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# New records of species of the family Phytoseiidae (Acari: Mesostigmata) from Ivory Coast

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## Original research

### ABSTRACT


Ivory Coast is one of the largest countries in Western Africa. Despite this, only five species of the Phytoseiidae mite family have been reported from this country so far. This study aims to improve the understanding of Phytoseiidae mites in papaya orchards in Ivory Coast. Sampling was conducted between 2017 and 2018 in three areas of intensive papaya cultivation in Ivory Coast: Anyama Ahoue (Abidjan), Yobouekro (Toumodi), and Ngattakro (Yamoussoukro). It involved the direct collection of mites from papaya leaves. This study identified 12 species of Phytoseiidae, all belonging to the Amblyseiinae subfamily. Among these species, 11 are newly reported for this country, namely *Neoseiulus longispinosus* (Evans), *N. teke* Pritchard & Baker, *Amblyseius swirskii* Athias-Henriot, *A. tamatavensis* Blommers, *Proprioseiopsis mexicanus* (Garman), *P. ovatus* (Garman), *Iphiseius degenerans* (Berlese), *Euseius fustis* (Pritchard & Baker), *E. lokele* (Pritchard & Baker), *E. nyalensis* (El-Badry) and *E. ovaloides* (Blommers). This study is part of an ongoing census of the mite family Phytoseiidae in Ivory Coast, which must be extended to other crops to improve biological control of crop pests.

**Keywords** mites; predators; surveys; *Carica papaya*; Amblyseiinae

## Introduction

Mites of the family Phytoseiidae are predatory species that feed on phytophagous mites and small insects such as thrips and whiteflies on both commercial plants and the endemic vegetation. Several species serve as biological control agents for the control of pest organisms in open field and protected crops worldwide (McMurtry and Croft 1997; McMurtry *et al.* 2013; Knapp *et al.* 2018). This family is widespread worldwide, present on all continents except Antarctica, and consists of about 2,500 valid species in 94 genera and three subfamilies (Demite *et al.* 2024). Biodiversity surveys in poorly investigated areas is still an urgent need, as they may lead to the discovery of additional species potentially useful for biological control, while also enhancing our understanding of biodiversity in these areas (Kreiter *et al.* 2018a, b, c, 2020a, b, c, 2021; Kreiter and Abo-Shnaf 2020a, b). From this perspective, areas with high biodiversity levels are particularly promising. Most of the African intertropical region constitutes one of the highest world biodiversity hotspots, a concept defined by Myers (1988) to identify regions of critical importance for biodiversity conservation. The common characteristics of these hotspots is their high levels of endemism, combined with the loss of at least 70% of their original natural vegetation (Myers *et al.* 2000). Knowledge of the phytoseiid diversity in these high interest areas is especially important in the context of global climate change, as it may help identify

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potential biological control agents (BCA) and support the future establishment of conservation programs.

Ivory Coast is an agricultural country where agriculture plays a crucial role in the national economy, contributing to one-third of the Gross Domestic Product (Gnago *et al.* 2010). In addition, in order to export crops such as coffee and cocoa, there are booming fruit crops such as papaya (*Carica papaya* L., Caricaceae). Papaya cultivation is more practiced in the southern and central regions of the country and has expanded significantly due to the Agricultural Export Promotion and Diversification Project (PPDEA). However, papaya production faces substantial challenges due to pressure from various pests, including phytophagous mites, which cause severe damage in papaya orchards. Biological control of these phytophagous mites required the use of predatory arthropods including mites of the family Phytoseiidae. Indeed, almost all species in this family are considered potential biological control agents (BCA) of mites and small phytophagous insects (McMurtry and Croft 1997; McMurtry *et al.* 2013).

Despite nearly 60 years of faunal studies conducted worldwide to search for phytoseiid species, many areas remain minimally explored or completely unexplored (Kreiter *et al.* 2020a, b, c, d). In Ivory Coast, very few surveys have focused on phytoseiids. Ragusa and Athias-Henriot (1983) recorded *Amblyseius masiaka* (Blommers & Chazeau, 1974), *A. usitatus* = *N. usitatus* (Van der Merwe), and *Neoseiulus erugatus* Ragusa and Athias-Henriot from soil samples. Athias-Henriot (1977) described *N. lamticus* (Athias-Henriot) from the Lamto region, in central Ivory Coast. Twenty kilometres from Yopougon, in the capital of Ivory Coast, Zannou *et al.* (2007) identified the species *Amblyseius sundi* Pritchard & Baker on *Eucommia ulmoides* Oliver (Eucommiaceae). Finally, Moraes *et al.* (1989a) recorded the species *A. largoensis* Muma. It should be noted that *Amblyseius masiaka* and *N. usitatus* are both junior synonyms of *Neoseiulus barkeri* Hughes (Ueckermann and Loots, 1988). Consequently, five species are currently recorded from Ivory Coast: *N. barkeri*, *N. erugatus*, *N. lamticus*, *A. masiaka* and *A. sundi*.

These results indicate that few studies have been carried out on the fauna of Phytoseiidae in Ivory Coast. This study was therefore carried out during years 2017 and 2018 on *Carica papaya* L. in order to contribute to a better knowledge of Phytoseiidae mites for biological control of crop pests in Ivory Coast. Here, we present the faunistic results.

## Material and methods

### Sampling of mites

The sampling of Phytoseiidae mites was conducted from 14/III/2017 to 17/IV/2018, as a part of the PhD thesis of the senior author (M. Touré) in Ivory Coast. The study covered three areas: Anyama, Yobouekro, and NGattakro, located in the departments of Abidjan, Toumodi, and Yamoussoukro, respectively. The average annual temperature and rainfall in these areas are 153.34 mm and 27.64 °C, 103.76 mm and 26.41 °C and 97.44 mm and 26.41 °C, respectively.

The sampling consisted of collecting papaya leaves from orchards at the different sites. The papaya leaves were cut, placed in transparent plastic bags, and transported to the laboratory for processing. Mites were collected from the papaya leaves using a binocular microscope. To facilitate observation under the microscope, the papaya leaves were cut into smaller lobes. A small brush soaked in alcohol was used to collect the mites, which were then transferred into microtubes containing 70% ethanol. These microtubes were labeled with information such as the date, collection area, plot, and sample block number.

### Mounting of mites

The mites were mounted between the slide and coverslip using Hoyer's fluid (Walter and Krantz 2009). Slides were placed in an oven at 45 °C and subsequently sealed with a durable nail polish to ensure long-term preservation.

## Taxonomical concepts

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, 2024) 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, numbered I to IV depending on the position on legs I, II, III or IV) 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 the Results section should be considered as absent. Type of spermatheca or insemination apparatus are that of Denmark and Evans (2011). All species recorded are measured and data mentioned in the literature for those species are provided in this paper. All measurements are given in micrometres ( $\mu\text{m}$ ) and presented with the mean in bold followed by the range in parenthesis.

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/Institut Agro/University of Montpellier.

## Abbreviations used in tables

The following abbreviations are used in this paper for morphological characters (Table 1 to 19) in addition to macrosetal notation (see above): **dsl** = dorsal shield length just above *jl* to just below *J5* in the middle line; **dsw s4** = dorsal shield width at the level of *s4*; **dsw R1** = dorsal shield width at the level of *R1*; **gensl** = genital shield length; **gensw st5** = genital shield width at level of stae *st5*; **gensw post. corn.** = 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 shortest inguinal sigilla (= "metapodal plate") length; **sisw** = secondary or shortest inguinal sigilla (= "metapodal plate") width; **vsl** = ventrianal (or ventral for *Iphiseius degenerans*) shield length; **asl** = anal shield length; **gv3 – gv3** = distance between centers of solenostomes *gv3* on the ventrianal shield; **vsw ant. corn. & vsw anus** = ventrianal shield width at anterior corners level and at paranal setae level; **asw** = anal shield width; **scl**: calyx total length; **scw** = calyx widest width; **fdl** = fixed digit length; **mdl** = movable digit length; **No teeth Fd** = number of teeth on the fixed digit; **No teeth Md** = number of teeth on the movable digit; **shaft** = length of the shaft of spermatodactyl; **branch** = length of the toe; **BCA** = Biological control agent; **aasl** = altitude above sea level.

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; **IRD** = Institut de Recherche pour le Développement; **UMR** = Unité Mixte de Recherche.

## Results

We collected 12 species, 11 of which are new records for Ivory Coast.

All recorded species belong to the subfamily Amblyseiinae, with no representatives of the subfamilies Phytoseiinae and Typhlodrominae found on the papaya plant.

The species recorded belong to three Amblyseiinae tribes: Neoseiulini, Amblyseiini, Euseiini, and to five genera: *Neoseiulus* (2 species), *Amblyseius* (3 species), *Proprioseiopsis* (2 species), *Iphiseius* (1 species) and *Euseius* (4 species).

In this paper, we present taxonomical information, measurements, world distribution, list of field collections and general information (when available) on these twelve species: *Neoseiulus longispinosus* (Evans), *N. teke* Pritchard & Baker, *Amblyseius sundi* Pritchard & Baker, *A. swirskii* Athias-Henriot, *A. tamatavensis* Blommers, *Proprioseiopsis mexicanus* (Garman), *P. ovatus* (Garman), *Iphiseius degenerans* (Berlese), *Euseius fustis* (Pritchard & Baker), *E. lokele* (Pritchard & Baker), *E. nyalensis* (El-Badry), and *E. ovaloides* (Blommers).

### Subfamily Amblyseiinae Muma

#### Amblyseiinae Muma, 1961: 273

#### Tribe Neoseiulini Chant & McMurtry

#### Neoseiulini Chant & McMurtry 2003: 6

#### Genus *Neoseiulus* Hughes

*Neoseiulus* Hughes, 1948: 141

#### *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 & Rimando 1966: 129; Schicha 1975: 103.

*Neoseiulus longispinosus*, Moraes *et al.* 1986: 85; 2000: 245; Chant & McMurtry 2003: 37; Moraes *et al.* 2004b: 129; Chant and McMurtry 2007: 29.

This species belongs to the *barkeri* species group and to the *womersleyi* species subgroup, as the calyx is markedly constricted at the junction with the atrium, the atrium is deeply forked at the junction with the major duct, and the major duct, atrium, and calyx are not of the same width (Chant and McMurtry 2003).

This species is widely distributed in many countries of the world, mainly in tropical areas (Moraes *et al.* 2000; Mailloux *et al.* 2010; Kreiter *et al.* 2013, 2018 a, c; Demite *et al.* 2024). It was found rarely in surveys made in Guadeloupe, Martinique and La Réunion, except in studies on companion plants in citrus orchards (Mailloux *et al.* 2010; Kreiter *et al.* 2013, 2018c; Le Bellec *et al.*, unpub. data). The species seems to be more common on weeds with populations of tetranychid mites. *Neoseiulus longispinosus*, a type II phytoseiid predatory mite, like *N. californicus* (McMurtry *et al.* 2013), has received increasing attention in Asia since 2010 for the control of different spider mites (of genera *Eutetranychus*, *Oligonychus*, and *Tetranychus*) (Nusartler *et al.* 2011). The feeding, development, predation, cannibalism, intra-guild predation and behaviour have been extensively studied by several authors (see for example Luong *et al.* 2017) for pest control purposes. *Neoseiulus longispinosus* is well-known as a BCA used in many countries worldwide for spider mite management. A recent study by Huyen *et al.* (2017) have shown that, at least in controlled laboratory conditions, *N. longispinosus* is a potential biological control agent against the citrus red mite, *P. citri*.

*Tetranychus urticae* is a major pest of papaya in south Florida, where *Neoseiulus longispinosus*, a newly naturalized predator, has become the most abundant predator associated with this pest. Single releases of *N. longispinosus* significantly suppressed TSSM populations. That study demonstrated that *N. longispinosus* has the potential to control TSSM on papaya, but the level of control can be negatively affected by high levels of cannibalism at low prey densities, as well as intraguild predation by aggressive intraguild predators, like *A. swirskii* (Döker *et al.* 2021).

This is the first record of this species in Ivory Coast.

**Specimens examined** — 45 ♀♀ and 1 ♂ collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W), on *Carica papaya* L.

**World distribution** — Australia, China (Fujian, Guangdong, Guangxi, Hainan, Yunnan), Cuba, Dominican Republic, Egypt, Grande Comore Island (Comoros), Guadeloupe Island (France), Hawaii, Hong Kong, India (Andaman Islands, Andhra Pradesh, Bihar Pradesh, Kerala, Orissa, Pondicherry, Tamil Nadu, Uttar Pradesh), Indonesia, Japan, Les Saintes Islands (France), Malaysia, Marie-Galante Island (France), Martinique (France), New Zealand, Nicaragua, Pakistan, Papua New Guinea, Philippines, La Réunion Island (France), Rodrigues Island (Mauritius), Russia (Primorsky Territory), Saint-Barthélemy Island (France), South Korea, Sri Lanka, Taiwan, Thailand, USA (Florida), Vietnam.

**Remarks** — The measurements of the female and male specimens from Ivory Coast (Table 1 and 2) overlap with those obtained from populations in various countries. These measurements are close to those obtained for specimens from FCI and La Réunion Island.

**Table 1.** Comparison of character measurements of adult females of *Neoseiulus longispinosus* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (10) (this study)	Grande Comore (1)	La Réunion (18)	Sri Lanka (3)	Indonesia Holotype (1)	Taiwan (?)	Thailand (3)	FCI (7)	Martinique (8)
dsl	335 (300–352)	380	320 (278–348)	321 (313–338)	332	–	330 (315–340)	332 (308–398)	321 (295–340)
dsw s4	176 (150–195)	192	183 (150–205)	187 (175–208)	173	–	186 (178–195)	179 (154–200)	168 (150–183)
dsw RI	180 (170–198)	–	–	–	–	–	–	–	–
j1	18 (13–22)	20	18 (15–20)	18 (17–19)	14	17	19 (18–21)	18 (16–22)	16 (13–18)
j3	61 (58–65)	69	62 (53–73)	62 (61–64)	51	58	61 (56–68)	59 (52–64)	58 (48–63)
j4	59 (53–63)	70	55 (48–60)	58 (56–60)	49	59	58 (54–62)	59 (52–65)	56 (50–65)
j5	70 (65–75)	78	66 (58–73)	70 (69–71)	59	–	69 (65–72)	69 (64–75)	66 (60–73)
j6	73 (65–79)	78	73 (65–83)	70 (68–72)	64	–	71 (68–73)	72 (68–75)	68 (60–83)
J2	74 (66–81)	88	74 (68–83)	77 (75–79)	66	–	74 (68–81)	76 (73–78)	76 (68–88)
J5	9 (8–10)	10	8 (6–10)	8	10	–	9 (7–12)	9 (8–11)	9 (8–10)
r3	58 (55–65)	75	59 (48–78)	55 (55–56)	54	–	61 (50–67)	57 (49–62)	54 (45–63)
RI	60 (55–65)	70	61 (54–80)	60 (59–62)	58	–	63 (55–70)	61 (57–65)	57 (50–63)
s4	83 (80–90)	–	82 (70–88)	82 (80–83)	75	72	81 (76–85)	77 (73–80)	78 (73–88)
S2	80 (73–90)	88	75 (68–85)	73 (70–79)	67	70	73 (68–80)	72 (68–76)	69 (63–76)
S4	54 (48–58)	63	56 (43–68)	59 (57–62)	49	58	61 (56–68)	57 (48–76)	52 (45–58)
S5	18 (14–20)	18	17 (15–18)	21 (19–23)	15	17	20 (18–25)	16 (14–16)	14 (13–15)
z2	68 (63–73)	75	67 (56–75)	69 (68–70)	58	62	66 (62–70)	65 (62–68)	64 (58–70)
z4	71 (65–83)	78	73 (65–80)	73 (73–75)	58	65	71 (68–75)	69 (67–73)	70 (63–87)
z5	31 (28–35)	38	27 (23–33)	32 (32–38)	–	–	31 (25–36)	35 (32–40)	31 (28–35)
Z1	76 (73–80)	83	75 (65–85)	77 (76–78)	67	–	75 (71–78)	75 (72–80)	74 (68–80)
Z4	72 (68–75)	78	70 (63–75)	72 (71–73)	68	65	71 (65–76)	71 (67–75)	69 (63–78)
Z5	78 (71–89)	85	81 (73–88)	80 (80–81)	72	70	78 (72–81)	80 (78–81)	77 (65–80)
st1-st1	49 (45–55)	48	47 (43–50)	–	–	–	–	–	46 (45–50)
st2-st2	57 (53–60)	55	58 (55–60)	53 (50–55)	–	–	59 (57–60)	55 (49–57)	54 (53–55)
st3-st3	72 (68–75)	60	71 (68–78)	–	77	–	–	60 (59–62)	58 (55–60)
st1-st3	55 (53–58)	73	57 (55–60)	55 (53–56)	62	–	63 (57–85)	–	70 (68–73)
st4-st4	79 (73–93)	85	71 (63–83)	–	–	–	–	–	72 (63–88)
gensl	117 (113–120)	–	–	–	–	–	–	–	–
st5-st5	58 (55–60)	58	54 (50–58)	53 (51–54)	–	–	61 (55–64)	56 (52–60)	53 (50–63)
gensw post. corn.	71 (65–75)	–	–	–	–	–	–	–	–
lisl	26 (23–30)	23	25 (20–30)	–	–	–	–	–	28 (23–33)
lisw	5 (3–6)	3	3 (3–6)	–	–	–	–	–	3
sisl	15 (13–18)	18	12 (10–18)	–	–	–	–	–	13 (10–15)
sisw	2 (1–3)	–	–	–	–	–	–	–	–
vsl	112 (105–120)	125	114 (93–125)	106 (103–111)	97	–	123 (120–125)	115 (94–121)	111 (103–120)
vsw ant. corn.	87 (80–93)	90	86 (80–95)	91 (89–93)	87	–	97 (95–100)	86 (80–92)	84 (75–90)
vsw anus	77 (73–83)	78	69 (67–73)	75 (73–77)	–	–	–	75 (67–83)	70 (65–75)
gv3-gv3	25 (23–28)	–	–	–	–	–	–	–	–
JV5	62 (58–65)	73	62 (55–70)	–	–	–	–	–	60 (55–63)
scl	20 (18–23)	25	24 (13–35)	21 (20–21)	30	–	–	28 (25–30)	20 (17–25)
scw	5 (4–6)	5	4 (3–10)	–	4	–	–	–	–
StIV	82 (75–88)	75	79 (75–83)	68 (68–70)	80–87	74	74 (72–77)	80 (75–87)	81 (75–88)
fdl, No teeth	24 (23–26), 4	23	24 (19–28), 6	22 (21–22), 5	–	–	23 (22–25)	25 (22–27), 4–5	24 (23–25), 4
mdl, No teeth	24 (24–26), 2	23	24 (23–30), 2	25 (23–25), 2	–, 2	–	26 (25–27)	25 (23–25), 2	24 (23–25), 2

Sources of measurements – Grande Comore: Kreiter *et al.* (2018b) (a mistake remains in this paper, 1 single female measured instead of 8 as indicated); La Réunion: Kreiter *et al.* (2020c); Sri Lanka: Moraes *et al.* (2004a); Indonesia Holotype: Schicha (1975); Taiwan: Tseng (1983); Thailand: Oliveira *et al.* (2012); FCI (French Caribbean Islands): Moraes *et al.* (2000); Martinique: Kreiter *et al.* (2018c); –: not provided.

**Neoseiulus teke Pritchard & Baker**

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

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

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

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

Like *N. longispinosus*, *N. teke* belongs to the *barkeri* species group and to the *womersleyi* species subgroup (see above) (Chant and McMurtry 2003).

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 *Iphiseius degenerans* (Berlese) but seems not efficient enough in field conditions (Nwilene and Nachman 1996). Quilici *et al.* (2000) and Kreiter *et al.* (2020c) have collected this species on La Réunion Island. Measurements of specimens collected during this study are provided in table 3. This is the first record of that species for Ivory Coast.

**Specimens examined** — a single specimen (1 ♀) collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W), on *Carica papaya* L.

**World distribution** — Burundi, DR Congo, Ghana, Grande Comore Island (Comoros), Kenya, Madeira Island (Portugal), Malawi, Mayotte Island (France), Mohéli Island (Comoros), Mozambique, La Réunion Island (France), Rwanda, Sierra Leone, South Africa, Tanzania, Zimbabwe.

**Remarks** — The measurements of morphological characters for the single *N. teke* female specimen from Ivory Coast (Table 3) are very close to those of specimens from neighbouring countries, especially from various African countries and La Réunion. However, they differ from the holotype from Congo (Zannou *et al.* 2006) and specimens from South Africa, which are larger (van der Merwe 1965).

**Table 2** . Comparison of character measurements of adult males of *Neoseiulus longispinosus* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	La Réunion (1)	F.C.I. (5)	Indonesia Paratype (1)	Characters	Ivory Coast (1) (this study)	La Réunion (1)	F.C.I. (5)	Indonesia Paratype (1)
dsl	250	248	247 (224–269)	231	Z1	45	55	56 (50–58)	46
dsw s4	158	170	160 (136–173)	138	Z4	50	53	55 (48–59)	45
dsw R1	166	–	–	–	Z5	53	58	57 (56–59)	57
j1	25	15	14 (13–16)	9	st1-st1	45	43	–	–
j3	47	50	44 (40–48)	43	st2-st2	50	53	–	–
j4	37	45	43 (42–43)	39	st3-st3	55	53	–	–
j5	45	48	52 (50–53)	43	st4-st4	45	103	–	–
j6	53	53	52 (50–53)	46	st1-st5	100	43	–	–
J2	53	55	56 (53–61)	54	st5-st5	38	35	–	–
J5	8	8	6 (5–6)	2	vsl	113	100	106 (99–112)	101
r3	33	35	32 (24–40)	32	vsw ant. corn.	145	130	135 (125–144)	130
R1	33	38	34 (32–37)	32	vsw anus	73	65	–	–
s4	60	63	62 (59–66)	57	gv3-gv3	15	–	–	–
S2	50	55	52 (50–54)	46	JV5	30	35	–	–
S4	27	40	30 (29–32)	22	StIV	55	60	66 (62–72)	–
S5	13	15	14 (13–16)	14	fdl, No teeth	18, ?	18	–	–
z2	45	48	44 (35–48)	45	mdl, No teeth	18, ?	18	–	–
z4	50	50	52 (48–54)	49	shaft	15	15	12 (11–14)	21
z5	30	28	27 (24–32)	–	branch	15	–	–	–

Sources of measurements – La Réunion: Kreiter *et al.* (2020c); FCI (French Caribbean Islands): Moraes *et al.* (2000); Indonesia Paratype: Schicha (1975); –: not provided.

As this species is a potential BCA, and as it is very difficult to obtain type specimens from Museum for old described species, it would be very important to undertake molecular studies and / or crossbreeding experiments with population collected in the field to determine whether all specimens of this various countries / locations belong to the same species or represent several different cryptic species.

## Tribe Amblyseiini Muma

### Amblyseiini, Muma, 1961: 68

#### Subtribe Amblyseiina Muma

Amblyseiina Muma, 1961: 69.

#### Genus *Amblyseius* Berlese

*Amblyseius* Berlese, 1914: 143.

#### *Amblyseius sundi* Pritchard & Baker

*Amblyseius* (*Amblyseius*) *sundi* Pritchard & Baker, 1962: 244.

*Amblyseius sundi*, Moraes *et al.* 1989a: 97; Chant & McMurtry 2004: 212; Moraes *et al.* 2004b: 52.

*Amblyseius* (*Proprioseiopsis*) *sundi*, Matthyse & Denmark, 1981: 344.

*Amblyseius sundi* belongs to the *sundi* species group and the *sundi* species subgroup. This species has already been recorded from the Ivory Coast. Blommers (1976) observed some *Tetranychus neocaledonicus* André and *Brevipalpus* sp. on the lemon trees on which this species was collected. But the biology of this species remain unknown.

**Specimens examined** — a single specimen (1 ♀) collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m Lat 5°26'00.87"N, Long 3°55'00.60"W), on *Carica papaya* L.

**World distribution** — Benin, Burundi, Cameroon, Cape Verde, Congo, Cuba, DR Congo, Ghana, Guadeloupe Island (France), Ivory Coast, Kenya, Madagascar Island, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, Uganda, Zimbabwe.

**Remarks** — The measurements of the single specimen collected are very close to those of specimens from other African countries (Table 4).

#### *Amblyseius swirskii* Athias-Henriot

*Amblyseius swirskii* Athias-Henriot, 1962: 5; Swirski *et al.* 1998: 102; Chant & McMurtry 2004: 201.

*Typhlodromips swirskii*, Moraes *et al.* 2004b: 227.

*Typhlodromips capsicum* Basha, Youssef, Ibrahim & Mostafa 2001: 372 (synonymy according to Abo-Shnaf & Moraes 2014).

*Amblyseius enab* El-Badry 1967: 178 (synonymy according to Abo-Shnaf & Moraes 2014).

*Amblyseius* (*Amblyseius*) *rykei* Pritchard & Baker 1962: 249 (synonymy according to Zannou *et al.* 2007).

*Amblyseius swirskii* belongs to the *obtusus* species group, characterized by the presence of setae *J2* and *Z1*, setae *z4* are minute and a female ventrianal shield is neither vase-shaped nor divided. Within this group, it belongs to *andersoni* species subgroup (120 species), as its spermatheca has a cup-shaped calyx. The predatory mite *Amblyseius swirskii* Athias-Henriot, 1962 (Acari: Phytoseiidae) is one of the most efficient predators; it is currently released in more than 50 countries of the world. Originally described in 1962 from almond (*Prunus amygdalus* [Miller] D.A. Webb) in Bet Dagan, Israel, by Athias-Henriot. The species was reported along

**Table 3** . Comparison of character measurements of adult females of *Neoseiulus teke* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	Congo Holotype (1)	Kenya (2)	La Réunion (10)	Mayotte (3)	Madagascar (1)	South Africa (5)	Other African countries (10)
dsl	330	348	295	307 (293–328)	305–323	340	332–341	308 (293–320)
dsw s4	152	–	160	165 (155–173)	170–183	200	190–203	172 (162–186)
dsw R1	170	–	–	–	–	–	–	–
j1	18	–	18	15 (13–18)	18–19	20	19–23	18 (16–19)
j3	50	61	39	46 (38–53)	55	50	62–67	44 (35–50)
j4	30	42	39	25 (23–28)	30–33	30	38–45	30 (23–36)
j5	43	–	39	39 (35–43)	47–48	45	47–54	42 (35–48)
j6	47	60	42	47 (45–53)	55	54	62–66	48 (43–53)
J2	55	68	48	55 (50–58)	62–63	65	68–75	53 (45–59)
J5	10	–	9	11 (10–13)	10–13	10	12–14	11 (10–12)
r3	38	61	37	44 (40–48)	47–50	50	54–66	40 (34–46)
R1	33	66	37	42 (40–45)	48–40	48	54–66	37 (27–48)
s4	63	71	55	60 (55–65)	64–65	66	75–82	60 (54–64)
S2	63	–	58	64 (60–68)	68–71	70	72–80	61 (56–67)
S4	38	–	39	47 (43–60)	51–55	50	56–63	43 (40–48)
S5	38	48	34	36 (28–38)	45–48	40	46–52	32 (23–40)
z2	53	62	46	51 (48–53)	58	56	66–71	49 (41–54)
z4	55	65	48	50 (48–50)	56–58	54	68–75	51 (43–56)
z5	27	42	35	25 (23–28)	35–38	25	33–44	29 (19–38)
Z1	58	65	44	54 (50–58)	60–63	55	71–77	53 (45–62)
Z4	63	–	55	57 (50–63)	65–68	66	66–74	60 (54–67)
Z5	65	–	58	68 (65–73)	70–78	76	80–90	65 (59–74)
st1-st1	50	–	–	44 (43–48)	45	–	–	–
st2-st2	65	–	53	55 (53–58)	54–56	–	–	58 (56–63)
st3-st3	80	–	–	67 (61–70)	68–69	–	63–67	–
st1-st3	53	–	53	60 (55–63)	60	–	56–59	56 (53–58)
st4-st4	?	–	–	66 (53–70)	61–63	–	–	–
gensl	100	–	–	–	–	–	–	–
gensw st5	53	–	58	54 (50–58)	56–60	–	70–74	56 (51–63)
gensw post. corn.	70	–	–	–	64–73	–	–	–
lisl	23	–	–	25 (23–28)	23–27	–	–	–
lisw	3	–	–	3 (3–5)	2–4	–	–	–
sisl	10	–	–	10 (8–10)	10–13	–	–	–
sisw	1	–	–	–	–	–	–	–
vsl	?	108	105	109 (100–115)	115–125	125	115–122	111 (104–118)
vsw ZV2	?	95	80	90 (83–95)	95–103	100	95–100	97 (93–102)
vsw anus	?	–	–	71 (63–80)	75	–	–	–
gv3 – gv3	20	–	–	–	20–23	–	–	–
JV5	43	–	55	57 (55–63)	68	64	66–72	–
scl	8	–	16	25 (23–28)	25–30	24	27	24 (22–27)
scw	3	–	–	6 (5–13)	5	7	–	–
StIV	63	72	65	69 (48–75)	63–65	75	75–78	66 (51–77)
fdl, No teeth	23, ?	–	–, 7	24 (18–25), 4	23–25, 4	24, 3	24, 4	24 (23–25), 4
mdl, No teeth	23, 3	–	–, 2	24 (20–28), 2	26–28, 2	26, 2	27, 2	26 (25–27), 2

Sources of measurements –Congo Holotype: Zannou *et al.* (2006); Kenya: El-Banhawy & Knapp (2011); La Réunion: Kreiter *et al.* (2020c); Mayotte: Kreiter *et al.* (2020a); Madagascar (Identified as *Amblyseius bibens* but synonymized by Ueckermann & Loots 1988): Blommers (1973); South Africa: van der Merwe (1968); Other African countries (Burundi 1♀, Ghana 2♀♀, Kenya 3♀♀, Malawi 1♀, Mozambique 1♀, Rwanda 1♀, Sierra Leone 1♀): Zannou *et al.* (2006); –: not provided.

the coast of Israel, in the Middle East, Southern Europe, Sub-Saharan Africa, and the Americas (Demite *et al.* 2024).

This species is able to develop not only in the Mediterranean basin but also in subtropical and tropical areas (Zannou and Hanna 2011). Since it does not enter diapause, it is suitable for use throughout much of the growing season in regions where daytime temperatures regularly exceed 22 °C (Calvo *et al.* 2015). *Amblyseius swirskii* is commonly used to control whiteflies and thrips in greenhouse vegetables (especially cucumber, pepper and eggplant) and some ornamental crops, in Europe and North America (Calvo *et al.* 2015). The biology of this species and its importance for biocontrol were comprehensively reviewed by Calvo *et al.* (2015) and Buitenhuis *et al.* (2015). In 2015, a species resembling to *A. swirskii* was discovered after a thrips outbreak on peppers and roses on La Réunion Island (Kreiter *et al.* 2016a, b), located thousands of kilometres from its supposed native area. Morphological and molecular analysis confirmed its identity as *A. swirskii* (Kreiter *et al.* 2016a, b). This is the first record of this species from Ivory Coast.

**Specimens examined** — 7 ♀♀ collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W), 3 ♀♀ and 1 ♂ collected between 05/IV/2017 and 17/IV/2018 in Toumodi, Yobouekro (aasl 184 m, Lat 6°31'19.196"N, Long 5°6'41.36"W) and 32 ♀♀ collected between 06/04/2017 au 18/03/2018 in Yamoussoukro, Ngattakro (aasl 158 m, Lat 6°49'39.443"N, Long 5°17'21.635"W) on *Carica papaya* L.

**World distribution** — Argentina, Azerbaijan, Benin, Burundi, Cape Verde, DR Congo, Egypt, Gaza Strip, Georgia, Ghana, Israel, Italy, Morocco, Reunion Island, Saudi Arabia, Senegal, Slovenia, Spain, Syria, Tanzania, Türkiye, USA (California and Florida), Yemen.

**Remarks** — The measurement values (Tables 5 and 6) are very close to those reported in the literature, especially for specimens from Africa.

**Table 4.** Character measurements of adult females of *Amblyseius sundi* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	DRC (1) Holotype	Nigeria1 (1)	Nigeria2 (1)	Other African Countries (14)	Characters	Ivory Coast (1) (this study)	DRC (1) Holotype	Nigeria1 (1)	Nigeria2 (1)	Other African Countries (14)
dsl	338	348	377	360	373 (318–421)	gensl	123	–	–	–	–
dsw s4	238	266	212	240	272 (248–304)	st5-st5	75	78	–	–	78 (72–85)
dsw RI	233	–	–	–	–	gensw post. corn.	73	–	–	–	–
j1	38	37	36	38	39 (32–45)	lisl	30	–	–	–	–
j3	45	50	44	44	48 (40–56)	lisw	3	–	–	–	–
j4	5	2	5	2	5 (4–5)	sisl	18	–	–	–	–
j5	5	2	5	2	4 (3–5)	sisw	1	–	–	–	–
j6	5	4	5	2	6 (5–8)	vsl	118	126	–	120	122 (100–141)
J2	5	5	5	2	6 (5–8)	vsw ant. corn.	65	70	–	60	73 (64–85)
J5	5	6	5	5	7 (6–8)	vsw anus	78	79	–	72	80 (69–91)
r3	18	13	16	10	14 (10–16)	gv3 – gv3	28	–	–	–	–
RI	8	8	5	7	8 (5–11)	JV5	?	–	–	–	–
s4	165	158	152	137	165 (133–206)	scl	38	31	–	36	40 (34–48)
S2	5	8	6	5	7 (5–8)	scw	4	–	–	–	–
S4	5	6	6	5	7 (6–8)	SgeI	73	72	–	36	74 (61–96)
S5	4	6	6	5	6 (5–8)	SgeII	45	48	–	48	49 (40–59)
z2	5	8	5	7	7 (5–8)	SgeIII	63	66	–	66	72 (50–88)
z4	5	6	5	7	7 (5–14)	StIII	45	53	–	53	56 (43–67)
z5	8	4	5	5	5 (4–5)	StIII	38	–	–	–	–
Z4	163	174	165	168	172 (144–208)	SgeIV	175	186	190	156	209 (157–270)
Z5	385	450	426	394	445 (366–547)	StIV	125	134	137	120	156 (112–208)
st1-st1	68	–	–	–	–	StIV	87	85	92	84	99 (69–141)
st2-st2	78	78	–	–	79 (73–88)	fdl, No teeth	35, 13	34, 12–13	–	36	34 (33–36), 13–14
st3-st3	83	–	–	–	–	mdl, No teeth	38, 3	36	–	36	38 (37–39), 3
st1-st3	69	66	–	–	69 (62–82)						
st4-st4	85	–	–	–	–						

Sources of measurements – DRC (Democratic Republic of Congo) Holotype: Pritchard & Baker (1962) in Zannou *et al.* (2007); Nigeria1: Matthyse & Denmak (1981); Nigeria2: Moraes *et al.* (1989b); Other African Countries (Burundi 1♀, Ghana 3♀♀, Ivory Coast 1♀, Kenya 4♀♀, Malawi 1♀, Rwanda 2♀♀, Sierra Leone 1♀, Uganda 1♀): Zannou *et al.* (2007); –: not provided.

**Table 5 .** Comparison of character measurements of adult females of *Amblyseius swirskii* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (10) (this study)	Cape Verde (16)	Egypt (8)	Other African Countries (10)	La Réunion (10)	Israel (?)	Spain (?)	Türkiye (5)
<b>dsl</b>	<b>347 (325–395)</b>	347–408	375 (358–397)	338 (326–352)	384 (368–400)	–	345–370	342 (335–350)
<b>dsw s4</b>	<b>197 (180–213)</b>	211–246	214 (195–224)	205 (202–208)	233 (205–245)	–	188–202	169 (165–175)
<b>dsw R1</b>	<b>208 (195–225)</b>	–	–	–	–	–	–	212 (200–230)
<b>j1</b>	<b>31 (28–35)</b>	31–39	30 (25–32)	29 (24–32)	29 (25–31)	29 (25–32)	24–28	29 (24–32)
<b>j3</b>	<b>54 (50–58)</b>	57–69	55 (52–57)	53 (48–56)	53 (50–58)	51 (46–57)	56	53 (50–57)
<b>j4</b>	<b>8</b>	8–9	10 (9–15)	8	8 (8–10)	–	9	10 (9–10)
<b>j5</b>	<b>8</b>	8–9	9 (8–10)	8	8	–	8	10 (9–10)
<b>j6</b>	<b>8 (8–10)</b>	9–11	10 (9–11)	9 (8–10)	8 (8–10)	–	8	9 (8–10)
<b>J2</b>	<b>9 (8–10)</b>	9–11	9 (8–10)	9 (8–10)	8	8 (7–9)	8	10 (9–10)
<b>J5</b>	<b>8 (8–9)</b>	9–11	10 (8–10)	7 (6–8)	10 (8–10)	–	8	10 (9–10)
<b>r3</b>	<b>23 (20–25)</b>	23	25 (23–27)	20 (19–21)	24 (23–25)	–	22–25	25 (25–26)
<b>R1</b>	<b>13 (10–15)</b>	12–15	15 (12–17)	11 (10–13)	15 (13–17)	–	14–16	17 (15–20)
<b>s4</b>	<b>77 (73–83)</b>	74–85	78 (72–81)	75 (70–82)	83 (78–100)	76 (70–81)	76–80	78 (75–80)
<b>S2</b>	<b>13 (11–13)</b>	15–20	19 (18–21)	13 (11–14)	18 (17–22)	19 (17–25)	16–22	15 (14–16)
<b>S4</b>	<b>9 (8–10)</b>	9–11	11 (8–13)	9 (8–10)	11 (10–12)	12 (10–14)	12–14	12 (10–13)
<b>S5</b>	<b>8 (8–9)</b>	9–11	11 (9–12)	7 (6–8)	10 (10–11)	–	10–12	10 (8–11)
<b>z2</b>	<b>11 (8–13)</b>	12–15	14 (11–16)	12 (11–16)	15 (13–15)	15 (13–20)	16	15 (12–17)
<b>z4</b>	<b>12 (10–15)</b>	12–15	15 (12–18)	13 (10–16)	15 (15–17)	17 (15–26)	16–22	14 (12–16)
<b>z5</b>	<b>8 (8–9)</b>	8–9	8 (7–10)	7 (6–8)	8 (5–8)	–	8–0	10 (9–10)
<b>Z1</b>	<b>9 (8–10)</b>	9–11	11 (10–12)	9 (8–10)	10 (8–10)	–	8–10	10 (9–11)
<b>Z4</b>	<b>74 (68–78)</b>	69–77	73 (70–76)	73 (69–78)	76 (73–80)	72 (67–76)	76–80	71 (69–73)
<b>Z5</b>	<b>113 (105–120)</b>	100–126	109 (105–112)	110 (106–115)	113 (108–114)	108 (102–116)	110–118	110 (104–120)
<b>st1-st1</b>	<b>62 (58–65)</b>	–	63 (55–68)	–	61 (58–65)	61 (61–62)	–	–
<b>st2-st2</b>	<b>73 (70–75)</b>	–	77 (71–87)	70 (69–70)	71 (63–78)	–	–	76 (75–76)
<b>st3-st3</b>	<b>85 (81–90)</b>	–	87 (79–91)	–	85 (82–90)	81 (78–83)	–	–
<b>st1-st3</b>	<b>63 (61–66)</b>	–	–	62	64 (63–65)	64 (61–66)	–	67 (67–68)
<b>st4-st4</b>	<b>94 (83–165)</b>	–	91 (82–101)	–	86 (80–92)	–	–	–
<b>gensl</b>	<b>129 (120–170)</b>	–	–	–	–	–	–	–
<b>st5-st5</b>	<b>74 (70–78)</b>	–	76 (70–81)	73 (67–78)	68 (60–73)	70 (64–76)	–	79 (75–81)
<b>gensw post. corn.</b>	<b>84 (80–88)</b>	–	–	–	–	–	–	–
<b>lisl</b>	<b>23 (20–28)</b>	–	–	–	–	–	–	–
<b>lisw</b>	<b>4 (4–5)</b>	–	–	–	–	–	–	–
<b>sisl</b>	<b>13 (12–15)</b>	–	–	–	–	–	–	–
<b>sisw</b>	<b>2 (2–3)</b>	–	–	–	–	–	–	–
<b>vsl</b>	<b>125 (118–135)</b>	130	132 (126–135)	115 (110–120)	131 (125–140)	117 (106–129)	123–134	130 (127–135)
<b>vsw ant. corn.</b>	<b>84 (80–88)</b>	85–90	83 (71–89)	79 (72–86)	87 (85–90)	83 (78–85)	89–92	87 (85–90)
<b>vsw anus</b>	<b>82 (78–88)</b>	–	86	79 (78–80)	84 (83–85)	–	–	87 (85–90)
<b>gv3-gv3</b>	<b>23 (21–26)</b>	–	–	–	–	–	–	26 (24–28)
<b>JV5</b>	<b>70 (63–75)</b>	62–77	72 (65–72)	–	67 (63–70)	–	–	66 (64–70)
<b>scl</b>	<b>10 (8–13)</b>	–	11	10	10	–	–	9 (8–10)
<b>scw</b>	<b>14 (12–20)</b>	–	–	–	–	–	–	–
<b>Sge I</b>	<b>31 (27–35)</b>	26–31	29 (27–30)	24	25	33 (29–36)	–	–
<b>Sge II</b>	<b>33 (30–38)</b>	31–39	33 (32–35)	28 (27–29)	33 (30–38)	32 (26–37)	–	31 (30–32)
<b>Sge III</b>	<b>36 (30–40)</b>	31–39	36 (35–37)	32	37 (33–48)	37 (36–39)	–	34 (32–35)
<b>Sti III</b>	<b>26 (23–28)</b>	26–28	27 (26–28)	22 (21–24)	26 (25–28)	–	–	25 (23–27)
<b>StIII</b>	–	–	–	–	–	–	–	25 (23–26)
<b>Sge IV</b>	<b>63 (60–68)</b>	57–69	63 (60–65)	61 (56–66)	64 (60–67)	64 (61–66)	65	57 (53–62)
<b>Sti IV</b>	<b>38 (33–53)</b>	46–54	47 (44–50)	44 (40–51)	43 (40–45)	45 (42–47)	40–42	43 (40–46)
<b>St IV</b>	<b>64 (60–73)</b>	57–69	66 (60–68)	59 (53–64)	64 (63–65)	62 (53–68)	62–66	59 (51–64)
<b>fdl, No teeth</b>	<b>31 (30–33), 8</b>	–, 11	33 (32–34), 9–10	33 (33–35), 9–10	33, 9	–	–, 11	31 (30–32), 9
<b>mdl, No teeth</b>	<b>34 (33–34), 3</b>	–, 3	33 (31–34), 3	28 (28–30), 3	33, 3	–	–, 3	31 (30–32), 3

Sources of measurements – Cape Verde: Ueckermann (1992); Egypt: Abo-Shnaf & Moraes (2014); Other African Countries (Benin: 2♀♀; Burundi: 1♀; Ghana: 4♀♀; Democratic Republic of Congo: holotype of *A. (A.) rykei*; Israel: 2♀♀); Zannou *et al.* (2007); Israel: Athias-Henriot (1962); La Réunion: Kreiter *et al.* (2016a); Spain: Ferragut *et al.* (2010); Türkiye: Döker *et al.* (2020); –: not provided.

**Amblyseius tamatavensis Blommers**

*Amblyseius tamatavensis* Blommers 1974: 144; Moraes *et al.* 1986: 31; Denmark & Muma 1989: 13; Chant & McMurtry 2004: 203; Ehara & Amano 2004: 17; Moraes *et al.* 2004b: 52;

**Table 6** . Comparison of character measurements of adult males of *Amblyseius swirskii* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	Egypt (5)	Ghana (1)	La Réunion (5)	Israel (10)	Türkiye (2)
dsl	265	275 (254–292)	258	289 (280–300)	255–295	267 (266–268)
dsw s4	145	179 (145–203)	190	180 (167–187)	–	144 (143–144)
dsw R1	175	–	–	–	–	158
j1	15	22 (20–24)	25	24 (23–25)	21–26	24 (23–24)
j3	38	44 (41–47)	43	44 (41–47)	44–49	42 (41–43)
j4	10	8 (7–11)	7	8 (8–10)	5–8	7
j5	8	8 (7–8)	7	8	5–8	7 (6–7)
j6	8	8 (7–9)	8	8	5–8	7
J2	8	8 (7–9)	7	8	5–8	8
J5	8	8 (7–8)	8	8	5–8	9
r3	18	21 (19–23)	20	21 (19–23)	21–23	21 (19–22)
R1	13	14 (13–14)	14	13 (13–15)	16–18	13 (12–13)
s4	55	61 (57–64)	59	63 (60–65)	57–65	65 (64–66)
S2	14	15 (13–18)	14	15 (13–18)	13–18	13 (12–13)
S4	8	9 (7–13)	9	14 (13–18)	9–13	11 (10–11)
S5	8	9 (8–10)	9	10 (8–11)	9–13	10
z2	13	14 (12–16)	13	15 (14–15)	12–16	17 (16–17)
z4	13	13 (10–15)	13	15 (14–15)	13–18	16 (15–16)
z5	8	7 (7–8)	6	8	5–8	7
Z1	8	11 (10–13)	8	8	10–16	8 (7–8)
Z4	50	52 (49–53)	52	58 (55–60)	49–62	56 (55–57)
Z5	68	74 (70–78)	80	79 (78–80)	73–81	80 (79–80)
st1-st1	50	55 (52–60)	–	52 (50–53)	–	–
st2-st2	32	59 (56–63)	–	60	–	–
st3-st3	63	61 (56–66)	–	60 (57–63)	–	–
st4-st4	50	47 (43–51)	–	49 (48–50)	–	–
st5-st5	41	39 (35–43)	–	39 (35–40)	–	–
st1-st5	113	–	–	112* (110–113)	–	–
vsl	123	121 (109–128)	113	110 (108–110)	112–125	119 (118–120)
vsw ant. corn.	158	151 (123–164)	145	158 (150–160)	–	166 (165–167)
vsw anus	80	–	–	79 (75–80)	–	–
gv3-gv3	?	–	–	–	–	–
JV5	30	36 (33–39)	–	29 (28–31)	31–41	34
Sge I	18	24 (21–25)	–	20	–	–
Sge II	25	26 (23–28)	25	29 (28–30)	–	29 (28–29)
Sge III	25	26 (23–28)	24	30	–	26 (25–26)
Sti III	20	21 (18–23)	20	28	–	23
StIII	–	–	–	–	–	22 (21–22)
Sge IV	40	45 (40–47)	39	47 (45–48)	39–52	42 (41–43)
Sti IV	28	36 (32–38)	35	38 (35–40)	31–44	37 (36–37)
St IV	42	54 (48–58)	50	54 (50–55)	49–62	51 (50–52)
fdl, No teeth	22, 6	26 (25–27), 6	–	31 (27–33), 6	–, 6	–, 7
mdl, No teeth	22, 1	25 (23–27), 1	–	29 (25–30), 1	–, 1	–, 1
shaft	18	20 (19–21)	19	21 (19–23)	–	19 (18–20)
branch	8	–	–	–	–	–

Sources of measurements –Egypt: Abo-Shnaf & Moraes (2014); Ghana: Zannou *et al.* (2007); La Réunion: Kreiter *et al.* (2016a); Israel: Athias-Henriot (1962); Türkiye: Döker *et al.* (2020); –: not provided.

Chant & McMurtry 2007: 81; Döker *et al.* 2018: 101.

*Amblyseius (Amblyseius) tamatavensis*, Ehara 2002: 33; Ehara & Amano 2002: 322.

*Amblyseius aegyptiacus* Denmark & Matthysse in Matthysse & Denmark 1981: 343 (synonymy according to Denmark & Muma 1989)

*Amblyseius maai* Tseng 1976: 123 (synonymy according to Denmark & Muma 1989).

*Amblyseius tamatavensis*, like the previous species, belongs to the *obtusus* species group, characterized by the presence of setae *J2* and *Z1*, setae *z4* are minute, and a female ventrianal shield that is neither vase-shaped nor divided. It is further classified in the *aerialis* species subgroup (46 species) due to the tubular calyx of the spermatheca (Chant and McMurtry 2004a).

It seems to fit the type III-b feeding habit (generalist predators living on glabrous leaves) as defined by McMurtry *et al.* (2013). Cavalcante *et al.* (2017) reported this species as a promising natural enemy of *B. tabaci*. Experimental releases on caged plants in a screen house have demonstrated its efficacy, reducing *B. tabaci* densities of on pepper plants by 60-80% (Massaro and Moraes 2019). Additionally, it can be easily mass-produced in large numbers using astigmatine mites as a food source, making it suitable for augmentative biological control programs (Massaro *et al.* 2021). This species has been reported in tropical areas from over 20 countries around the world including Africa, Asia, Americas, and Oceania. Measurements of specimens collected during this study are provided in table 7. This is the first record of this species from Ivory Coast.

**Specimens examined** — 4 ♀♀ and 1 ♂ collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W) on *Carica papaya* L.

**World distribution** — Australia (New South Wales, Queensland), Benin, Brazil (Alagoas, Amazonas, Bahia, Ceará, Espírito Santo, Goiás, Minas Gerais, Pará, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Roraima, Sergipe, São Paulo, Tocantins), Burundi, Cameroon, Cook Islands, Cuba, Dominican Republic, DR Congo, Easter Island/Isla de Pascua (Chile), Fiji, Ghana, Guadeloupe Island (France), Indonesia, Japan, Kenya, Madagascar Island, Malawi, Malaysia, Marie-Galante Island (France), Martinique (France), Mauritius Island, Mayotte Island (France), Mozambique, Nigeria, Papua New Guinea, Peru, Philippines, Réunion Island (France), Rodrigues Island (Mauritius), Rwanda, Singapore, South Africa, Sri Lanka, Taiwan, Thailand, Uganda, USA (Florida), Vanuatu, Venezuela, Vietnam, Western Samoa.

**Remarks** — The measurement values (Tables 7 and 8) are very close to that reported in the literature, especially for specimens from Africa. However, the current specimens exhibit *r3*, *z2*, *Z5* and *SgeIV* being shorter compared to those of previous reports.

### Subtribe Proprioseiopsina Chant & McMurtry

Proprioseiopsina Chant & McMurtry 2004: 219.

### Genus *Proprioseiopsis* Muma

*Proprioseiopsis* Muma 1961: 277.

### *Proprioseiopsis mexicanus* (Garman)

*Amblyseiopsis mexicanus* Garman 1958: 75.

*Amblyseius mexicanus*, Moraes & McMurtry 1983: 134.

*Proprioseiopsis mexicanus*, Muma & Denmark 1970: 48; Denmark & Muma 1973: 237; Moraes *et al.* 1986: 118; Kreiter & Moraes 1997: 379; Moraes *et al.* 2004b: 181; Chant & McMurtry 2005a: 13, 2007: 89.

*Amblyseiulus amotus* Zack 1969: 72 (Synonymy according to Denmark & Evans 2011).

*Typhlodromus (Amblyseius) asetus* Chant, 1959: 80 (Synonymy according to Denmark & Evans 2011).

**Table 7.** Comparison of character measurements of adult females of *Amblyseius tamatavensis* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (4) (this study)	Madagascar Holotype (1)	Other African Countries (10)	La Réunion (11)	Thailand (9)	Brazil (7)	Dominican Republic (5)	USA (4)
dsl	367 (348–388)	340	354 (328–390)	320 (295–338)	337 (310–360)	352 (323–379)	337 (320–350)	295 (292–298)
dsw s4	217 (195–232)	250	237 (218–256)	240 (223–288)	213 (190–230)	216 (182–238)	216 (200–228)	183 (180–184)
dsw RI	229 (205–248)	–	–	–	–	–	–	209 (208–210)
j1	32 (30–33)	32	31 (26–40)	30 (25–35)	32 (28–37)	33 (31–36)	28 (25–30)	32 (30–34)
j3	48 (44–52)	54	50 (38–59)	52 (48–55)	52 (49–55)	53 (50–57)	48 (43–50)	53 (52–54)
j4	4 (3–5)	4	5 (5–8)	4 (3–5)	5 (4–5)	5 (4–5)	4 (2–6)	5 (4–6)
j5	4 (3–5)	3	4 (3–5)	3 (3–5)	4 (3–4)	4 (3–4)	3 (2–4)	5 (4–6)
j6	5 (5–6)	3	6 (5–8)	3 (3–5)	5 (4–6)	5 (5–6)	3 (3–4)	5 (4–6)
J2	6 (5–6)	5	7 (5–8)	4 (3–5)	5 (5–7)	6 (5–6)	4 (4–5)	5 (4–6)
J5	7 (7–8)	6	8 (5–10)	6 (4–8)	6 (4–7)	7 (6–7)	5 (4–6)	7 (6–8)
r3	8 (7–9)	15	15 (14–18)	13 (10–15)	14 (9–17)	14 (13–16)	12 (11–13)	14 (12–16)
RI	6 (6–7)	5	8 (6–10)	5 (5–7)	7 (6–8)	8 (7–8)	7 (6–8)	5 (4–6)
s4	85 (83–88)	88	87 (77–96)	85 (80–90)	86 (80–92)	91 (90–92)	83 (76–88)	87 (86–88)
S2	8 (6–9)	5	8 (6–10)	5 (4–8)	7 (6–9)	7 (6–7)	7 (5–8)	5 (4–6)
S4	7 (6–8)	6	8 (6–10)	5 (4–6)	6 (5–9)	6 (6–7)	7 (5–8)	5 (4–6)
S5	5 (5–6)	6	8 (6–10)	5 (5–6)	6 (5–9)	6 (5–6)	5 (4–7)	5 (4–6)
z2	5	6	9 (8–11)	5 (5–6)	7 (6–9)	7 (6–8)	7 (5–10)	5 (4–6)
z4	7 (6–8)	6	8 (6–10)	6 (5–8)	6 (5–9)	8 (7–8)	7 (5–8)	5 (4–6)
z5	4 (3–5)	3	5 (3–6)	4 (3–4)	4 (3–5)	4 (3–4)	5 (4–7)	5 (4–6)
Z1	7 (5–8)	5	7 (5–8)	5 (4–6)	6 (5–7)	6 (6–7)	7 (5–8)	5 (4–6)
Z4	108 (106–110)	115	108 (94–125)	106 (100–113)	107 (86–116)	108 (100–115)	108 (105–113)	117 (114–120)
Z5	228 (215–235)	250	250 (221–272)	221 (203–233)	231 (212–240)	235 (227–246)	233 (225–238)	237 (232–242)
st1-st1	58 (55–60)	–	–	60 (55–63)	–	–	–	–
st2-st2	65 (64–68)	–	72 (67–77)	68 (65–70)	70 (67–75)	69 (67–72)	71 (70–73)	67 (66–68)
st3-st3	74 (70–76)	–	–	76 (70–80)	–	–	–	–
st1-st3	59 (58–60)	–	63 (59–66)	60 (58–63)	60 (58–65)	60 (58–63)	60 (58–63)	63 (60–64)
st4-st4	79 (78–80)	–	–	77 (68–88)	–	–	–	–
gensl	109 (105–115)	–	–	–	–	–	–	–
st5-st5	72 (70–75)	–	73 (69–77)	73 (70–78)	74 (69–80)	73 (70–77)	71 (75–78)	68 (66–72)
gensw post. corn.	74 (72–75)	–	–	–	–	–	–	–
lisl	20	–	–	19 (18–20)	–	–	–	–
lisw	5 (5–6)	–	–	7 (5–8)	–	–	–	–
sisl	12 (12–13)	–	–	10	–	–	–	–
sisw	1	–	–	–	–	–	–	–
vsl	121 (105–138)	120	122 (110–136)	111 (100–115)	117 (110–125)	113 (108–118)	110 (100–118)	105 (104–108)
vsw ZV2	90 (88–92)	100	90 (75–101)	92 (85–100)	89 (79–100)	95 (89–99)	94 (90–100)	–
vsw anus	83 (80–85)	–	84 (69–102)	82 (75–88)	–	85 (80–87)	87 (83–90)	91 (88–94)
JV5	77 (75–80)	84	–	83 (70–93)	–	–	–	79 (78–80)
gv3-gv3	23 (21–25)	–	–	–	–	–	–	19 (18–20)
scl	42 (38–48)	–	23 (18–32)	17 (13–23)	12 (9–15)	17 (16–18)	14 (12–15)	–
scw	3	–	–	–	–	–	–	–
SgeI	38 (36–39)	41	39 (39–40)	41 (39–43)	39 (37–44)	40 (37–42)	38 (35–40)	41 (40–42)
SgeII	35 (35–37)	39	38 (35–42)	39 (38–40)	36 (34–38)	39 (35–41)	37 (35–38)	40 (38–42)
SgeIII	52 (50–55)	61	58 (48–70)	55 (53–58)	55 (50–60)	57 (55–61)	54 (53–58)	53 (52–54)
StiIII	40 (38–42)	41	46 (34–53)	45 (43–48)	46 (42–48)	47 (46–47)	44 (43–45)	43 (42–44)
SgeIV	95 (88–98)	120	106 (85–126)	102 (100–103)	106 (100–120)	103 (100–105)	103 (97–115)	103 (102–104)
StiIV	69 (68–73)	–	69 (54–86)	73 (69–78)	72 (65–77)	77 (68–80)	69 (63–73)	73 (72–74)
StiV	63 (60–68)	–	71 (58–86)	69 (68–70)	66 (62–70)	71 (70–72)	58 (63–75)	71 (70–72)
fdl, No teeth	34 (33–35), 13	–	34 (34–35), 13	34 (30–38), 11	31 (29–35)	30 (27–32)	–	32 (30–33), 11
mdl, No teeth	36 (33–37), 3	–	39 (39–40), 3	37 (28–38), 3	38 (35–41)	37 (36–38)	–	32 (31–33), 4

Sources of measurements – Madagascar Holotype: Blommers (1974a); Other African Countries (Benin 2 ♀♀, Burundi 1 ♀, Cameroon 2 ♀♀, DR Congo 1 ♀, Ghana 2 ♀♀, Rwanda 1 ♀, Uganda 1 ♀): Zannou *et al.* (2007); La Réunion: Kreiter *et al.* (2020c); Thailand: Oliveira *et al.* (2012); Brazil (Bahia): Souza *et al.* (2015); Dominican Republic: Abo-Shnaf *et al.* (2016); USA (Florida): Döker *et al.* (2018); –: not provided.

*Amblyseiulus clausae* Muma 1962: 1 (Synonymy according to Denmark & Evans 2011).  
*Amblyseius kogi* Chant & Hansell 1971: 713 (Synonymy according to Denmark & Evans 2011).  
*Typhlodromus (Amblyseius) putmani* Chant 1959: 91 (Synonymy according to Denmark & Evans 2011).  
*Amblyseeiulus temperellus* Denmark & Muma 1967: 171 (Synonymy according to Denmark & Evans 2011).  
*Amblyseiopsis tropicanus* Garman 1958: 77 (Synonymy according to Denmark & Evans 2011).  
*Amblyseius (Proprioseiopsis) tulearensis* Blommers 1976: 100 (Synonymy according to Denmark & Evans 2011).  
*Amblyseiulus versutus* Zack 1969: 74 (Synonymy according to Denmark & Evans 2011).

*Proprioseiopsis mexicanus* belongs to the *belizensis* species group as genu I lacks macrosetae. It is classified within the *asetus* species subgroup due to its spermatheca having a short, cup-shaped calyx (Chant and McMurtry 2005a). This species is known from all islands of French West Indies (Kreiter and Moraes 1997; Moraes *et al.* 2000, Kreiter *et al.* 2006; Mailloux *et al.* 2010; Kreiter *et al.* 2018c) but was found in large number only during a previous study on companion plant in Guadeloupe (Mailloux *et al.* 2010) and on La Réunion (Le Bellec, unpub. data). This species seems to be very abundant on weeds in the lower vegetation. Phytoseiid mites of the genus *Proprioseiopsis* are mainly found in ground surfaces, humus, litter, soil, moss or on grass (Muma and Denmark 1970; McMurtry *et al.* 2015). Populations of *P. mexicanus* increase when fed *T. urticae* eggs (Megevand *et al.* 1993), and this species has shown potential as a predator of thrips (Kreiter, unpub. data). It is one of the prevailing phytoseiid species in citrus orchards in Alabama (Fadamiro *et al.* 2009). Denmark and Evans (2011) mentioned that the species can be reared on *T. urticae* and *Oligonychus pratensis* (Banks) and is associated with *Bryobia praetiosa* Koch, *Bryobia* sp. and *P. ulmi*. It was also found in association with *Tetranychus evansi* Baker and Pritchard (Furtado *et al.* 2014), although it is mentioned as a poor predator of this species. The biology of this species remains, however, almost unknown. This is the first record of this species from the Ivory Coast.

**Table 8** . Comparison of character measurements of adult males of *Amblyseius tamatavensis*\*s\* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	Ghana (1)	La Réunion (5)	Thailand (1)	Brazil (2)	Characters	Ivory Coast (1) (this study)	Ghana (1)	La Réunion (5)	Thailand (1)	Brazil (2)
dsl	243	273	248 (245–250)	254	259–292	st1-st1	48	–	51 (50–53)	–	–
dsw s4	163	187	169 (150–195)	170	177–179	st2-st2	55	–	57 (55–58)	–	–
dsw RI	170	–	–	–	–	st3-st3	53	–	55 (53–58)	–	–
j1	25	25	24 (21–25)	25	27–29	st4-st4	45	–	46 (43–110)	–	–
j3	40	42	42 (40–45)	40	43–45	st5-st5	38	–	38 (38–48)	–	–
j4	4	5	4 (4–5)	5	4–5	st1-st5	100	–	106 (100–112)	–	–
j5	4	5	3 (3–4)	3	3–4	vsl	103	109	107 (100–113)	112	108–118
j6	5	5	3 (3–4)	4	5	vsw ant. corn.	173	145	140 (130–150)	135	137–150
J2	5	5	4 (4–5)	5	5	vsw anus	75	–	75 (63–90)	–	–
J5	5	5	5 (4–8)	6	7	gv3 –gv3	14	–	–	–	–
r3	10	11	12 (10–13)	11	11–12	JV5	40	–	41 (38–43)	–	–
RI	8	–	5 (5–6)	6	7	SgeI	30	30	31 (30–33)	30	31–32
s4	63	62	68 (58–90)	65	67–69	SgeII	28	28	26 (20–28)	30	30–31
S2	5	6	5 (5–6)	6	6–7	SgeIII	38	41	37 (35–40)	37	38
S4	5	6	4	5	5–6	StiIII	30	31	30 (28–35)	34	33–34
S5	5	6	4	5	5	SgeIV	63	62	63 (60–65)	68	67
z2	5	6	5 (5–6)	6	6	StiIV	45	39	44 (40–48)	50	47–50
z4	6	5	6 (5–6)	6	7	StIV	50	51	55 (53–60)	55	55–56
z5	3	5	5	3	3–4	fdl, No teeth	24, 6	–	24 (23–25), 6	20	–
Z1	5	6	5	5	5–6	mdl, No teeth	24, ?	–	22 (20–25), 1	23	–
Z4	78	86	80 (75–83)	78	82–90	shaft	15	17	28 (25–30)	16	17
Z5	155	164	151 (143–158)	158	172	branch	5	–	–	–	–

Sources of measurements – Brazil (Bahia): Souza *et al.* (2015); Ghana: Zannou *et al.* (2007); La Réunion: Kreiter *et al.* (2020c); Thailand: Oliveira *et al.* (2012); –: not provided.

**Specimens examined** — a single female (1 ♀) collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W) on *Carica papaya* L.

**World distribution** — Australia, Benin, Brazil (Alagoas, Bahia, Distrito Federal Maranhão, Mato Grosso do Sul, Paraná, Paraíba, Pernambuco, Piauí, Rondonia, São Paulo, Tocantins), Colombia, Cuba, Ghana, Guadeloupe Island (France), Hawaii, Kenya, Martinique Island, Mexico, New Zealand, Panama, Peru, Réunion Island (France), Rodrigues Island (Mauritius), USA (Alabama, Florida, Georgia, Iowa, Kansas, Louisiana, Maryland, Minnesota, Missouri, New Jersey, North Carolina, Ohio, Pennsylvania, West Virginia).

**Remarks** — The measurements of the single female specimen of the Ivory Coast (Table 9) fit well those obtained for populations of various countries. The number of setae on genu II of our single specimen is the same than the number given by Moraes *et al.* (2007) with the same formula: 2-2/0,2/0-1. This character may be of interest with some molecular taxonomy in the future, in the framework of an integrative taxonomy, in order to distinguish if we have one species or a species complex.

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

*Amblyseiopsis ovatus* Garman 1958: 78.

*Amblyseiulus ovatus*, Muma 1961: 278.

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

*Typhlodromus ovatus*, Hirschmann 1962: 19.

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

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

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

*Amblyseiulus cannaensis* Muma 1962: 4 (Synonymy according to Denmark & Evans 2011).

*Amblyseius hudsonianus* Chant & Hansell 1971: 723 (Synonymy according to Denmark & Evans 2011).

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

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

Like *P. mexicanus*, *P. ovatus* belongs to the *belizensis* species (see above). As the spermatheca of this 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 large number only during a previous study on companion plants in Guadeloupe (Mailloux *et al.* 2010) and a recent study on La Réunion (Le Bellec, unpub. data). In other habitats, this species seems to be rare. Similar to *P. mexicanus*, *P. ovatus* seem to abundant on weeds in the lower vegetation. Denmark and Evans (2011) indicated that this species is associated with *O. pratensis* and *Brevipalpus* sp. It was also found in association with *T. evansi* (Furtado *et al.* 2014) but is considered a poor predator of that species. Despite this findings, the biology of this species remains largely unknown. This is the first record of this species from the Ivory Coast.

**Specimens examined** — a single female (1 ♀) collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W) on *Carica papaya* L.

**World distribution** — Argentina, Brazil (Alagoas, Bahia, Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso, Minas Gerais, Paraná, Pará, Rio Grande do Sul, São Paulo), Colombia, Costa Rica, Cuba, Ecuador, Egypt, French Guiana (France), Ghana, Grande Comore Island (Comoros), Hawaii, Honduras, Japan, Malaysia, Martinique Island (France), Mayotte Island (France), Mozambique, Peru, Philippines, Puerto Rico, La Réunion Island (France),

Saudi Arabia, Sierra Leone, South Africa, Spain, Sri Lanka, Taiwan, Thailand, Türkiye, USA (Arizona, California, Florida, Kansas, Louisiana, Minnesota, Missouri, New Mexico, Texas,

**Table 9** . Comparison of character measurements of adult females of *Proprioiseiopsis mexicanus* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	Other African Countries (3)	Madagascar (?)	La Réunion (15)	Brazil (2)	Guadeloupe (5)	Martinique (12)	Mexico Holotype (1)
dsl	358	340 (336–344)	340	357 (325–368)	325–350	335 (331–339)	337 (312–369)	355
dsw s4	180	223 (214–230)	230	232 (213–240)	195–215	224 (212–241)	205 (186–257)	216
dsw R1	238	–	–	–	–	–	–	–
j1	18	17 (16–18)	20	24 (23–28)	21–22	19 (15–22)	22 (19–24)	22
j3	33	28 (26–29)	27	31 (28–33)	30–31	30 (24–34)	30 (28–31)	28
j4	5	5 (5–6)	3	5 (5–8)	5	5 (4–7)	5 (3–6)	6
j5	5	4 (3–5)	4	4 (3–5)	5	5 (4–7)	5 (4–6)	5
j6	8	6 (5–6)	4	5 (3–8)	6	5 (5–6)	6 (5–7)	7
J5	9	9 (8–10)	7	9 (8–10)	9–10	9 (9–10)	10 (6–14)	7
r3	15	15 (14–16)	12	14 (13–15)	14–16	11 (9–14)	13 (13–16)	13
R1	?	8 (6–10)	12	10 (8–13)	10–11	9 (8–10)	9 (7–10)	7
s4	58	54 (53–56)	54	63 (58–68)	49–52	59 (56–65)	63 (53–68)	56
S2	10	9 (8–10)	9	9 (8–10)	8–9	9 (8–10)	9 (8–10)	8
S4	11	9 (8–10)	9	9 (8–10)	10	9 (8–10)	9 (8–10)	8
S5	10	10 (10–11)	9	10 (8–10)	10	9 (9–12)	10 (8–11)	8
z2	15	12 (8–16)	13	16 (13–18)	12	12 (11–14)	14 (13–15)	14
z4	10	9 (8–11)	9	11 (8–13)	11–12	10	10 (8–11)	10
z5	5	4 (3–5)	4	4 (3–5)	4	4 (4–5)	5 (4–5)	5
Z1	9	8	9	8 (8–10)	9	6 (5–7)	7 (6–8)	6
Z4	75	69 (62–74)	60	79 (75–83)	64–70	74 (72–76)	78 (66–83)	73
Z5	105	102 (94–112)	104	110 (103–120)	85–93	103 (97–110)	108 (95–131)	98
st1-st1	50	–	–	54 (53–58)	–	–	49 (45–52)	–
st2-st2	65	64	–	65 (63–68)	64–65	68 (65–74)	61 (57–64)	–
st3-st3	46	–	–	74 (73–80)	–	–	69 (62–71)	–
st1-st3	58	60 (59–61)	–	64 (63–75)	57–60	60 (58–62)	58 (55–62)	–
st4-st4	65	–	–	72 (68–75)	–	–	70 (64–74)	–
gensl	130	–	–	–	–	–	–	–
st5-st5	65	65 (61–69)	–	69 (63–73)	65–70	66 (64–72)	62 (58–69)	–
gensw post. corn.	83	–	–	–	–	–	–	–
lisl	24	–	–	27 (23–30)	–	–	23 (21–26)	–
lisw	3	–	–	5 (5–5)	–	–	6 (5–7)	–
sisl	8	–	–	11 (8–15)	–	–	12 (10–16)	–
sisw	1	–	–	–	–	–	–	–
vsl	108	113 (109–115)	115	116 (100–125)	102–108	108 (103–114)	102 (95–120)	112
vsw ant. corn.	98	97 (81–101)	90	86 (78–90)	92–95	92 (86–97)	91 (83–100)	96
vsw anus	80	77 (72–80)	–	66 (60–73)	80	85 (80–89)	75 (68–81)	–
gv3-gv3	15	–	–	–	–	–	–	–
JV5	63	–	62	71 (60–78)	60–65	–	68 (62–76)	–
scl	15	–	–	–	–	–	–	–
scw	10	–	–	–	–	–	–	–
SgeII	24	23 (22–24)	20	24 (23–28)	21–22	23 (20–24)	23 (21–24)	25
SgeIII	23	23 (22–24)	20	24 (23–25)	23	24 (23–25)	26 (21–28)	25
SgeIV	50	49 (45–51)	48	50 (43–55)	45	49 (48–51)	52 (46–55)	54
StiIV	33	27	30	31 (23–35)	26	32 (27–36)	32 (25–35)	32
StiV	55	58	61	61 (55–63)	55	56 (51–60)	59 (53–67)	62
fdl, No teeth	35, 8	29 (28–29), 8	28, 8	31 (30–33), 8	29, 8	33 (29–38)	29 (27–32), 9	–
mdl, No teeth	32, 1	34 (33–34), 1	28, 1	31 (30–33), 1	31, 1	31 (29–32)	33 (31–34), 1	–

Sources of measurements – Other African Countries: Moraes *et al.* (2007); Madagascar (identified as *Amblyseius tullearensis*, synonymized by Denmark & Evans 2011): Blommers (1976); La Réunion: Kreiter *et al.* (2020c); Brazil: Lofego *et al.* (2009); Guadeloupe: Kreiter & Moraes (1997); Martinique: Kreiter *et al.* (2018c); Holotype Mexico: Moraes *et al.* (2007);–: not provided.

Utah, Washington), Venezuela.

**Remarks**— The measurements of the single female specimen from the Ivory Coast (Table 10) fit well those obtained for populations from various countries.

### Tribe Euseiini Chant & McMurtry

Euseiini Chant & McMurtry 2005b: 191.

### 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 & Emmanouel 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. Although it can feed on a wide range of foods, thrips larvae and sweet pepper pollen are less favourable for immature development (Vanthornhout *et al.* 2004, 2005), potentially hindering the establishment of this predator in sweet pepper crops. According to McMurtry *et al.* (2013), *I. degenerans* is classified as a type-IV 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, as well as insect larvae and pollen of many plants (Vantornhout *et al.* 2005). Another study concluded that *I. degenerans* can be considered a suitable biological control candidate based on its preference with *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*, its effectiveness 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). This is the first record of this species from the Ivory Coast.

**Specimens examined** — 34 ♀♀ and 21 ♂♂ collected between 05/IV/2017 and 17/IV/2018 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W) on *Carica papaya* L.

**World distribution** — numerous countries in Northern and Southern Africa (Demite *et al.* 2024), Mediterranean area (Cyprus, Greece, Italy, Portugal), Near East or Middle East (Egypt, Israel, Lebanon, Saudi Arabia, Syria, Türkiye, Yemen), in Europe (Georgia), South America (Brazil) and in North America (USA in California, Florida, Georgia, New Hampshire), Indian Ocean (Grande Comore Island, Comoros).

**Remarks** — The measurements of the 10 ♀♀ + 1 ♂ (Tables 11 & 12) fit well with measurements of specimens reported in the literature.

**Table 10** . Comparison of character measurements of adult females of *Propriozeiopsis ovatus* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	South Africa (3)	Madagascar (?)	Other African Countries (10)	La Réunion (12)	Sri Lanka (1)	Thailand (8)	USA Holotype (1)
dsl	388	358–362	320	348 (324–381)	361 (328–400)	357	329 (320–337)	372
dsw s4	288	294–313	230	270 (227–290)	290 (253–330)	292	268 (225–315)	252
dsw R1	338	–	–	–	–	–	–	–
j1	?	28–30	32	29 (28–32)	31 (30–35)	27	26 (24–29)	28
j3	?	66	61	64 (57–69)	66 (57–75)	61	64 (60–68)	64
j4	5	6	–	6 (4–8)	5 (5–8)	5	6 (5–8)	8
j5	9	6	–	6 (5–8)	5 (4–8)	–	5 (5–6)	8
j6	8	9–13	–	9 (8–10)	10 (8–13)	8	11	12
J5	10	9–13	–	8 (6–10)	8 (8–10)	9	8 (6–9)	8
r3	20	20	–	19 (16–21)	20 (15–25)	20	21 (17–25)	22
R1	13	10	–	10 (9–11)	13 (10–15)	11	10 (10–11)	17
s4	105	105–110	100	99 (91–106)	103 (93–108)	96	100 (98–100)	88
S2	20	19–21	21	20 (14–26)	21 (18–25)	22	21 (14–25)	17
S4	15	9–13	–	14 (9–16)	13 (10–17)	13	16 (12–18)	16
S5	10	9–13	–	10 (9–11)	12 (10–15)	11	12 (10–15)	12
z2	40	43–45	30	39 (32–44)	42 (35–53)	45	34 (31–36)	42
z4	28	28–30	25	25 (19–34)	26 (18–36)	24	22 (20–27)	22
z5	5	6	–	6 (5–8)	5 (5–6)	5	5 (4–6)	8
Z1	13	19–21	–	21 (14–24)	24 (23–25)	20	21 (18–25)	17
Z4	?	122	100	108 (88–120)	107 (103–118)	107	109 (105–115)	101
Z5	100	105–110	110	88 (67–107)	95 (90–103)	96	92 (83–96)	90
st1-st1	53	–	–	–	54 (49–60)	–	–	–
st2-st2	75	–	–	70 (63–77)	76 (70–80)	70	73 (70–77)	–
st3-st3	88	82 (78–84)	–	–	93 (85–98)	–	–	–
st1-st3	55	48–52	–	53 (50–56)	60 (55–63)	47	54 (52–55)	–
st4-st4	91	–	–	–	91 (83–98)	–	–	–
gensl	128	–	–	–	–	–	–	–
st5-st5	92	111–115	102	89 (82–96)	95 (88–103)	93	92 (90–97)	–
gensw ant. corn.	110	–	–	–	–	–	–	–
lisl	25	–	–	–	30 (25–33)	–	–	–
Lisw	6	–	–	–	5 (4–5)	–	–	–
sisl	13	–	–	–	10	–	–	–
sisw	3	–	–	–	–	–	–	–
vsl	115	110–115	93	109 (98–122)	114 (103–133)	115	106 (100–115)	–
vsw ant. corn.	113	110–115	102	108 (104–115)	97 (75–115)	113	112 (109–115)	–
vsw anus	75	–	–	90 (84–104)	87 (75–95)	90	–	–
gv3 – gv3	23	–	–	–	–	–	–	–
JV5	73	89–93	77	–	85 (75–95)	–	78	–
scl	14	24	–	16 (13–19)	22 (18–23)	18	14 (12–17)	22
scw	8	10	–	–	9 (8–10)	–	–	–
SgeIII	26	33	32	28 (25–32)	27 (22–31)	25	27 (24–29)	–
StiIII	23	–	–	–	22 (20–25)	–	24 (22–26)	–
SgeIV	65	66	50	58 (46–66)	61 (55–65)	50	55 (45–61)	55
StiIV	43	45	36	41 (34–47)	40 (35–45)	37	37 (35–40)	43
StIV	93	90	86	84 (77–91)	87 (73–105)	79	88 (83–90)	96
fdl, No teeth	33, 6	33, 5	–	30 (28–32), 5	32 (25–35), 6–7	32, 6–7	30 (29–31)	–
mdl, No teeth	33, 1	35, 1	–	33 (32–34), 1	32 (30–35), 1	30, 1	31 (29–34)	–

**Sources of measurements – South Africa** (identified as *Amblyseius peltatus* , synonymized by Tseng 1983): van der Merwe (1968); **Madagascar** (identified as *Amblyseius peltatus* , synonymized by Tseng 1983): Blommers (1976); **Other African Countries** (Ghana 4♀♀, Kenya 2♀♀, Sierra-Leone 1♀, Zimbabwe 1♀, South Africa 2♀♀): Moraes *et al.* (2007a); **La Réunion**: Kreiter *et al.* (2020c); **Sri Lanka**: Moraes *et al.* (2004b); **Thailand**: Oliveira *et al.* (2012); **USA Holotype**: Moraes & McMurtry (1983); –: not provided.

**Table 11** . Comparisons of character measurements of female specimens of *Iphiseius degenerans* collected in different locations (Localities followed by the number of specimens measured between brackets).

Characters	Ivory Coast (10) (this study)	Algeria (?)	Kenya (66)	Other African Countries (12)	Grande Comore (7)	Spain (?)	Syria (20)	Türkiye (10)
dsl	387 (360–450)	–	360	373 (363–387)	420 (370–462)	374–382	405 (395–420)	383 (378–388)
dsw s4	297 (258–400)	–	345	309 (290–317)	362 (350–375)	284–294	359 (355–360)	263 (260–265)
dsw R1	329 (286–390)	–	–	–	–	–	–	274 (270–278)
j1	25 (20–28)	27	23	24 (14–32)	24 (20–25)	24	27 (25–38)	24 (20–28)
j3	3	–	–	5 (4–8)	5	4	5	4 (3–5)
j4	3	–	–	4 (3–6)	5	4	5	4 (3–5)
j5	3	–	–	4 (3–5)	5	4	5	4 (3–5)
j6	3	–	–	5 (4–6)	5	4	5	4 (3–5)
J2	3 (3–5)	–	–	6 (4–7)	5	4	5	4 (3–5)
J5	3	–	–	6 (5–7)	5	–	5	4 (3–5)
r3	6 (6–7)	–	–	12 (10–13)	14 (13–15)	–	5	4 (3–5)
R1	5	–	–	9 (7–10)	11 (9–13)	–	5	4 (3–5)
s4	8 (8–9)	–	–	9 (7–12)	8	7–8	5	4 (3–5)
S2	5	–	–	8 (6–9)	8	4–5	5	4 (3–5)
S4	5	–	–	9 (6–11)	9 (8–9)	4–7	5	4 (3–5)
S5	5	–	–	9 (7–11)	9 (8–9)	6–7	5	4 (3–5)
z2	3	–	–	5 (4–8)	5	4	5	4 (3–5)
z4	3	–	–	5 (4–9)	5	4	5	4 (3–5)
z5	3	–	–	4 (3–5)	5	4	5	4 (3–5)
Z1	3	–	–	6 (5–8)	5	4–5	5	4 (3–5)
Z4	6 (6–7)	–	–	7 (5–9)	8 (6–9)	4–6	5	4 (3–5)
Z5	13 (11–13)	14	12	14 (11–20)	14 (11–15)	10–12	16 (13–17)	11 (10–13)
st1-st1	55 (53–58)	–	–	–	57 (55–60)	–	60	–
st2-st2	68 (65–72)	–	46	49 (42–52)	54 (53–55)	–	75 (72–78)	69 (65–73)
st3-st3	84 (83–86)	–	64	71 (67–73)	71 (68–75)	–	92 (90–92)	–
st1-st3	52 (50–55)	–	–	–	86 (65–93)	–	60 (60–62)	54 (53–55)
st4-st4	90 (86–95)	–	–	–	96 (90–100)	–	105 (105–107)	–
gensl	149 (135–168)	–	–	–	–	–	–	–
St5-St5	96 (92–100)	–	100	–	96 (90–103)	–	105 (100–110)	101 (98–105)
gensw post. corn.	101 (95–113)	–	–	–	–	–	–	–
lisl	35 (33–38)	–	–	–	36 (30–38)	–	–	–
lisw	5 (5–6)	–	–	–	5 (4–8)	–	–	–
sisl	13 (10–15)	–	–	–	14 (13–18)	–	–	–
sisw	2	–	–	–	–	–	–	–
vsl	26 (23–33)	–	–	–	35 (33–38)	–	–	–
vsw ant. corn.	72 (68–87)	–	74	65 (58–73)	77 (70–83)	–	–	–
asl	61 (58–65)	–	–	–	72 (68–75)	–	–	–
asw anus	74 (72–76)	–	–	72 (68–77)	77 (70–83)	–	–	–
JV5	24 (22–25)	–	14	–	24 (20–25)	–	30 (28–30)	19 (18–20)
gv3-gv3	31 (30–31)	–	–	–	–	–	–	–
scl	37 (35–40)	–	–	–	–	–	30	35 (33–38)
sew	< 1	–	–	–	–	–	–	–
SgeII	20 (18–25)	22	23	–	24 (21–25)	–	–	–
SgeIII	26 (23–28)	33	35	–	30 (28–33)	–	–	–
StiIII	23 (21–25)	27	–	–	25 (25–26)	–	–	–
SgeIV	40 (38–45)	42	30	–	43 (40–50)	38–44	43(40–45)	38 (35–40)
StiIV	30 (28–33)	35	25	–	29 (25–33)	32–36	34 (30–35)	32 (30–33)
StIV	27 (23–30)	37	38	–	32 (30–33)	28–34	30	26 (25–28)
fdl, No teeth	26 (25–28), 8	–	–	26 (24–27), 6–8	27 (25–30), –	–	28, 5–6	27 (25–28), 6
mdl, No teeth	29 (23–30), 2	–	–	31 (27–35), 1–2	25 (23–27), –	–	25, 1	24 (23–25), 1

Sources of measurements – Algeria: Athias-Henriot (1957); Kenya: El-Banhawy & Knapp (2011); Other African Countries (Burundi 1♀, Cameroon 1♀, Ghana 1♀, Kenya 2♀♀, Malawi 2♀♀, Rwanda 1♀, Sierra Leone 2♀♀, Uganda 1♀, Zambia 1♀); Moraes *et al.* (2007); Grande Comore: Kreiter *et al.* 2018b; Spain: Ferragut *et al.* (2010); Syria: Barbar (2013); Türkiye: Döker *et al.* (2018); –: not reported.

**Table 12** . Comparisons of character measurements of male specimens of *Iphiseius degenerans* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (5) (this study)	Kenya (?)	South Africa (?)	Other African Countries (5)	Grande Comore (4)	Türkiye (3)
dsl	344 (338–350)	–	353-376	318 (283–356)	306 (295-312)	353 (350–355)
dsw s4	260 (253–267)	–	282-294	255 (244–261)	232 (238-250)	233 (230–235)
dsw R1	278 (270–288)	–	–	–	–	234 (240–247)
j1	23 (22–24)	–	28-31	20 (11–25)	21 (18-23)	22 (20–24)
j3	3	–	–	5 (4–5)	5	4 (3–5)
j4	3	–	–	3 (3–5)	5	4 (3–5)
j5	3	–	–	3 (3–4)	5	4 (3–5)
j6	3	–	–	4 (4–5)	5	4 (3–5)
J2	3	–	–	4 (3–4)	5	4 (3–5)
J5	4	–	–	5 (4–6)	5	4 (3–5)
r3	6	–	–	11 (10–12)	12 (10-13)	4 (3–5)
R1	5	–	–	7 (6–9)	6 (5-9)	4 (3–5)
s4	3	–	–	7 (6–9)	5	4 (3–5)
S2	3	–	–	6 (5–7)	7	4 (3–5)
S4	3	–	–	6 (5–8)	7	4 (3–5)
S5	3	–	–	7 (5–10)	7	4 (3–5)
z2	3	–	–	4 (3–5)	5	4 (3–5)
z4	3	–	–	4 (3–5)	5	4 (3–5)
z5	3	–	–	3 (3–4)	5	4 (3–5)
Z1	3	–	–	5	5	4 (3–5)
Z4	3	–	–	5 (4–5)	8	4 (3–5)
Z5	15 (13–17)	–	15-19	13 (9–16)	14 (13-15)	10 (9–12)
st1–st1	49 (47–61)	–	–	–	49 (48-50)	–
st2–st2	62 (60–64)	–	–	–	62 (60-63)	–
st3–st3	65 (64–67)	–	–	–	64 (60-68)	–
st4–st4	57 (54–60)	–	–	–	60 (58-63)	–
st5–st5	113 (111–115)	–	–	–	52 (48-58)	–
st1–st5	51 (48–53)	–	–	–	114 (110-118)	–
vsl	72 (70–75)	86	68-73	72 (65–85)	71 (68-73)	–
vsw ant. corn.	169 (154–180)	210	188-195	176 (172–179)	171 (165-175)	–
asl	50 (46–53)	63	49-53	50 (48–53)	51 (48-55)	–
asw	60 (58–63)	75	65-69	66 (63–75)	64 (58-68)	–
JV5	17 (16–18)	–	21-24	–	22 (20-23)	–
gv3–gv3	25	–	–	–	–	–
SgeII	20	–	26-28	21 (18–24)	21 (18-25)	–
SgeIII	26 (25–26)	–	35-38	27 (21–32)	29 (28-30)	–
StiIII	23 (20–25)	–	26-28	21 (20–24)	24 (23-25)	–
SgeIV	35 (33–38)	–	44-48	36 (30–40)	42 (40-43)	36 (34–38)
StiIV	28 (27–29)	–	34-38	28 (27–30)	30 (28-30)	31 (30–33)
StIV	28 (27–29)	–	31-35	28 (26–32)	31 (30-33)	27 (25–28)
fdl, No teeth	23 (20–24), 5	–	24, 4	–	23 (20-25), 4	24 (23–25), 4
mdl, No teeth	21 (19–22), 1	–	24, 1	–	22 (20-23), 1	22 (20–23), 1
shaft	25	22	28	29 (22–45)	24 (23-25)	32 (28–35)

Sources of measurements – Kenya: el-Banhawy & Knapp (2011); South Africa: van der Merwe (1968); Other African Countries (Ghana 1♀, Kenya 1♀, Rwanda 1♀, Sierra Leone 1♀, Uganda 1♀); Moraes *et al.* (2007); Grande Comore: Kreiter *et al.* (2021); Türkiye: Döker *et al.* (2018a);–: not reported.

## Genus *Euseius* Wainstein

*Amblyseius* (*Amblyseius*) section *Euseius*, Wainstein, 1962: 15;  
*Euseius* De Leon, 1967: 86.

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

*Amblyseius* (*Amblyseius*) *fustis* Pritchard & Baker, 1962: 283; Ueckermann & Loots, 1988: 83.  
*Euseius fustis*, Matthyse & Denmark, 1981: 348; Moraes *et al.* 1986: 45, 2004b: 69; Moraes & McMurtry, 1988: 15; Chant & McMurtry 2005b: 215, 2007: 121.

Bruce-Oliver *et al.* (1996) have tested various foods associated with cassava for their effect on the development, fecundity and longevity of *Euseius fustis*, the most common phytoseiid species found on cassava in Africa. *Euseius fustis* developed successfully to adulthood on the spider mite prey species *Mononychellus tanajoa* (Bondar) and *Oligonychus gossypii* (Zacher) and on pollen from maize, castor bean, and cassava. *Euseius fustis* also completed development on water-diluted phloem exudate from cassava, diluted honeydew from the cassava mealybug and on various pollen and prey combinations. When reared on *Tetranychus urticae* Koch prey or free water only, *E. fustis* did not develop after the deutonymphal stage. All larvae held on clean leaf discs on water-soaked cotton died without moulting. Diets of maize plus castor bean pollen and maize pollen plus *M. tanajoa* resulted in the highest rate of development, the highest fecundity and the greatest longevity. Castor bean pollen alone and maize pollen alone produced a higher fecundity and greater longevity than *M. tanajoa* tested alone. A colony of *E. fustis* reared continuously for seven generations on castor bean pollen produced nine times more adult females than a colony of *E. fustis* reared continuously on *M. tanajoa*. No negative effects on the development and fecundity of *E. fustis* were observed after seven generations were reared on pollen. On cassava, the leaf-dwelling *Typhlodromalus manihoti* and *E. fustis* occur on the middle leaves, whereas the apex-inhabiting *T. aripo* migrates from the apex to the top leaves only during the night (Magalhaes *et al.* 2002). We found that differential distributions of these predators allow prey to escape predation by vertical migration to other plant strata. We studied the role of odours in the underlying prey behaviour on predator-free plants placed downwind from plants with predators and prey or with prey only. Prey showed increased vertical migration in response to predator-related odours. Moreover, these responses were specific: when exposed to odours associated with *T. manihoti*, prey migrated upwards, irrespective of the plant stratum where they were placed. Odours associated with *T. aripo* triggered a flexible response: prey on the top leaves migrated downwards, whereas prey on the middle leaves migrated upwards. Odours associated with *E. fustis*, a low-risk predator, did not elicit vertical migration. Further experiments revealed that: (1) prey migrate up or down depending on the stratum where they are located, and (2) prey discrimination among predators is based upon the perception of predator species-specific body odours. Thus, at the scale of a single plant, odour-based enemy specification allows herbivorous mites to escape predation by vertical migration. This is the first record of this species from the Ivory Coast.

**Specimens examined** — a single specimen (1 ♀) collected between 05/IV/2017 and 17/IV/2018 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W) and 107 ♀♀ and 39 ♂♂ collected between 06/IV/2017 au 18/III/2018 in Yamoussoukro, Ngattakro (aasl 158 m, Lat 6°49'39.443"N; Long 5°17'21.635"W) on *Carica papaya* L.

**World distribution** — Benin, Burundi, Cape Verde, Congo, DR Congo, Ghana, Malawi, Nigeria, Rwanda, Tanzania, Uganda, Zimbabwe.

**Remarks** — The measurements of specimens from the Ivory Coast (tables 13 and 14) are very close to those of specimens from other regions of Africa.

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

*Amblyseius* (*Amblyseius*) *lokele* Pritchard & Baker, 1962: 271.

**Table 13** . Comparisons of character measurements of adult females of *Euseius fustis* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (10) (this study)	Cape Verde (5)	DRC (1) Holotype	Kenya1 (3)	Kenya2 (1?)	Tanzania (1)	Other African Countries (2)
dsl	345 (330–358)	341 (326–347)	365	347 (334–360)	310	–	344 (329–360)
dsw s4	221 (205–228)	204 (199–214)	233	222 (216–226)	200	–	221 (206–235)
dsw RI	216 (205–225)	–	–	–	–	–	–
j1	28 (25–30)	27 (26–27)	28	22 (19–26)	23	29	24 (21–27)
j3	15 (13–17)	19 (18–20)	18	18 (17–19)	17	29	15 (14–16)
j4	8 (6–8)	10 (8–11)	13	11 (10–12)	9	15	10
j5	7 (6–8)	11	12	11 (10–12)	9	15	9 (8–10)
j6	8 (8–9)	13 (12–13)	13	14 (12–14)	12	22	11
J2	10 (9–11)	14 (13–15)	14	16 (14–17)	14	22	14 (13–14)
J5	7 (6–8)	8 (7–8)	6	7	8	11	7 (6–8)
r3	13 (11–16)	16 (15–16)	14	15 (12–17)	5	14	14
RI	7 (6–9)	13	12	13 (12–14)	12	15	11
s4	16 (15–17)	23 (22–24)	18	21 (17–24)	19	31	18 (16–21)
S2	12 (10–13)	16 (13–17)	12	14 (12–17)	15	25	12 (11–13)
S4	13 (11–15)	12 (11–13)	12	13 (10–14)	13	24	11
S5	11 (9–13)	14 (13–17)	12	12 (10–14)	13	26	11
z2	8 (8–9)	15 (14–16)	14	14 (12–17)	14	22	11 (10–13)
z4	10 (9–11)	13 (12–13)	14	14 (12–17)	14	22	12 (11–13)
z5	8 (6–9)	12 (11–13)	13	11 (10–12)	12	18	10
Z1	8 (8–9)	13 (13–14)	14	11 (10–12)	14	22	10 (10–11)
Z4	11 (10–12)	14 (12–15)	13	14 (12–17)	14	26	12 (11–13)
Z5	44 (41–48)	46 (42–49)	47	45 (43–48)	42	48	41 (37–45)
st1-st1	57 (54–58)	–	–	–	–	–	–
st2-st2	65 (63–68)	–	72	70 (67–72)	65	–	68 (67–69)
st3-st3	77 (75–80)	–	–	–	–	–	–
st1-st3	58 (55–60)	–	64	62 (60–65)	62	–	62
st4-st4	92 (86–104)	–	–	–	–	–	–
gensl	121 (115–125)	–	–	–	–	–	–
st5-st5	75 (73–78)	–	86	80 (77–84)	82	–	76 (74–78)
gensw post. corn.	86 (84–88)	–	–	–	–	–	–
lisl	25 (23–26)	–	–	–	–	–	–
lisw	5	–	–	–	–	–	–
sisl	7 (6–8)	–	–	–	–	–	–
sisw	< 1	–	–	–	–	–	–
vsl	95 (93–98)	–	–	100 (98–101)	90	–	100 (96–104)
vsw ZV2	53 (50–55)	–	48	48 (46–50)	62	–	50
vsw anus	67 (64–68)	–	62	70 (67–72)	–	–	60 (58–62)
gv3 – gv3	32 (30–33)	–	–	–	–	–	–
JV5	32 (28–36)	–	–	–	28	–	–
SgeI	33 (31–34)	–	28	20 (19–22)	–	22	18 (18–19)
scl	6	–	–	56 (48–65)	40	–	30 (29–32)
scw	23 (21–25)	–	–	–	–	–	–
SgeII	22 (20–23)	–	24	–	22	20	21 (19–22)
SgeIII	29 (26–31)	–	28	29 (26–31)	25	20	27 (22–32)
StiIII	19 (18–20)	–	19	19	20	14	18 (18–19)
SgeIV	44 (41–47)	–	48	41 (38–43)	45	42	39 (34–45)
StiIV	30 (28–33)	–	28	24	18	23	24 (22–26)
StiV	41 (40–43)	–	42	43 (41–46)	48	28	41 (37–45)
fdl, No teeth	25 (24–25), 8	–	–	24, –	–, 3	–	–
mdl, No teeth	23 (22–24), 2	–	–	24, –	–, 2	–	–

Sources of measurements –Cape Verde: Ferragut & Baumann (2021); DRC (Democratic Republic of Congo) Holotype: Pritchard & Baker (1962) in Moraes & McMurtry (1988); Kenya1: Moraes & McMurtry (1988); Kenya2: El-Banhawy & Knapp (2011); Tanzania: El-Banhawy & Abou-Awad (1990); Other African Countries (Uganda 1♀, RDC: 1♀): Moraes *et al.* (2001); –: not provided.

*Euseius lokele*, Moraes *et al.* 1986: 47, 1989a: 99, 1989b: 85, 2004b: 72; Chant & McMurtry 2005b: 215, 2007: 121.

*Euseius lokele* was found on *Solanum aethiopicum* in association with tetranychid and tarsonemid mites in southern Benin (Moraes *et al.* 2001). But, its biology is unknown. This is the first record of this species from the Ivory Coast.

**Specimens examined** — a single specimen (1 ♀) collected between 05/IV/2017 and 17/IV/2018 in Toumodi, Yobouekro (aasl 184 m, Lat 6°31'19.196"N, Long 5°6'41.36"W) and 12 ♀♀ and 6 ♂♂ collected between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N, Long 3°55'00.60"W) on *Carica papaya* L.

**World distribution** — Benin, Burundi, Cameroon, DR Congo, Ghana, Kenya, Nigeria, Sierra Leone, Uganda.

**Remarks** — The measurements of specimens from the Ivory Coast (tables 15 and 16) are very close to those of specimens from other regions of Africa.

***Euseius nyalensis* (El-Badry)**

*Amblyseius nyalensis* El-Badry 1968: 322.

*Euseius nyalensis*, Moraes *et al.* 1986: 47, 2001: 40, 2004b: 72; Chant & McMurtry 2005b: 215, 2007: 121.

*Euseius neotutsi* Ueckermann 1992: 149 (synonymy according to Moraes *et al.* 2001).

The biology of this species remains unknown and this is its first record for the Ivory Coast.

**Specimens examined** — 7 ♀♀ and 1 ♂ collected during this study, between 06/IV/2017 and 18/III/2018 in Yamoussoukro, Ngattakro (aasl 158 m, Lat 6°49'39.443"N; Long 5°17'21.635"W) on *Carica papaya* L

**World distribution** — Benin, Cameroon, Cape Verde, Ghana, Sierra Leone, Sudan, Yemen.

**Table 14** . Comparisons of character measurements of male specimens of *Euseius fustis* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (5) (this study)	Cape Verde (6)	Characters	Ivory Coast (5) (this study)	Cape Verde (6)
dsl	252 (248–258)	250 (242–257)	st1–st1	48 (46–50)	–
dsw s4	173 (163–180)	175 (169–182)	st2–st2	54 (53–56)	74 (72–76)
dsw RI	173 (163–180)	–	st3–st3	59 (58–61)	–
j1	22 (20–25)	22 (20–25)	st4–st4	46 (45–48)	–
j3	14 (13–15)	17 (16–17)	st5–st5	38 (36–39)	–
j4	5 (5–6)	12 (11–13)	st1–st5	96 (95–98)	111 (109–112)
j5	5 (5–6)	11 (10–12)	vsl	103 (98–108)	49 (47–51)
j6	6 (6–7)	12 (11–13)	vsw	136 (133–138)	137 (128–146)
J2	8 (8–9)	12 (11–14)	vsw anus	54 (53–58)	–
J5	5 (5–6)	8 (7–8)	gv3–gv3	22 (21–23)	22 (20–23)
r3	11 (10–13)	16 (15–18)	JV5	24 (23–27)	26 (24–28)
RI	7 (6–8)	13 (11–16)	SgeI	19 (18–21)	22 (21–23)
s4	14 (13–16)	23 (20–25)	SgeII	20 (18–22)	20 (20–21)
S2	8	15 (13–17)	SgeIII	26 (24–28)	26(25–28)
S4	8 (8–9)	13 (12–15)	StiIII	18 (18–19)	17 (16–18)
S5	9 (8–10)	12 (11–13)	SgeIV	38 (36–39)	34 (33–34)
z2	7 (6–8)	14 (13–15)	StiIV	25 (24–27)	23 (22–23)
z4	7	12 (11–14)	StIV	33 (31–35)	34 (33–35)
z5	6 (6–8)	10 (9–11)	fdI, No teeth	20 (19–22), 6	22 (21–22), 4 or 5
Z1	6 (5–7)	10 (9–11)	mdl, No teeth	19 (18–20), 1	21 (20–21), 1
Z4	8	13 (11–14)	shaft	20 (20–21)	–
Z5	37 (36–39)	39 (36–41)	Branch	6 (5–6)	–

Sources of measurements –Cape Verde: Ferragut & Baumann (2021); –: not reported.

**Table 15** . Character measurements of adult females of *Euseius lokele* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (13) (this study)	DRC (1) Holotype	DRC (1) Paratype	Kenya1 (5)	Kenya2 (1)	Kenya3 (1?)	Other African Countries (21)
<b>dsl</b>	<b>366 (325–400)</b>	320	–	346 (334–355)	–	310	323 (291–408)
<b>dsw s4</b>	<b>237 (215–260)</b>	220	–	233 (218–240)	–	210	219 (200–274)
<b>dsw R1</b>	<b>234 (212–250)</b>	–	–	–	–	–	–
<b>j1</b>	<b>30 (24–35)</b>	33	30	29 (26–31)	23	27	27 (26–35)
<b>j3</b>	<b>13 (10–16)</b>	8	22	17 (10–22)	17	16	11 (10–24)
<b>j4</b>	<b>8 (6–10)</b>	8	9	9 (7–12)	9	10	6 (6–11)
<b>j5</b>	<b>9 (7–10)</b>	8	–	10 (7–12)	–	10	6 (6–11)
<b>j6</b>	<b>12 (9–14)</b>	8	–	11 (10–12)	–	10	8 (6–14)
<b>J2</b>	<b>13 (11–15)</b>	9	12	12 (10–12)	13	12	10 (8–16)
<b>J5</b>	<b>7 (6–8)</b>	6	–	7 (5–10)	–	7	6 (5–8)
<b>r3</b>	<b>14 (11–20)</b>	16	–	15 (12–17)	–	17	14 (11–22)
<b>R1</b>	<b>12 (10–13)</b>	–	–	12	–	10	10 (8–13)
<b>s4</b>	<b>17 (13–24)</b>	13	20	21 (14–26)	28	25	14 (11–29)
<b>S2</b>	<b>13 (12–15)</b>	11	–	13 (12–14)	–	14	12 (10–16)
<b>S4</b>	<b>13 (11–15)</b>	11	12	12 (10–14)	13	12	10 (8–18)
<b>S5</b>	<b>12 (11–14)</b>	11	–	12 (10–14)	–	12	10 (7–16)
<b>z2</b>	<b>11 (8–14)</b>	9	13	12 (10–14)	12	12	10 (6–16)
<b>z4</b>	<b>12 (9–15)</b>	8	–	13 (10–17)	–	14	10 (8–16)
<b>z5</b>	<b>10 (8–14)</b>	8	–	10 (7–12)	–	10	8 (6–11)
<b>Z1</b>	<b>11 (9–14)</b>	10	–	11 (10–12)	–	12	11 (8–14)
<b>Z4</b>	<b>12 (10–16)</b>	8	–	12 (10–14)	–	13	11 (8–16)
<b>Z5</b>	<b>61 (55–65)</b>	47	61	57 (53–58)	60	55	51 (48–70)
<b>st1-st1</b>	<b>63 (60–65)</b>	–	–	–	–	–	–
<b>st2-st2</b>	<b>73 (69–75)</b>	66	–	72 (65–77)	–	70	68 (64–80)
<b>st3-st3</b>	<b>80 (76–82)</b>	–	–	–	–	–	–
<b>st1-st3</b>	<b>60 (55–63)</b>	53	–	61 (55–62)	–	60	57 (40–67)
<b>st4-st4</b>	<b>114 (110–118)</b>	–	–	–	–	–	–
<b>gensl</b>	<b>124 (113–133)</b>	–	–	–	–	–	–
<b>st5-st5</b>	<b>75 (73–78)</b>	65	–	78 (77–79)	–	80	71 (67–86)
<b>gensw post. corn.</b>	<b>86 (85–88)</b>	–	–	–	–	–	–
<b>lisl</b>	<b>25 (23–28)</b>	–	–	–	–	–	–
<b>lisw</b>	<b>4 (3–4)</b>	–	–	–	–	–	–
<b>sisl</b>	<b>12 (10–14)</b>	–	–	–	–	–	–
<b>sisw</b>	<b>1</b>	–	–	–	–	–	–
<b>vsl</b>	<b>99 (95–105)</b>	88	–	91 (86–96)	–	92	91 (88–120)
<b>vsw ant. corn.</b>	<b>53 (50–56)</b>	44	–	48 (48–50)	–	–	50 (40–58)
<b>vsw anus</b>	<b>72 (68–76)</b>	65	–	70 (65–72)	–	60	72 (62–82)
<b>gv3 – gv3</b>	<b>28 (26–30)</b>	–	–	–	–	–	–
<b>JV5</b>	<b>45 (43–57)</b>	–	42	–	43	–	–
<b>Sc1</b>	<b>18 (16–20)</b>	16	–	18 (17–22)	–	18	14 (11–19)
<b>Scw</b>	<b>8 (7–8)</b>	–	–	–	–	7	–
<b>SgeI</b>	–	19	–	25 (22–29)	–	–	–
<b>SgeII</b>	<b>30 (26–33)</b>	28	–	32 (29–36)	–	32	28 (24–34)
<b>SgeIII</b>	<b>42 (40–45)</b>	33	–	37 (36–41)	–	37	35 (32–42)
<b>StIII</b>	<b>29 (26–32)</b>	24	–	32 (31–34)	–	–	26 (22–34)
<b>SgeIV</b>	<b>62 (58–68)</b>	58	–	66 (60–74)	–	60	54 (50–70)
<b>StIV</b>	<b>41 (36–45)</b>	39	–	42 (41–43)	–	38	34 (30–53)
<b>StIV</b>	<b>73 (69–77)</b>	66	–	76 (67–82)	–	70	68 (62–86)
<b>fdl, No teeth</b>	<b>25 (24–29), 6</b>	–	–	29	–	–, 4	–
<b>mdl, No teeth</b>	<b>25 (23–26), 2</b>	–	–	26	–	–, 2	–

Sources of measurements – DRC (Democratic Republic of Congo) Holotype: Pritchard & Baker (1962) in Moraes *et al.* (1989); DRC Paratype: Pritchard & Baker (1962) in Swirski & Ragusa (1978); Kenya1: Moraes *et al.* (1989a); Kenya2: Swirski & Ragusa (1978); Kenya3: El-Banhawy & Knapp (2011); Other African Countries (Benin: 1♀, Burundi: 2♀♀, Cameroon: 1♀, Ghana: 2♀♀, Kenya: 7♀♀, Sierra Leone: 2♀♀, Uganda: 3♀♀, Zaire: 3♀♀): Moraes *et al.* (2001); –: not provided.

**Remarks** — The measurements of specimens from the Ivory Coast (Tables 17 and 18) are very close to those of specimens from other regions.

**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) on Madagascar. Like all *Euseius* species, this species belongs to the type IV (pollinophagous generalist predators) of McMurtry and Croft (1997) and McMurtry *et al.* (2013). The species has 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. Although 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. It is one of the most common species on La Réunion Island (Kreiter *et al.* 2020c). This is the first record of this species from the Ivory Coast.

**Specimens examined** — a single specimen (1 ♂) collected during this study between 14/III/2017 and 10/III/2018 in Abidjan, Anyama Ahoue (aasl 42 m, Lat 5°26'00.87"N; Long 3°55'00.60"W) on *Carica papaya* L.

**World distribution** — Guadeloupe Island (France), Madagascar Island, Marie-Galante Island (France), Martinique Island (France), Mauritius Island, Mayotte Island (France), Papua New Guinea, La Réunion Island (France), Rodrigues Island (Mauritius), Seychelles Archipelago, Vietnam.

**Remarks** — The measurements of specimens from the Ivory Coast (table 19) are very close to those of specimens from other regions, with slightly longer dimensions, especially for

**Table 16** . Comparisons of character measurements of male specimens of *Euseius lokele* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (5) (this study)	Characters	Ivory Coast (5) (this study)
dsl	281 (275–288)	st1–st1	54 (53–55)
dsw s4	209 (203–218)	st2–st2	63 (60–65)
dsw RI	208 (203–216)	st3–st3	60 (59–60)
j1	27 (25–28)	st4–st4	48 (47–49)
j3	12 (11–13)	st5–st5	38 (37–39)
j4	8 (8–9)	st1–st5	108 (107–110)
j5	8 (8–9)	vsl	110 (108–113)
j6	10 (8–11)	vsw ant. corn.	157 (153–160)
J2	13 (12–13)	Vsw anus	61 (55–65)
J5	6 (5–6)	gv3-gv3	26 (25–27)
r3	17 (16–18)	JV5	26 (25–28)
RI	12 (10–13)	SgeII	24 (23–25)
s4	22 (20–24)	SgeIII	29 (28–30)
S2	15 (14–16)	StiIII	28 (27–28)
S4	13 (12–13)	SgeIV	47 (45–50)
S5	12 (11–13)	StiIV	34 (34–35)
z2	12 (11–13)	StIV	57 (53–60)
z4	13 (12–13)	fdl, teeth	21 (20–22)
z5	10 (9–11)	mdl, teeth	23 (23–24)
Z1	12 (12–13)	shaft	21 (20–22)
Z4	13 (12–14)	branch	5 (5–6)
Z5	52 (50–53)		

**Table 17.** Comparison of character measurements of adult females of *Euseius nyalensis* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (7) (this study)	Cape Verde (6)	Senegal (3)	Sudan (1) Holotype	Other African Countries (24)	Yemen (3)
<b>dsl</b>	<b>347 (324–393)</b>	343 (330–355)	339 (332–340)	330	339 (307–387)	324–378
<b>dsw s4</b>	<b>246 (225–258)</b>	214 (205–227)	226 (215–235)	145	229 (208–249)	211–221
<b>dsw R1</b>	<b>230 (218–235)</b>	–	–	–	–	–
<b>j1</b>	<b>37 (35–39)</b>	39 (37–42)	35 (33–35)	37	38 (34–48)	33–35
<b>j3</b>	<b>45 (43–48)</b>	52 (48–57)	43 (38–48)	45	47 (38–58)	46–47
<b>j4</b>	<b>24 (18–28)</b>	37 (32–46)	43 (38–50)	37	32 (16–46)	28–35
<b>j5</b>	<b>27 (25–28)</b>	45 (40–52)	45 (43–48)	45	38 (16–56)	38–41
<b>j6</b>	<b>59 (56–63)</b>	67 (64–71)	62 (62–65)	62	58 (43–67)	54–59
<b>J2</b>	<b>59 (53–63)</b>	62 (59–67)	63 (62–65)	60	58 (43–70)	54–57
<b>J5</b>	<b>4 (4–5)</b>	4 (4–6)	7 (5–8)	–	5 (3–8)	4
<b>r3</b>	<b>25 (24–26)</b>	34 (32–38)	27 (25–29)	–	27 (16–35)	22–24
<b>R1</b>	<b>20 (18–21)</b>	21 (20–23)	18 (17–20)	–	19 (14–24)	19
<b>s4</b>	<b>81 (80–83)</b>	86 (81–90)	74 (62–85)	75	81 (69–91)	71–72
<b>S2</b>	<b>62 (48–65)</b>	62 (56–67)	59 (48–65)	60	59 (46–72)	54–58
<b>S4</b>	<b>49 (46–50)</b>	49 (46–53)	49 (45–55)	47	46 (35–59)	38–44
<b>S5</b>	<b>48 (45–50)</b>	52 (50–55)	49 (47–50)	42	46(48–59)	38–41
<b>z2</b>	<b>37 (35–39)</b>	42 (40–46)	37 (35–41)	37	39 (30–48)	38
<b>z4</b>	<b>56 (55–59)</b>	63 (60–69)	55 (53–60)	52	56 (46–67)	52–54
<b>z5</b>	<b>14 (13–15)</b>	63 (60–69)	18 (14–23)	17	17 (10–35)	13–14
<b>Z1</b>	<b>58 (55–60)</b>	63 (61–68)	60 (55–64)	55	55 (35–64)	54–55
<b>Z4</b>	<b>58 (56–60)</b>	57 (55–61)	61 (58–65)	57	57 (48–67)	47–57
<b>Z5</b>	<b>85 (78–90)</b>	79 (76–81)	82 (80–83)	75	80 (70–91)	71–72
<b>st1–st1</b>	<b>61 (60–61)</b>	–	–	–	–	–
<b>st2–st2</b>	<b>66 (63–70)</b>	–	70 (67–75)	–	70 (62–80)	91–101
<b>st3–st3</b>	<b>86 (83–88)</b>	–	–	–	–	–
<b>st1–st3</b>	<b>66 (65–68)</b>	–	65 (64–67)	–	63 (56–70)	211–221
<b>st4–st4</b>	<b>97 (93–105)</b>	–	–	–	–	–
<b>gensl</b>	<b>128 (125–133)</b>	–	–	–	–	–
<b>gensw st5</b>	<b>86 (83–90)</b>	–	83 (81–87)	–	83 (72–94)	88–98
<b>gensw post. corn.</b>	<b>106 (103–113)</b>	–	–	–	–	–
<b>Lisl</b>	<b>23 (20–28)</b>	–	–	–	–	–
<b>Lisw</b>	<b>2 (2–3)</b>	–	–	–	–	–
<b>Sisl</b>	<b>10</b>	–	–	–	–	–
<b>Sisw</b>	<b>&lt; 1</b>	–	–	–	–	–
<b>vsl</b>	<b>104 (90–113)</b>	–	106 (102–110)	–	107 (96–123)	95–113
<b>vsw post. corn.</b>	<b>52 (50–55)</b>	–	64 (63–65)	–	53 (46–64)	–
<b>vsw anus</b>	<b>80 (76–83)</b>	–	74 (72–76)	–	74 (62–86)	69–79
<b>gv3–gv3</b>	<b>31 (30–33)</b>	–	–	–	–	–
<b>JV5</b>	<b>48 (45–50)</b>	–	–	–	–	41–47
<b>scl</b>	<b>30 (25–35)</b>	22 (20–22)	23 (20–25)	–	21 (11–32)	–
<b>scw</b>	<b>2 (1–2)</b>	–	–	–	–	–
<b>SgeI</b>	<b>35 (30–38)</b>	–	31 (30–32)	30	33 (30–37)	32–33
<b>SgeII</b>	<b>32 (31–35)</b>	33 (32–35)	32 (30–33)	27	31 (26–32)	30–32
<b>SgeIII</b>	<b>44 (40–47)</b>	42 (40–44)	41 (40–42)	35	42 (38–46)	41
<b>StiIII</b>	<b>31 (30–33)</b>	30 (29–30)	27 (25–28)	30	29 (24–32)	28–30
<b>SgeIV</b>	<b>61 (60–63)</b>	63 (63–64)	59 (57–60)	–	60 (50–69)	59–60
<b>StiIV</b>	<b>41 (40–42)</b>	44 (43–45)	36 (35–37)	45	40 (34–48)	38–39
<b>StIV</b>	<b>79 (76–80)</b>	75 (74–76)	71 (70–73)	65	67 (48–77)	66–67
<b>fdl, No teeth</b>	<b>26 (25–28)</b>	–, 5	–	–	–	–
<b>mdl, No teeth</b>	<b>24 (23–25)</b>	–, 1	–	–	–	–

Sources of measurements –Cape Verde: Ferragut & Baumann (2021); Senegal: Kade *et al.* (2011); Sudan Holotype: El-Badry (1968) in Ueckermann & Loots (1988); Yemen: Ueckermann & Loots (1988); Other African Countries (Benin: 13♀♀, Cameroon: 5♀♀, Ghana: 1♀, Sierra Leone: 5♀♀); Moraes *et al.* (2001); –: not provided.

**Table 18** . Comparisons of character measurements of male specimens of *Euseius nyalensis* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	Cape Verde (6)	Sudan (1)	Yemen (1)	Characters	Ivory Coast (1) (this study)	Cape Verde (6)	Sudan (1)	Yemen (1)
dsl	250	239–262	263	261	st1–st1	54	–	–	–
dsw s4	175	139–165	165	180	st2–st2	65	82	–	110
dsw RI	200	–	–	–	st3–st3	65	–	–	–
j1	30	39–43	–	28	st4–st4	55	–	–	–
j3	35	39–43	–	38	st5–st5	40	–	–	–
j4	10	15–23	–	23	st1–st5	123	131	–	128
j5	13	23–26	–	26	vsl	93	92	–	98
j6	33	39–43	–	41	vsw ant. corn.	163	146	–	161
J2	28	32–34	–	38	Vsw anus	63	–	–	–
J5	3	5–6	–	3	gv3–gv3	24	–	–	–
r3	20	23–26	–	21	JV5	30	31	–	–
RI	10	9–15	–	13	SgeI	30	–	–	32
s4	55	–	–	55	SgeII	25	28–31	–	30
S2	40	39–42	–	45	SgeIII	30	34–39	–	37
S4	28	28–30	–	27	StiIII	28	26–28	–	25
S5	28	31–39	–	28	SgeIV	50	48–54	–	50
z2	28	35–37	–	30	StiIV	38	39–40	–	33
z4	28	46–54	–	43	StIV	58	48–54	–	60
z5	9	12–15	–	11	fdl, teeth	23	–	–	–
Z1	28	39–40	–	41	mdl, teeth	20	–	–	–
Z4	28	31–39	–	38	shaft	23	–	–	–
Z5	55	54–57	–	50	Branch	5	–	–	–

Sources of measurements – Cape Verde: Ueckermann (1992) but identified as *E. neotusi*; Sudan: El-Badry (1968); Yemen: Ueckermann (1996); –: not reported.

the macrosetae, except for setae *j1*, which are shorter. The morphological and morphometric characters, as well as all measurements of our single male specimen fit well with measurements reported by Kreiter *et al.* (2020c).

This species was recently reported from Rodrigues and Mauritius Islands (Kreiter and Abo-Shnaf 2020a, b), Mayotte Island (Kreiter *et al.* 2020a), Vietnam (Kreiter *et al.* 2020b), and Grande Comore (Kreiter *et al.* 2021), all located in the Indian Ocean. But, *E. ovaloides* seems not reported from other African countries. This species was the second most collected species in a study conducted in Mauritius, compared to *A. herbicolus* (Kreiter & Abo-Shnaf 2020b) and it was also very common on La Réunion (Kreiter *et al.* 2020c) but less common in Mayotte and Grande Comore Islands (Kreiter *et al.* 2020a, 2021). In our study, only one specimen was collected.

## Conclusion

Before this paper, the fauna of Phytoseiidae of Ivory Coast was limited to five recorded species all belonging to the subfamily Amblyseiinae.

This paper reports on the results of a survey conducted recently (2017–2018) and adds 11 newly recorded species. The total number of Phytoseiidae species for the Ivory Coast now reaches to 16, all belonging to the subfamily Amblyseiinae.

Among these 16 species, several are already well-known as biological control agents (BCA). This must be underlined when new regulations on the importation of macro-organisms are proposed. The knowledge of the biodiversity, especially regarding efficient biological control agents, is of considerable importance not only for fundamental knowledge or conversation purposes but also for agricultural and economic reasons.

**Table 19** . Comparison of character measurements of an adult male of *Euseius ovaloides* collected in different locations (localities followed by the number of specimens measured).

Characters	Ivory Coast (1) (this study)	Guadeloupe (2)	La Réunion (4)	Papua-New Guinea (3)	Characters	Ivory Coast (1) (this study)	Guadeloupe (2)	La Réunion (4)	Papua-New Guinea (3)
<b>dsl</b>	<b>250</b>	254–259	243–268	247	<b>st1–st1</b>	<b>50</b>	–	–	–
<b>dsw s4</b>	<b>167</b>	186–189	190–214	157	<b>st2–st2</b>	<b>60</b>	–	–	–
<b>dsw RI</b>	<b>175</b>	–	–	–	<b>st3–st3</b>	<b>55</b>	–	–	–
<b>j1</b>	<b>23</b>	30–31	25–32	27	<b>st4–st4</b>	<b>45</b>	–	–	–
<b>j3</b>	<b>10</b>	8–9	9	8–9	<b>st5–st5</b>	<b>33</b>	–	–	–
<b>j4</b>	<b>10</b>	5–6	6	6–8	<b>st1–st5</b>	<b>105</b>	–	–	–
<b>j5</b>	<b>8</b>	5–6	6	6–8	<b>vsl</b>	<b>90</b>	88–90	85–101	90
<b>j6</b>	<b>10</b>	6	6	6–8	<b>vsw ant. corn.</b>	<b>143</b>	130–136	126–154	150
<b>J2</b>	<b>10</b>	6	6–8	6–8	<b>vsw anus</b>	<b>53</b>	–	–	–
<b>J5</b>	<b>5</b>	5	5–6	4	<b>gv3-gv3</b>	<b>18</b>	–	–	19
<b>r3</b>	<b>12</b>	9–11	9	9	<b>JV5</b>	<b>15</b>	–	–	–
<b>RI</b>	<b>10</b>	6	06-août	7	<b>SgeI</b>	<b>20</b>	13–19	–	–
<b>s4</b>	<b>18</b>	11–12	11–13	12	<b>SgeII</b>	<b>20</b>	13–14	–	–
<b>S2</b>	<b>10</b>	6–8	6	7–8	<b>SgeIII</b>	<b>25</b>	22–24	–	22
<b>S4</b>	<b>10</b>	6	6	7–8	<b>StIII</b>	<b>25</b>	17	–	–
<b>S5</b>	<b>9</b>	6	6	7–8	<b>SgeIV</b>	<b>40</b>	32–33	–	29
<b>z2</b>	<b>10</b>	7–9	06-sept	8–9	<b>StIV</b>	<b>33</b>	30–31	–	27
<b>z4</b>	<b>10</b>	6–8	6	8–9	<b>StIV</b>	<b>53</b>	47–50	–	44
<b>z5</b>	<b>8</b>	4–6	6	6	<b>fdl, No teeth</b>	<b>20</b>	–	–	–
<b>Z1</b>	<b>10</b>	6	6	7–8	<b>mdl, No teeth</b>	<b>20</b>	–	–	–
<b>Z4</b>	<b>11</b>	6	6	6	<b>shaft</b>	<b>23</b>	–	22–25	18
<b>Z5</b>	<b>45</b>	40	35–41	38	<b>branch</b>	<b>13</b>	–	–	–

Sources of measurements – Guadeloupe: Moraes *et al.* (2000); La Réunion: Kreiter *et al.* (2020c); Papua-New-Guinea: Schicha & Gutierrez (1985); –: not provided.

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