kreiter *et al.* 2018c). It was found in very high numbers only during a previous study on companion plant in Guadeloupe (Mailloux *et al.* 2010) and in a recent study in La Réunion (Le Bellec, unpub. data). *Proprioseiopsis mexicanus*, and *P. ovatus* seems to be abundant on weeds in the lower vegetation (Mailloux *et al.* 2010; Kreiter *et al.* 2018c). Denmark and Evans (2011) indicated that this species is associated with *Oligonychus pratensis* (Banks) and *Brevipalpus* spp. It was also found in association with *Tetranychus evansi* Baker and Pritchard (Furtado *et al.* 2014) but mentioned as an ineffective predator of that species. Despite this information, the biology of *P. ovatus* remains unknown.

**World distribution:** Argentina, Brazil, Colombia, Costa Rica, Cuba, Ecuador, Egypt, Ghana, Hawaii, Honduras, Japan, Malaysia, Martinique Island, Mayotte Island, Mozambique, Peru, Philippines, Puerto Rico, La Réunion Island, Saudi Arabia, Sierra Leone, South Africa, Spain, Sri Lanka, Taiwan, Thailand, Turkey, USA, Venezuela.

**Specimens examined:** two specimens (2 ♀♀) collected during this study. **Moroni** (171 m aasl, lat. 11°40'47" S, long. 43°16'27" E), 2 ♀♀ on *Bidens pilosa* L. (Asteraceae), 9/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of the two specimens correspond well with measurements of Kreiter *et al.* (2020a, 2020c) and those given for specimens from La Réunion Island, Mayotte Island and other parts of the world (van der Merwe 1968, Blommers 1976, Moraes and McMurtry 1983, Moraes *et al.* 2004a, Moraes *et al.* 2007a, Oliveira *et al.* 2012, Kreiter *et al.* 2018c).

## Tribe Euseiini Chant & McMurtry

Euseiini Chant & McMurtry 2005b: 191.

## Subtribe Euseiina Chant & McMurtry

Euseiina Chant & McMurtry 2005b: 209.

## Genus *Euseius* Wainstein

*Amblyseius* (*Amblyseius*) section *Euseius* Wainstein 1962: 15, *Euseius* De Leon 1966: 86.

### *Euseius baetae* (Meyer & Rodrigues)

*Amblyseius baetae* Meyer & Rodrigues 1966: 28.

*Euseius baetae*, Moraes *et al.* 1986: 37, 2004b: 62, 2001: 11, Chant & McMurtry 2005b: 215, 2007: 120, El Banhawy & Knapp 2011: 36.

*Euseius kangwanensis* Ueckermann & Loots, 1988: 85 (synonym according to Ueckermann & Loots 1988, Moraes *et al.* 2001, El-Banhawy & Knapp 2011).

The 200 species of the genus *Euseius* are considered as Type IV species, pollenophagous generalists (McMurtry and Croft 1997; McMurtry *et al.* 2013) and *Euseius baetae* most probably also belongs to this type. The biology of *E. baetae* is however totally unknown.

**World distribution:** Grande Comore Island, Congo, Kenya, Malawi, Mozambique, South Africa.

**Specimens examined:** six specimens (1 ♂ and 5 ♀♀) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on *Bauhinia galpinii* Bown (Fabaceae), 6/XII/2018; **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♂ and 3 ♀♀ on *Senna siamea* (Lamarck) Irwin and Barneby (Fabaceae) and 1 ♀ on *Averrhoa carambola* L. (Oxalidaceae), 11/XII/2018.

**Remarks** measurements of the 5 ♀♀ and of the single male (tables 4 and 5) fit well with the measurements from the literature with slightly shorter dimensions in general and measurements from specimens of a previous record in Grande Comore (Kreiter *et al.* 2018b).

## ***Euseius hima* (Pritchard & Baker)**

*Amblyseius (Amblyseius) hima* Pritchard & Baker 1962: 257, Blommers 1976: 89.

*Euseius hima*, Moraes et al. 1986: 46, 2004b: 71, Quilici et al. 2000: 99, Chant & McMurtry 2005b: 215, 2007: 121.

**World distribution:** Anjouan Island, Benin, Cape Verde, Ghana, India, Kenya, Madagascar Island, Mauritius Island, Mohéli Island, Réunion Island, Rwanda, Uganda.

**Specimens examined:** 16 specimens (16 ♀♀) collected during this study. **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 4 ♀♀ on an unknown host plant, 6/XII/2018; **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 10 ♀♀ on *Occimum gratissimum* L. (Lamiaceae) and 1 ♀ on *Solanum mauritianum* Scopoli (Solanaceae), 7/XII/2018; **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ on *O. gratissimum*, 10/XII/2018.

**Remarks:** this species was recorded from several countries of Sub-Saharan Africa, but also from India (Demite et al. 2021), La Réunion (Quilici et al. 2000; Kreiter et al. 2020d), Madagascar (Blommers 1976), Mauritius (Kreiter and Abo-Shnaf 2020b), Anjouan (Kreiter et al. 2021a) and Mohéli (Kreiter et al. 2021b). Morphological and morphometric characters and all measurements of our specimens fit well with measurements published in Kreiter et al. (2020d) and with measurements of specimens from Mauritius, Anjouan and Mohéli Island (Kreiter and Abo-Shnaf 2020b, Kreiter et al. 2021a, b).

## ***Euseius ovaloides* (Blommers)**

*Amblyseius (Amblyseius) ovaloides* Blommers 1974: 147.

*Euseius ovaloides*, Moraes et al. 1986: 51, 2004b: 78, Chant & McMurtry 2005b: 215, 2007: 121.

*Euseius ovaloides* was described by Blommers (1974) from specimens collected on *Citrus hystrix* de Candolle (Rutaceae) and *Persea americana* Miller (Lauraceae) in Madagascar. Like all *Euseius* species, this species belongs to the type IV (pollenophagous generalist predators) of McMurtry and Croft (1997) and McMurtry et al. (2013). The species had been occasionally recorded from Madagascar (Blommers 1974), Papua-New Guinea (Schicha and Gutierrez 1985), Seychelles (Schicha 1987), La Réunion Island, (Quilici et al. 1997, 2000, Kreiter et al. 2020c), Guadeloupe, Martinique and Marie-Galante (Moraes et al. 2000; Kreiter et al. 2006) on various plants, though its biology remains unknown. It is suspected to be a poor predator of tetranychid mites (Gutierrez and Etienne 1986) but can be considered as a potential predator of thrips and whiteflies. This is one of the most common species on La Réunion Island (Kreiter et al. 2020c).

**World distribution:** Guadeloupe Island, Madagascar Island, Marie-Galante Island, Martinique Island, Mauritius Island, Mayotte Island, Papua New Guinea, Réunion Island, Rodrigues Island, Seychelles Archipelago, Vietnam.

**Specimens examined:** a single specimen (1 ♀ and 1 ♂) collected during this study. **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ and 1 ♂ on *Persea americana* Miller (Lauraceae), 10/XII/2018.

**Remarks:** this species was recently reported from Rodrigues and Mauritius Islands (Kreiter and Abo-Shnaf 2020a, b), from Mayotte Island (Kreiter et al. 2020a) and from Vietnam (Kreiter et al. 2020b). Morphological and morphometric characters and all measurements of our specimens fit well with measurements in Kreiter et al. (2020d). This species was the second most collected species in our study comparing with *A. herbicolus* on Mauritius (Kreiter & Abo-Shnaf 2020b) and it was also very common in La Réunion (Kreiter et al. 2020c) but less common in Mayotte and Grande Comore Islands.

## **Genus *Iphiseius* Berlese**

*Iphiseius* Berlese, 1916: 33, Chant & McMurtry 2005b: 217, 2007: 123.

## ***Iphiseius degenerans* (Berlese)**

*Seius degenerans* Berlese 1889: 9.

*Amblyseius (Iphiseius) degenerans*, Muma 1961: 288.

*Typhlodromus degenerans*, Hirschmann 1962: 2.

*Iphiseius (Iphiseius) degenerans*, Pritchard & Baker 1962: 299.

*Amblyseius degenerans*, Zaher 1986: 99, Northcraft 1987: 521, Papadoulis & Emmanuel 1991: 36.

*Iphiseius degenerans*, Berlese 1921: 95, Evans 1954: 518, Moraes *et al.* 1986: 61, 2004b: 92, Chant & McMurtry 2005b: 215, 2007: 125.

*Iphiseius martigellus* El-Badry 1968: 325 (synonymy according to Chant & McMurtry 2005b).

The biological characteristics of this Ethiopian species have been well documented because of its use in controlling thrips on various cultivated plants in greenhouses. *Iphiseius degenerans* is a commercially available biological control agent of thrips and spider mites in greenhouse crops. It is able to feed on a variety of foods, but thrips' larvae and sweet pepper pollen are unfavourable food for immature development. This could compromise the establishment of this biological control agent when used against thrips in sweet pepper crops. According to the classification by McMurtry *et al.* (2013), *I. degenerans* is a type-III generalist predator. It is one of the most common native phytoseiid mite species on cassava in southern Africa (Zannou *et al.* 2005) and feeds on *Mononychellus tanajoa* (Bondar) (Nwilene and Nachman 1996), a widely distributed neotropical mite pest of cassava in Africa, insect larvae and pollen of many plants (Vantomhout *et al.* 2005). Another study concluded that *I. degenerans* can be considered a suitable biological control candidate based on its preference for *Eutetranychus orientalis* (Klein) in the Mediterranean region (Fantinou *et al.* 2012). *Iphiseius degenerans* preys on *Oligonychus perseae* Tuttle, Baker & Abbatiello outside the webbed nests. Although *I. degenerans* contributed towards the control of *O. perseae*, it is limited and needs further investigation, considering the inclusion of alternative food (e.g. Castor oil pollen) for predator population growth (Zappala *et al.* 2015).

**World distribution:** numerous countries in Northern and Southern Africa (Demite *et al.* 2021), Mediterranean area (Cyprus, Greece, Italy, Portugal), Near East or Middle East (Egypt, Israel, Lebanon, Saudi Arabia, Syria, Turkey, Yemen), in Europe (Georgia), South America (Brazil) and in North America (USA in California, Florida, Georgia, New Hampshire). It was recorded only in Grande Comore Island in the Indian Ocean (Kreiter *et al.* 2018b).

**Specimens examined:** four specimens (1 ♂ and 3 ♀♀) collected during this study. **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 ♀ on *Ricinus communis* L. (Euphorbiaceae) and 1 ♂ and 1 ♀ on *Bidens pilosa* L. (Asteraceae), 6/XII/2018; **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 1 ♀ on *Artocarpus altilis* (Parkinson) Fosberg (Moraceae), 7/XII/2018.

**Remarks:** measurements of the 3 ♀♀ + 1 ♂ fit well with measurements of specimens reported in the literature, but especially with those specimens previously collected in Grande Comore at Moroni (Kreiter *et al.* 2018b).

## **Sub-tribe Typhlodromalina Chant & McMurtry**

Typhlodromalina Chant & McMurtry 2005b: 195.

## **Genus *Typhlodromalus* Muma**

*Amblyseius (Typhlodromalus)* Muma 1961: 288, *Typhlodromalus* De Leon 1966: 87.

## ***Typhlodromalus athiasae* (Pritchard & Baker)**

*Amblyseius (Amblyseius) athiasae* Pritchard & Baker 1962: 291.

*Amblyseiella athiasae*, Moraes *et al.* 1986: 4.

*Typhlodromalus athiasae*, Moraes *et al.* 2004b: 196, 2006: 13, Chant & McMurtry 2005b: 199, 2007: 111.

This species and the species to follow belongs to the *athiasae* species group (Chant and McMurtry 2005b, Moraes *et al.* 2006). It was described from Zaire by Pritchard and Baker (1962) and was redescribed by Moraes *et al.* (2006) from specimens collected in various African countries. Its biology remains totally unknown.

**World distribution:** Benin, Burundi, Cameroon, DR Congo, Ivory Coast, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Tanzania, Togo, Uganda.

**Specimens examined:** 19 specimens (2 ♂♂, 15 ♀♀ and 2 imm.) collected during this study. **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 ♂, 2 ♀♀ and 1 imm. on *Stachytarpheta jamaicensis* (Verbenaceae) and 1 ♂ and 6 ♀♀ on *Bidens pilosa* L. (Asteraceae), 6/XII/2018; **Moroni**, Le Kalyptus Hotel (24 m aasl, lat. 11°40'58" S, long. 43°15'45" E), 1 ♀ on *Lantana camara* L. (Verbenaceae) with eriophyid galls and 2 ♀♀ on *Ricinus communis* L. (Euphorbiaceae), 7/XII/2018; **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 2 ♀♀ on *S. jamaicensis* and 2 ♀♀ and 1 imm. on *Occimum gratissimum* L. (Lamiaceae), 10/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements (Tables 5 and 6) of specimens collected in Grande Comore Island fit well measurements in the literature; with only slight differences except:

- concerning females (Table 5), seta *z5* which shorter in specimens from Grande Comore.
- concerning males (Table 6), setae *S2* and *z2* which shorter in specimens from Grande Comore Island and seta *r3* and length and width of ventrianal shield which are longer in specimens from Grande Comore Island. However, males collected in Grande Comore Island and in Kenya were very few (2 for both). According to Tixier (2012) this number of males are lower than the minimum number of specimens needed to determine intraspecific variations.

This is the first mention of that species for the Indian Ocean and outside the Africa continent.

### ***Typhlodromalus spinosus* (Meyer & Rodrigues)**

*Amblyseius spinosus* Meyer & Rodrigues 1966: 30, Moraes *et al.* 1986: 31.

*Kampimodromus spinosus*, Quilici *et al.* 2000: 100.

*Typhlodromalus spinosus*, Moraes *et al.* 2004b: 204, Chant & McMurtry 2005b: 199, 2007: 111.

This species also belongs to the *athiasae* species group as setae *J1* and *S5* are absent (Chant and McMurtry 2005b, Moraes *et al.* 2006). The rapid multiplication of this species on the western flower thrips (WFT), *Frankliniella occidentalis* Pergande, was confirmed under laboratory and field conditions, but it was not effective against *T. urticae* (Mwangi *et al.* 2015). It seems abundant in low vegetation as it was found in high populations in a study of companion plants in citrus orchards (Le Bellec *et al.* unpub. data).

**World distribution:** Anjouan Island, Benin, Burundi Dr Congo, Kenya, Malawi, Mauritius Island, Mohéli Island, Mozambique, Réunion Island.

**Specimens examined:** five specimens (5 ♀♀) collected during this study. **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 2 ♀♀ on *Rubus rosifolius* Smith (Rosaceae) and 3 ♀♀ on *Occimum gratissimum* L. (Lamiaceae), 7/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of our specimens fit well with measurements in Kreiter *et al.* (2020d). This species was described from Mozambique (Meyer and Rodrigues 1966) and then reported from Indian Ocean from La Réunion Island (Quilici *et al.* 2000; Kreiter *et al.* 2020d), Mauritius (Kreiter and Abo-Shnaf 2020b) and more recently from Anjouan (Kreiter *et al.* 2021a) and Mohéli Islands (Kreiter *et al.* 2021b) in the Comoros Archipelago.

**Subfamily Phytoseiinae Berlese**

Phytoseiini Berlese 1913: 3 and Phytoseiinae Vitzthum 1941: 767.

**Genus *Phytoseius* Ribaga***Phytoseius* Ribaga 1904: 177.***Phytoseius amba* Pritchard & Baker***Phytoseius (Pennaseius) amba* Pritchard & Baker 1962: 224, Blommers 1976: 85.*Phytoseius (Phytoseius) amba*, Denmark 1966: 49.*Typhlodromus (Pizytoseius) amba*, van der Merwe 1968: 101.*Phytoseius amba*, Swirski & Ragusa 1978: 408.*Pennaseius amba*, Matthysse & Denmark 1981: 352.*Phytoseius amba*, Moraes *et al.* 1986: 210, 2004b: 232, Chant & McMurtry 2007: 129.

This species belongs to the *horridus* species group (Chant and McMurtry 1994) as setae *R1* and *J2* are present. Species of the genus *Phytoseius* are supposed to belong to the Type III species (McMurtry and Croft 1997; McMurtry *et al.* 2013), *i.e.*, a polyphagous generalist predator. However, the biology of *Phytoseius amba* remains totally unknown.

**World distribution:** Anjouan Island, Benin, Burundi, Cameroon, Cape Verde, DR Congo, Grande Comore Island, Kenya, Madagascar Island, Malawi, Mozambique, Nigeria, Reunion

**Table 5** Character measurements of adult females of *Typhlodromalus athiasae* collected in this study with those obtained from previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (12) (This study)	Africa (14)	Holotype Congo	Characters	Grande Comore (12) (This study)	Africa (14)	Holotype Congo
Dsl	<b>328</b> (300 – 350)	340 (320 – 371)	298	Gensl	<b>118</b> (108 – 128)	–	–
Dsw	<b>200</b> (175 – 225)	201 (176 – 237)	196	Gensw st5	<b>79</b> (75 – 81)	–	–
j1	<b>31</b> (28 – 33)	30 (23 – 37)	31	st5-st5	<b>73</b> (71 – 76)	74 (67 – 82)	75
j3	<b>37</b> (34 – 40)	36 (32 – 43)	34	Gensw post. corn.	<b>87</b> (83 – 90)	–	–
j4	<b>16</b> (13 – 18)	19 (16 – 27)	17	Lisl	<b>19</b> (15 – 22)	–	–
j5	<b>17</b> (14 – 18)	20 (16 – 27)	19	Lsiw	<b>4</b> (3 – 5)	–	–
j6	<b>23</b> (21 – 25)	28 (22 – 38)	26	Sisl	<b>9</b> (8 – 10)	–	–
J2	<b>23</b> (19 – 25)	29 (22 – 38)	28	Vsl	<b>112</b> (108 – 120)	108 (98 – 120)	94
J5	<b>8</b> (7 – 9)	8 (6 – 10)	–	vsw ZV2	<b>63</b> (58 – 68)	60 (53 – 69)	58
r3	<b>21</b> (20 – 23)	20 (14 – 25)	19	Vsw anus	<b>64</b> (55 – 70)	68 (61 – 80)	63
R1	<b>18</b> (16 – 20)	19 (14 – 28)	16	gv3 – gv3	<b>28</b> (26 – 30)	–	–
s4	<b>47</b> (44 – 50)	49 (42 – 58)	41	JV5	<b>62</b> (55 – 66)	–	–
S2	<b>47</b> (43 – 53)	48 (40 – 53)	41	SgeI	<b>17</b> (15 – 20)	17 (11 – 22)	17
S4	<b>36</b> (31 – 43)	37 (30 – 40)	33	SgeII	<b>19</b> (17 – 20)	18 (14 – 21)	17
z2	<b>22</b> (18 – 25)	26 (21 – 34)	19	SgeIII	<b>28</b> (25 – 30)	27 (24 – 30)	24
z4	<b>37</b> (33 – 40)	37 (32 – 43)	34	StI	<b>19</b> (16 – 21)	20 (18 – 22)	17
z5	<b>16</b> (11 – 20)	20 (18 – 27)	18	SgeIV	<b>42</b> (38 – 43)	41 (37 – 48)	39
Z1	<b>24</b> (21 – 28)	28 (22 – 38)	27	StI	<b>25</b> (20 – 30)	26 (22 – 30)	24
Z4	<b>51</b> (48 – 55)	50 (42 – 58)	44	StI	<b>59</b> (53 – 65)	56 (48 – 64)	48
Z5	<b>67</b> (63 – 75)	68 (61 – 83)	56	scl	<b>36</b> (30 – 43)	33 (26 – 43)	–
st1-st1	<b>58</b> (55 – 64)	–	–	scw	<b>9</b> (8 – 10)	–	–
st2-st2	<b>63</b> (59 – 69)	64 (58 – 69)	58	Fdl	<b>33</b> (33 – 35)	29 (28 – 29)	–
st3-st3	<b>77</b> (73 – 81)	–	–	No teeth Fdl	<b>8</b> (7 – 9)	6 – 10	7
st1-st3	<b>62</b> (60 – 65)	63 (61 – 67)	63	Mdl	<b>34</b> (33 – 35)	33 (32 – 35)	–
st4-st4	<b>84</b> (68 – 98)	–	–	No teeth Mdl	<b>4</b>	3 – 4	–

Sources of measurements – Africa (Benin 2♀♀, Cameroon 6♀♀, Kenya 3♀♀, Nigeria 1♀, Uganda 1♀, Democratic Republic of Congo 1♀) and holotype from democratic Republic of Congo: Moraes *et al.* (2006); –: not provided.

Island, Rwanda, Senegal, South Africa, Zambia, Zimbabwe.

**Specimens examined:** three specimens (6 ♀♀, 2 ♂♂ and 1 imm.) collected during this study. **Moroni**, Le Kalyptus Hotel (24 m aasl, lat. 11°40'58" S, long. 43°15'45" E), 5 ♀♀ and 2 ♂♂ on *Clerodendrum speciosissimum* Van Geert ex. Morren (Verbenaceae), 7/XII/2018; **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ and 1 imm. on *Averrhoa bilimbi* L. (Oxalidaceae), 11/XII/2018.

**Remarks:** measurements of the specimens collected during this study agree well with measurements of the literature, especially with those of Ueckermann *et al.* (2007) obtained with a great number of specimens (29) from various countries in Africa, with those of Kreiter *et al.* (2020d) for specimens from La Réunion, with those of Kreiter *et al.* (2018b) for specimens from Grande Comore and with those of Kreiter *et al.* (2021a) for specimens from Anjouan Island.

### ***Phytoseius crinitus* Swirski & Shechter**

*Phytoseius (Dubininellus) crinitus* Swirski & Shechter 1961: 102.

*Phytoseius crinitus*, Amitai & Swirski 1966: 21, Swirski & Amitai 1966: 11, Denmark 1966: 66, Moraes *et al.* 1986: 220, 2004b: 236, Chant & McMurtry 2007: 129.

This species also belongs to the *horridus* species group (Chant and McMurtry 1994). The biology of this species remains totally unknown.

**World distribution:** Anjouan Island, Burundi, China, Hong Kong, India, Indonesia, Japan, Madagascar Island, Mauritius Island, Philippines, Réunion Island, Rodrigues Island, Singapore,

**Table 6** Character measurements of adult males of *Typhlodromalus athiasae* collected in this study with those obtained from previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (2) (this study)	Kenya (2)	Characters	Grande Comore (2) (this study)	Kenya (2)
Dsl	243 – 250	221 (220 – 223)	st1-st1	45 – 48	–
Dsw	145 – 150	141 (138 – 145)	st2-st2	55	–
j1	20	18 (18 – 19)	st3-st3	58 – 71	–
j3	24 – 25	25	st1-st5	103 – 108	–
j4	12 – 13	13	st4-st4	45 – 50	–
j5	13 – 14	14 (13 – 15)	st5-st5	28 – 44	–
j6	15 – 16	14 (14 – 15)	Vsl	98 – 118	86 (85 – 88)
J2	15	15	Vsw ZV2	128 – 138	119 (118 – 120)
J5	5 – 6	6	Vsw anus	63 – 75	–
r3	16 – 19	13	gv3 – gv3	21	–
R1	11	15	JV5	18 – 25	–
s4	33 – 35	36 (35 – 36)	SgeI	14 – 15	14
S2	25 – 28	31 (30 – 31)	SgeII	15 – 18	18
S4	18 – 20	19 (18 – 20)	SgeIII	18	19 (19 – 20)
z2	15 – 16	19 (18 – 20)	StiIII	13 – 15	17 (16 – 18)
z4	25	26 (25 – 28)	SgeIV	25	25
z5	13	13	StiIV	19 – 20	20
Z1	15	16 (15 – 16)	StIV	38 – 40	37 (35 – 39)
Z4	33 – 38	33 (33 – 34)	Fdl	23	–
Z5	43 – 45	44 (44 – 45)	No teeth Fd	8	–
			Mdl	20 – 22	–
			No teeth Md	?	–
			Shaft	15 – 18	15

**Sources of measurements – Kenya:** Moraes *et al.* (2006); –: not provided.

Taiwan.

**Specimens examined:** 2 ♀♀ in total. **Moroni** (51 m aasl, lat. 11°41'01" S, long. 43°15'55" E), 2 ♀♀ on *Passiflora edulis* Sims (Passifloraceae), 9/XII/2018;

**Remarks:** morphological and morphometric characters and all measurements of our specimens fit well with measurements in Kreiter *et al.* (2020d) for specimens of La Réunion Island. This species was recorded in several countries of Asia, in Burundi, Madagascar (Demite *et al.* 2021) and La Réunion (Quilici *et al.* 2000). It was recently recorded in Mauritius Island by Ferragut and Baumann (2019) and in Anjouan Island by Kreiter *et al.* (2021a). It was however previously reported by Quilici *et al.* (2000) in the Indian Ocean from Mascareignes Archipelago in La Réunion Island where Kreiter *et al.* (2020d) have recovered the species in larger numbers.

### ***Phytoseius duplus* Ueckermann & Loots**

*Phytoseius (Phytoseius) duplus* Ueckermann & Loots 1985: 37.

*Phytoseius duplus*, Moraes *et al.* 2004b: 237, Chant & McMurtry 2007: 129.

This species orchards belongs to the *horridus* species group. Its biology is unknown. This is the second record of this species from Indian Ocean after Mauritius Island.

**World distribution:** Mauritius Island, South Africa.

**Specimens examined:** two specimens (2 ♀♀) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on *Gmelina arborea* Roxburgh ex. Smith (Verbenaceae), 6/XII/2018; **Moroni** (171 m aasl, lat. 11°40'47" S, long. 43°16'27" E), 1 ♀ on *Bidens pilosa* L. (Asteraceae), 9/XII/2018.

**Remarks:** the measurements of specimens collected in Grande Comore Island are very close to those obtained by Ueckermann and Loots (1985) for the two specimens (Table 7) and close also to those provided by Kreiter and Abo-Shnaf (2020b) for specimens from Mauritius Island.

### **Subfamily Typhlodrominae Wainstein**

Typhlodromini Wainstein 1962: 26 and Typhlodrominae Chant & McMurtry 1994: 235.

### **Tribe Chanteiini Chant & McMurtry**

Chanteiini Chant & McMurtry 1994: 237, 2007: 132.

### **Genus *Chanteius* Wainstein**

*Chanteius* Wainstein 1962: 19.

#### ***Chanteius contiguus* (Chant)**

*Typhlodromus (Typhlodromus) contiguus* Chant 1959: 29.

*Typhlodromus (Diadromus) contiguus*, Athias-Henriot 1960: 62.

*Typhloseiopsis contiguus*, Muma 1961: 294.

*Chanteius (Chanteius) contiguus*, Wainstein 1962: 9.

*Typhlodromus contiguus*, Hirshmann 1962: 2.

*Typhlodromus (Typhloseiopsis) contiguus*, Pritchard & Baker 1962: 222.

*Diadromus contiguus*, Chant & Yoshida-Shaul 1986: 2030, Moraes *et al.* 1986: 184.

*Chanteius contiguus*, Moraes *et al.* 2004b: 261, Chant & McMurtry 1994: 239.

*Chanteius lieni* (Tseng 1976): 97 (synonymy according to Chant & Yoshida-Shaul 1986).

This species belongs to the *contiguus* species group (Chant and McMurtry 1994) and its biology remains totally unknown.

**World distribution:** Anjouan Island, China, Hong-Kong, Japan, Madagascar Island, Mayotte Island, Mohéli Island, Philippines, Singapore.

**Specimens examined:** 37 specimens (27 ♀♀, 7 ♂♂ and 3 imm.) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on *Acacia mangium* Willdenow (Mimosaceae), 1 ♀ on an unknown host plant, 1 ♂, 3 ♀♀ and 1 imm. on *Acalypha wilkesiana* Müller Argoviensis (Euphorbiaceae), 1 ♂ on *Artocarpus heterophyllus* Lamarck (Moraceae), 1 ♀ on *Clerodendrum speciosissimum* Van Geert ex. Morren (Verbenaceae), 2 ♀♀ on *Theobroma cacao* L. (Malvaceae) and 4 ♀♀ and 1 imm. on *Mangifera indica* L. (Anacardiaceae), 6/XII/2018; **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E) and 1 ♀ on *Myristica fragans* Houttuyn (Myristicaceae), 1 ♀ on *Litchi sinensis* Sonnerat (Sapindaceae), 6/XII/2018; **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 2 ♀♀ on *M. indica*, 7/XII/2018; **Moroni**, Le Kalyptus Hotel (24 m aasl, lat. 11°40'58" S, long. 43°15'45" E), 1 ♂ on *Citrus* sp. (Rutaceae), 7/XII/2018; **Moroni** (171 m aasl, lat. 11°40'47" S, long. 43°16'27" E), 1 ♀ and 1 imm. on *Carica papaya* L. (Caricaceae) and 1 ♂ on *Clidemia hirta* (L.) Don (Melastomataceae), 9/XII/2018; **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ on *Syzygium aromaticum* (L.) Merrill and Perry (Myrtaceae), 10/XII/2018; **Mdjoizezi** (230 m aasl, lat. 11°50'19" S, long. 43°18'29" E), 1 ♂ on *Vitex doniana* Sweet (Lamiaceae) and 4 ♀♀ on *M. indica*, 10/XII/2018; **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on an unknown host plant and 2 ♂♂ and 4 ♀♀ on *Senna occidentalis* (L.) Link (Fabaceae), 11/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of our specimens fit well with measurements in the many descriptions and redescriptions available in the literature, especially those of Blommers (1976) for specimens from Madagascar. Mentioned only from South-East Asia and Madagascar, this species seems quite common in Comoros

**Table 7** Character measurements of adult females of *Phytoseius duplus* collected in this study and those reported in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (2) (this study)	Mauritius (4)	South Africa (2)	Characters	Grande Comore (2) (this study)	Mauritius (4)	South Africa (2)
Dsl	<b>285 – 293</b>	288 (280 – 290)	280 – 315	st1-st1	<b>48</b>	47 (45 – 48)	–
Dsw	<b>125</b>	136 (125 – 142)	–	st2-st2	<b>60</b>	56 (55 – 60)	69 – 76
j1	<b>25 – 26</b>	25 (23 – 25)	22 – 25	st3-st3	<b>71 – 75</b>	71 (60 – 75)	–
j3	<b>23 – 25</b>	18 (15 – 20)	22 – 25	st1-st3	<b>55</b>	50	60 – 63
j4	<b>6 – 7</b>	5 (4 – 5)	9	st4-st4	<b>77 – 80</b>	77 (58 – 88)	–
j5	<b>6 – 7</b>	5 (4 – 5)	9	gensl	<b>100 – 103</b>	102 (100 – 108)	–
j6	<b>6 – 7</b>	5 (5 – 6)	9	gensw st5	<b>66 – 68</b>	–	–
J5	<b>6 – 7</b>	5	9	gensw post. cor.	<b>78 – 83</b>	79 (73 – 85)	–
r3	<b>37</b>	39 (38 – 40)	35 – 41	st5-st5	<b>63 – 65</b>	66 (63 – 68)	76 – 82
s4	<b>58 – 63</b>	63 (60 – 65)	61 – 69	Lisl	Not visible	18 (15 – 20)	–
s6	<b>78 – 85</b>	77 (75 – 83)	76 – 88	Lisw	Not visible	8	–
z2	<b>21 – 23</b>	21 (20 – 25)	22 – 25	Vsl	<b>90 – 93</b>	84 (80 – 90)	85 – 88
z3	<b>35</b>	32 (30 – 33)	28 – 38	Vsw ZV2	<b>35 – 37</b>	33 (30 – 35)	44 – 57
z4	<b>19</b>	15 (13 – 15)	16 – 22	Vsw anus	<b>48 – 50</b>	51 (40 – 55)	–
z5	<b>8</b>	6	9	JV5	<b>30 – 37</b>	34 (33 – 35)	32 – 38
Z4	<b>78 – 83</b>	77 (75 – 83)	79 – 91	Scl	<b>12 – 13</b>	11 (8 – 15)	–
Z5	<b>65 – 70</b>	67 (63 – 70)	63	Scw	<b>8 – 10</b>	10 (8 – 13)	–
				SttIV	<b>18 – 20</b>	19 (18 – 20)	19 – 22
				Fdl	<b>16 – 18</b>	17 (15 – 18)	–
				No teeth Fd	<b>2</b>	2	–
				Mdl	<b>18</b>	17 (15 – 18)	–
				No teeth Md	<b>1</b>	1	–

Sources of measurements – Mauritius: Kreiter & Abo-Shnaf (2020b); South Africa: Ueckermann & Loots (1985); –: not provided.

Archipelago (Kreiter *et al.* 2020a, Kreiter *et al.* 2021a, b). This is the second most abundant species collected during this study.

### Tribe **Typhlodromini** Wainstein

Typhlodromini Wainstein 1962: 26.

### Genus **Typhlodromus** Scheuten

*Typhlodromus* Scheuten 1857: 111.

### Subgenus **Anthoseius** De Leon

*Typhlodromus (Anthoseius)* De Leon 1959: 258, van der Merwe 1968: 20, Karg 1982: 194, Chant & McMurtry 1994: 250, 2007: 149.

### ***Typhlodromus (Anthoseius) grewiae* Zannou, Moraes & Oliveira**

*Typhlodromus (Anthoseius) grewiae* Zannou, Moraes & Oliveira in Ueckermann *et al.* 2008: 48.

This species belongs to the *singularis* species group as setae JV3 are absent and dorsal shield setae are short (Chant and McMurtry 1994). The biology of that species is unknown. It was mentioned only from Kenya (Ueckermann *et al.* 2008) only from one female.

**World distribution:** Anjouan Island, Kenya, Mayotte Island, Mohéli Island.

**Specimens examined:** three specimens (3 ♀♀) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on *Artocarpus heterophyllus* Lamarck (Moraceae), 6/XII/2018; **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 1 ♀ on *Solanum mauritianum* Scopoli (Solanaceae), 7/XII/2018; **Moroni** (171 m aasl, lat. 11°40'47" S, long. 43°16'27" E), 1 ♀ on *Clidemia hirta* (L.) Don (Melastomataceae), 9/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of our specimens (Table 8) fit well with measurements of the original description of Zannou, Moraes and Oliveira in Ueckermann *et al.* (2008) and with measurements of specimens from Mayotte Island (Kreiter *et al.* 2020a), Anjouan Island (Kreiter *et al.* 2021a) and Mohéli Island (Kreiter *et al.* 2021b).

### ***Typhlodromus (Anthoseius) hartlandrowei* Evans**

*Typhlodromus (Typhlodromus) hartlandrowei* Evans 1958: 580-581, Chant 1959: 60.

*Clavidromus hartlandrowei*, Muma 1961: 296.

*Typhlodromus (Neoseiulus) hartlandrowei*, Pritchard & Baker 1962: 222.

*Typhlodromus (Anthoseius) hartlandrowei*, Moraes *et al.* 2004b: 328, Chant & McMurtry 2007: 155, Ueckermann *et al.* 2008: 50.

This species belongs to the *bergi* species group (Chant and McMurtry 1994). The biology of this species is unknown. This is the first mention of this species outside the African continent. The male was unknown until our study but one male has been collected and will be described in a following paper.

**World distribution:** Anjouan Island, DR Congo, Mohéli Island, Nigeria, Uganda.

**Specimens examined:** two specimens (1 ♀ and 1 imm.) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 1 ♀ on *Mangifera indica* L. (Anacardiaceae), 6/XII/2018; **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 im. on *Ricinus communis* L. (Euphorbiaceae), 6/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of our specimens (Table 9) fit well with measurements of the original description given by Evans

**Table 8** Character measurements of adult females of *Typhlodromus (Anthoseius) grawiae* collected in this study compared to those obtained in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore Island (3) (this study)	Anjouan Island (1)	Kenya (1, the holotype)	Mayotte Island (2)	Mohéli Island (2)
Dsl	<b>298</b> (250 – 313)	315	298	288 – 308	300
Dsw	<b>177</b> (168 – 188)	205	179	168 – 180	179
j1	<b>18</b>	13	Not visible	15	15
j3	<b>21</b> (20 – 23)	20	16	15 – 20	20
j4	<b>18</b>	15	16	13 – 15	18
j5	<b>18</b>	15	16	15	18
j6	<b>21</b> (20 – 23)	20	19	20	23
J2	<b>25</b> (23 – 28)	25	22	21 – 23	28 – 30
J5	<b>11</b> (10 – 12)	10	10	9 – 10	10
r3	<b>19</b> (18 – 20)	18	16	15	16 – 18
R1	<b>17</b> (17 – 18)	18	16	15 – 18	17 – 18
s4	<b>24</b> (23 – 25)	20	19	18 – 20	20 – 23
s6	<b>26</b> (25 – 28)	25	22	21 – 23	25 – 26
S2	<b>30</b> (28 – 33)	30	24	26 – 28	30
S4	<b>31</b> (28 – 35)	30	27	28	29 – 30
S5	<b>27</b> (25 – 28)	25	22	23	25
z2	<b>18</b>	18	14	13 – 15	16
z3	<b>20</b>	18	14	15	18 – 20
z4	<b>21</b> (20 – 23)	20	18	15 – 18	21 – 23
z5	<b>20</b>	19	18	18	20
Z4	<b>34</b> (33 – 35)	35	29	30 – 33	33 – 35
Z5	<b>37</b> (35 – 38)	36	35	33 – 35	35 – 37
st1-st1	<b>45</b> (43 – 47)	48	–	38	43 – 47
st2-st2	<b>61</b> (60 – 63)	60	61	53	55 – 60
st3-st3	<b>60</b> (58 – 63)	59	–	48	58
st1-st3	<b>61</b> (59 – 63)	63	58	55	55 – 58
st4-st4	<b>65</b> (62 – 68)	63	–	43	65
Gensl	<b>109</b> (103 – 110)	100	–	93	95
Gensw st5	<b>57</b> (55 – 58)	63	53	50	60
Gensw post. corn.	<b>72</b> (70 – 73)	68	–	75	73
st5-st5	<b>54</b> (53 – 55)	55	–	–	55
Lisl	<b>25</b> (24 – 25)	20	–	18 – 23	25
Lisw	<b>4</b>	5	–	4	3
sisl	<b>9</b> (8 – 10)	10	–	10	10
Vsl	<b>108</b> (103 – 110)	110	99	95 – 100	103
Vsw ZV2	<b>87</b> (83 – 90)	63	90	83 – 90	90
Vsw anus	<b>70</b> (68 – 73)	70	–	68 – 75	73
gv3 – gv3	<b>29</b> (28 – 30)	25	–	26	24
JV5	<b>28</b> (25 – 30)	26	–	25 – 27	25
StIV	<b>21</b> (20 – 23)	20	18	17 – 18	16 – 20
Scl	<b>13</b> (10 – 15)	15	14	13 – 15	14 – 15
Scw	<b>8</b>	5	–	5	8 – 12
Fdl	<b>25</b> (23 – 28)	25	23	25	23
No teeth Fd	<b>4</b>	Not visible	3 – 4	4	3
Mdl	<b>26</b> (25 – 28)	26	25	25 – 28	25
No teeth Md	<b>2</b>	Not visible	2	2	2

**Sources of measurements – Kenya:** Ueckermann *et al.* (2008), original description base on a single female; **Mayotte Island** (Kreiter *et al.* 2020a); –: not provided.

(1958), those given by Ueckermann *et al.* (2008) concerning specimens from Africa and those of specimens from Anjouan (Kreiter *et al.* 2021a) and Mohéli (Kreiter *et al.* 2021b) Islands.

### ***Typhlodromus (Anthoseius) lobatus* Zannou, Moraes & Oliveira**

*Typhlodromus (Anthoseius) lobatus* Zannou, Moraes & Oliveira in Ueckermann *et al.* 2008: 59.

This species belongs to the large *rhenanus* species group (Chant and McMurtry 1994). The biology of that species is unknown.

**World distribution:** Anjouan Island, Ghana, Mauritius Island, Mayotte Island, Mohéli Island, Rodrigues Island.

**Specimens examined:** six specimens (6 ♀♀) collected during this study. **Mdé**, INRAPE (51 m aasl, lat. 11°44'12" S, long. 43°14'59" E), 2 ♀♀ on *Theobroma cacao* L. (Malvaceae), 6/XII/2018; **Mvouni**, University of Comoros (434 m aasl, lat. 11°43'11" S, long. 43°16'31" E), 1 ♀ on *Stachytarpheta jamaicensis* (Verbenaceae), 6/XII/2018; **Ivembeni**, Banda Samlini (791 m aasl, lat. 11°29'22" S, long. 43°19'36" E), 2 ♀♀ on *Occimum gratissimum* L. (Lamiaceae), 7/XII/2018; **Moroni**, Le Kalyptus Hotel (24 m aasl, lat. 11°40'58" S, long. 43°15'45" E), 1 ♀ on *Ricinus communis* L. (Euphorbiaceae), 7/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of our specimens fit well with measurements of the original description in Ueckermann *et al.* (2008) concerning specimens from Ghana, Western Africa. They fit well with measurements of specimens from Rodrigues (Kreiter and Abo-Shnaf 2020a), Mauritius (Kreiter and Abo-Shnaf 2020b), Mayotte (Kreiter *et al.* 2020a), Anjouan (Kreiter *et al.* 2021a) and Mohéli Islands (Kreiter *et al.* 2021a). This species seems rather common in the Indian Ocean Islands, except in La Réunion Island.

### ***Typhlodromus (Anthoseius) luzonensis* Schicha & Corpuz-Raros**

*Typhlodromus luzonensis* Schicha & Corpuz-Raros 1992: 75.

*Amblydromella (Amblydromella) luzonensis*, Denmark & Welbourn 2002: 307.

*Typhlodromus (Anthoseius) luzonensis*, Moraes *et al.* 2004b: 336, Chant & McMurtry 2007: 155.

As the previous species, this one also belongs to the large *rhenanus* species group (Chant and McMurtry 1994). It has been collected only once in Philippines on *Dysoxylum cumingianum* (De Candolle) Harms, a common Meliaceae in this area. This is the first mention of its occurrence outside Philippines. Its biology is unknown.

**World distribution:** Philippines.

**Specimens examined:** **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ on *Syzygium aromaticum* (L.) Merrill and Perry (Myrtaceae), 10/XII/2018.

**Remarks:** morphological and morphometric characters and all measurements of our specimens (Table 10) fit well with measurements of the original description given by Schicha and Corpuz-Raros (1992). Some differences exist in the length of the shorter setae: *j3, j6, RI, s4, s6, z2, z3* and *z4* which are longer in Philippines specimens and setae *S5* which is longer in Grande Comore Island specimens. Number of teeth of the fixed digit also corresponds with that of the Philippine specimens.

### ***Typhlodromus (Anthoseius) quadratus* Wu & Liu**

*Typhlodromus quadratus* Wu & Liu 1997: 150-151.

*Typhlodromus (Anthoseius) quadratus*, Moraes *et al.* 2004b: 344, Chant & McMurtry 2007: 155, Wu *et al.* 2010: 302.

This species also belongs to the *rhenanus* species group (Chant and McMurtry 1994). It has been collected only once in China on unknown host plants. So this the first report of this species outside China. Its biology is unknown.

**Table 9** Character measurements of adult females of *Typhlodromus (Anthoseius) hartlandrowei* collected in this study compared to those in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore (2) (this study)	Africa (3)	Anjouan Island (2)	Holotype	Mohéli (2)
Dsl	<b>263</b>	290 (285 – 295)	325	295	308
Dsw	<b>150</b>	206 (200 – 215)	180	190	200 – 205
j1	<b>25</b>	26 (25 – 27)	20	–	27 – 30
j3	<b>40</b>	43 (40 – 45)	38	48	40 – 43
j4	<b>28</b>	40 (37 – 41)	25	44	28
j5	<b>30</b>	40 (36 – 44)	30	43	25 – 26
j6	<b>40</b>	55 (50 – 59)	33	57	40
J2	<b>50</b>	53 (50 – 55)	40	56	45 – 47
J5	<b>10</b>	10	8	9	8 – 9
r3	<b>33</b>	40 (38 – 43)	40	44	38 – 40
R1	<b>40</b>	59 (58 – 60)	45	60	45
s4	<b>48</b>	61 (60 – 62)	58	63	55 – 60
s6	<b>50</b>	65 (65 – 66)	55	67	53 – 55
S2	<b>53</b>	69 (68 – 71)	60	71	63 – 65
S4	<b>58</b>	70 (70 – 71)	65	71	63 – 65
S5	<b>22</b>	22 (19 – 24)	22	17	20 – 22
z2	<b>25</b>	24 (23 – 25)	25	23	25 – 28
z3	<b>35</b>	51 (50 – 51)	45	53	44 – 47
z4	<b>43</b>	56 (54 – 57)	48	58	45
z5	<b>30</b>	38 (35 – 40)	29	38	28 – 30
Z4	<b>60</b>	63 (62 – 64)	60	62	60
Z5	<b>60</b>	64 (63 – 66)	66	63	65 – 67
st1-st1	<b>40</b>	–	50	–	50
st2-st2	<b>50</b>	55 (54 – 56)	53	50	48 – 50
st3-st3	<b>48</b>	–	65	–	60
st1-st3	<b>68</b>	55 (52 – 57)	55	59	58
st4-st4	<b>43</b>	–	70	–	60 – 68
Gensl	Not visible	–	110	–	103 – 105
Gensw st5	<b>50</b>	55 (53 – 57)	Not visible	55	58 – 60
Gensw post. corn.	Not visible	–	Not visible	–	68 – 75
st5 – st5	<b>43</b>	–	Not visible	–	54 – 55
Lisl	Not visible	–	30	–	23 – 28
Lisw	Not visible	–	4	–	3
sisl	Not visible	–	11	–	10
Vsl	<b>100</b>	102 (98 – 104)	100	97	95 – 113
Vsw ZV2	<b>80</b>	89 (84 – 96)	90	85	78 – 80
Vsw anus	<b>65</b>	–	68	–	68 – 79
gv3 – gv3	Not visible	–	–	–	38 – 39
JV5	<b>50</b>	–	63	–	65 – 67
SgeIII	<b>20</b>	22 (21 – 22)	19	20	18 – 20
StiIII	<b>15</b>	18 (17 – 19)	18	19	18 – 19
SgeIV	<b>30</b>	32 (31 – 32)	29	32	28 – 30
StiIV	<b>20</b>	22 (21 – 24)	22	23	24 – 25
StIV	<b>50</b>	40 (37 – 42)	45	43	40 – 47
Scl	Not visible	14 (11 – 17)	10	–	7
Scw	Not visible	–	8	–	–
Fdl	<b>21</b>	24	23	–	23 – 25
No teeth Fd	<b>2</b>	2	Not visible	–	Not visible
Mdl	<b>23</b>	27	26	–	28
No teeth Md	<b>1</b>	1	Not visible	–	Not visible

Sources of measurements – Africa (DR Congo 1♀, Nigeria 1♀, Uganda 1♀): Ueckermann *et al.* (2008); Anjouan Island: Kreiter *et al.* (2021a); Holotype: Ueckermann *et al.* (2008); Mohéli Island: Kreiter *et al.* (2021b); –: not provided.

**World distribution:** China.

**Specimens examined:** A single female collected during this study. **Djoumoichongo** (230 m aasl, lat. 11°48'34" S, long. 43°17'37" E), 1 ♀ on *Cyathea* sp. (Cyatheaceae), 10/XII/2018.

**Remarks:** description by Wu and Liu (1997) is quite poor, with many details lacking and very small drawings, making difficult comparisons and diagnose. Morphological and morphometric characters and all measurements of our specimen (Table 11) fit however very well with measurements of the original description given by those authors. Only slight differences exist in the length of setae. The most important difference between the Chinese specimens and the present specimen is seta Z4 which is serrated in our specimen but smooth in the original description.

## Conclusion

The results of the survey carried out in 2018 in Grande Comore Island is presented in this paper. Of a total of 29 records, 25 are documented in this paper: 16 Amblyseiinae, 3 Phytoseiinae

**Table 10** Character measurements of an adult female of *Typhlodromus (A.) luzonensis* collected in this study compared to those in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore Island (1) (this study)	Philippines (2)	Characters	Grande Comore Island (1) (this study)	Philippines (2)
Dsl	<b>280</b>	296	st1-st1	<b>40</b>	—
Dsw	<b>158</b>	157	st2-st2	<b>45</b>	51
j1	<b>12</b>	12	st3-st3	<b>50</b> , on sternal shield	Posterior part not visible
j3	<b>8</b>	12	st1-st3	<b>53</b>	55
j4	<b>8</b>	9	st4-st4	<b>48</b> , on a metasternal shield	On a metasternal shield
j5	<b>8</b>	10	Gensl	<b>95</b>	—
j6	<b>9</b>	12	Gensw st5	<b>46</b>	—
J2	<b>11</b>	13	Gensw post. corn.	<b>58</b>	—
J5	<b>8</b>	8	st5 – st5	<b>44</b>	63
r3	<b>11</b>	11	Lisl	<b>20</b>	26
R1	<b>8</b>	11	Lisw	<b>4</b>	—
s4	<b>8</b>	12	sisl	<b>Not visible</b>	10
s6	<b>8</b>	13	Vsl	<b>90</b>	97
S2	<b>11</b>	13	Vsw ZV2	<b>83</b>	78
S4	<b>10</b>	12	Vsw anus	<b>75</b>	—
S5	<b>13</b>	9	gv3 – gv3	<b>19</b>	18
z2	<b>5</b>	12	JV5	<b>12, not knobbed</b>	15, not knobbed
z3	<b>5</b>	11	SgeIV	<b>10, knobbed</b>	12, knobbed
z4	<b>8</b>	12	StiIV	<b>10, knobbed</b>	13, knobbed
z5	<b>8</b>	9	StIIV	<b>11, knobbed</b>	15, knobbed
Z4	<b>15, pointed</b>	15, pointed	Scl	<b>10, glass shape</b>	—
Z5	<b>45, plumose and knobbed</b>	33, plumose and knobbed	Scw	<b>6</b>	—
			Fdl	<b>18</b>	19
			No teeth Fd	<b>6</b>	3
			Mdl	<b>20</b>	19
			No teeth Md	<b>1</b>	1

Sources of measurements – Philippines: Schicha & Corpuz-Raros (1992); —: not provided.

and 6 Typhlodrominae, have been obtained, namely: *Neoseiulus teke*, *Okiseius subtropicus*, *Paraphytoseius horrifer*, *P. orientalis*, *Amblyseius duplexesetus*, *A. herbicolus*, *A. largoensis*, *A. parasundi*, *Typhlodromips shi*, \**Proprioseiopsis ovatus*, ***Euseius baetae***, ***E. hima***, ***E. ovaloides***, *Iphiseius degenerans*, *Typhlodromalus athiasae*, ***T. spinosus***, *Phytoseius amba*, ***P. crinitus***, ***P. duplus***, *Chanteius contiguus*, *Typhlodromus\* (Anthoseius) grawiae*, ***T. (A.) hartlandrowei***, ***T. (A.) lobatus***, ***T. (A.) luzonensis*** and ***T. (A.) quadratus***. Two new species (one *Amblyseius* n. sp. and one *Ueckermannseius* n. sp.\*\*) will be described in a following paper.

Only one species not recovered during this study [*Neoseiulus longispinosus* (Evans) in Kreiter et al. 2018a], 28 species are now recorded from this Island.

Among the 25 recorded species during this study, at least seven species (*N. teke*, *P. orientalis*, *A. largoensis*, *A. herbicolus*, *E. ovaloides*, *I. degenerans*, and *T. spinosus*) are already known as biological control agents (BCAs), some having been evaluated and some others commercially reared in other parts of the world. With *N. longispinosus*, not recovered this time but reported previously (Kreiter et al. 2018a) and which is also a effective BCA in many parts of the world, it represents eight species of interest for Grande Comore.

**Table 11** Character measurements of an adult female of ***Typhlodromus (A.) quadratus*** collected in this study compared to those in previous studies (localities followed by the number of specimens measured between brackets).

Characters	Grande Comore Island (1) (this study)	China (30)	Characters	Grande Comore Island (1) (this study)	China (30)
Dsl	<b>292</b>	279 – 313	<i>st1-st1</i>	<b>40</b>	–
Dsw	<b>170</b>	206 – 216	<i>st2-st2</i>	<b>50</b>	–
<i>j1</i>	<b>13</b>	10	<i>st3-st3</i>	<b>58, on metasternal shield</b>	On metasternal shield
<i>j3</i>	<b>14</b>	14	<i>st1-st3</i>	<b>53</b>	–
<i>j4</i>	<b>13</b>	10	<i>st4-st4</i>	<b>61, on metasternal shield</b>	On metasternal shield
<i>j5</i>	<b>10</b>	10	Gensl	<b>103</b>	–
<i>j6</i>	<b>13</b>	10	Gensw <i>st5</i>	<b>58</b>	–
<i>J2</i>	<b>14</b>	12	Gensw post. corn.	<b>73</b>	–
<i>J5</i>	<b>10</b>	7	<i>st5 – st5</i>	<b>54</b>	–
<i>r3</i>	<b>10</b>	10	Lisl	<b>25, thin and elongate</b>	Apparently thin and elongate
<i>R1</i>	<b>13</b>	10	Lisw	<b>2</b>	–
<i>s4</i>	<b>16</b>	17	<i>sisl</i>	<b>15</b>	–
<i>s6</i>	<b>14</b>	17	Vsl	<b>100</b>	–
<i>S2</i>	<b>18</b>	17	Vsw ZV2	<b>83</b>	–
<i>S4</i>	<b>18</b>	14	Vsw anus	<b>78</b>	–
<i>S5</i>	<b>15</b>	10	<i>gv3 – gv3</i>	<b>15</b>	–
<i>z2</i>	<b>13</b>	14	<i>JV5</i>	<b>15</b>	17
<i>z3</i>	<b>13</b>	14	Macrosetae	<b>None</b>	None
<i>z4</i>	<b>13</b>	14	Scl	<b>14, elongate</b>	Elongate ?
<i>z5</i>	<b>13</b>	14	Scw	<b>3</b>	–
<i>Z4</i>	<b>19, serrated</b>	19, not serrated ?	Fdl	<b>20</b>	–
<i>Z5</i>	<b>30, serrated and rounded</b>	28, serrated and knobbed	No teeth Fd	<b>2</b>	–
			Mdl	<b>20</b>	–
			No teeth Md	<b>1</b>	–

Sources of measurements – China: Wu & Liu (1997); –: not provided.

In addition to the intrinsic value of phytoseiid mite biodiversity in tropical environments, demonstration of the natural occurrence of efficient BCAs in a developing country such as Grande Comore Island is of great agricultural, commercial and strategic interests for the country.

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