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A new species of the genus *Euseius* Wainstein (Acari, Phytoseiidae) from Republic of Congo

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Abstract

The purpose of this study was to describe a new species, *Euseius congolensis* ***sp.* nov**. from several adult females belonging to the genus *Euseius*, that were collected from three host plants: cassava, okra, and chilli in the Republic of the Congo.

Keywords: *Euseius congolensis* sp. nov., morphometric measurements., traditional taxonomy, vegetable crops

Introduction

Phytoseiidae mites are well known worldwide for their ability to control the damage caused in vegetable crops by pest mite infestations (McMurtry and Croft 1997). It is also documented that the success of biological control programs greatly depends on the reliability of the specific taxonomic expertise involved in the program. Indeed, each species has its own bio-ecological characteristics, including predator–prey relations, which determine their effectiveness in biological control programs (Mc Murtry et al. 2013). According to the latest international catalogue, 55 species belonging to the family Phytoseiidae have been identified from Central Africa (De Moraes. et al. 2004). Very little scientific data exists on the biodiversity of Phytoseiidae species present in

the Republic of Congo (RC). The first study conducted in the RC (Gutierrez & Bonato 1994) reported five species of predatory mites: *E. fustis* Pritchard and Baker 1962 and *Typhlodromalus saltus* Denmark and Mathysse 1981 on cassava, *E. neodossei* Ueckermann and Oliveira 2001 and *E. baetae* Meyer and Rodriguez 1966 on *Coffea* sp., and *Amblyseius sundi* Pritchard and Baker 1962 on an unidentified plant species (Gutierrez & Bonato 1994). Both *E. fustis* and *A. sundi* have already been reported from the Democratic Republic of the Congo on *Manihot esculenta* and *Ficus polita,* respectively (reference). *Euseius fustis* has already been recorded in Uganda on *M. esculenta*; *E. neodossei* has already been recorded in Kenya on *Cassia* sp. and in Burundi on *Gmelina* sp. (Gutierrez & Bonato 1994). The aim of this study was to describe a new species whose taxonomic status was validated in a previous study using integrative taxonomy (Belle Mbou Okassa et al. 2020). . This study has shown that morphological differences existed between the *Euseius* **sp. nov**. and both *E. neodossei* and *E. fustis,* and that both mitochondrial DNA fragments considered (i.e., 12S rRNA and ITSS) showed a clear delineation between *Euseius* **sp. nov.** and *E. fustis* Individuals of *Euseius* sp. nov. belonging to the tribe Euseiini were collected from three host plants : cassava, chilli, and okra in RC. This tribe is the third most diverse with 271 species, the genus (*Euseius* De Leon) accounting for 73% of the species (Santos and Tixier 2018). These specimens were morphologically compared to two species *E. fustis* and *E. neodossei*. About *E. neodossei,* we did not find any specimens on all sampled host plants. For this, in this study, . only the original description of *E. neodossei* was considered for the morphological analyses.

Materials and methods

Acari survey

A total of 118 individuals was collected from four host plants: *M. esculenta, Abelmoschus esculentus* and *Capsicum* sp. in the south of Brazzaville at different sites: Moungali (1), Groupement Jean Félicien Mahounda (2), Kombé (3), and Faculté des Sciences (FST4). Mites collected from identical host plants but in geographically different locations were considered as different populations (Table 1).

Some individuals per population were collected directly from the leaves using a fine, clean hairbrush and immediately placed in 70% alcohol in plastic vials. The name of the host plant, site of collection with GPS coordinates, and number of individuals per

population were noted on each vial. Males and immature stages were not considered because specific identification is impossible owing to the lack of discriminating characters.

Table 1 Characteristic of different populations of *Euseius fustis* and *Euseius congolensis* sp. nov. collected

Number of female	Species	Number of site	Site name	Latitude	Longitude	Host plant
30	*Euseius fustis*	*1*	Moungali	-4.248112	15.260441	*Cassava*
13	*Euseius fustis*	*2*	GJFM	-4.310978	15.187236	*Cassava*
15	*Euseius fustis*	*3*	Kombe	-4.326431	15.170045	*Cassava*
10	*Euseius fustis*	*4*	FST	-4.295585	15.245811	*Cassava*
23	*Euseius sp nov.*	*3*	Kombe	-4.326431	15.170045	*Cassava*
6	*Euseius sp nov.*	*1*	Moungali	-4.248112	15.260441	*chili*
10	*Euseius sp nov.*	*2*	GJFM	-4.310978	15.187236	*Cassava*
11	*Euseius sp nov.*	*3*	Kombe	-4.326431	15.170045	*okra*

Morphometric characterisation

Eighty adult females were mounted on slides in lactic acid and observed under a phase and differential interference contrast microscope (Sony Carl Zeiss Sonnar T* FE 55 mm f/1.8 ZA) at a magnification of × 400. The best slides were selected for further analysis. A morphometric characterisation was conducted on 22 individuals from five populations and 21 individuals from four populations of *Euseius* sp. nov. and *Euseius fustis,* respectively. Morphological characters considered are the ones currently used for the identification of Phytoseiid mites by Chant and McMurtry (1994), and specifically continuous variables have been used to distinguish species belong to the tribe Euseiini (Santos and Tixier 2018). Terminology for chaetotaxy used in this paper follow that proposed by Lindquist and Evans (1965) as adapted by Rowel et al. (1978) for dorsal idiosomal setae of Phytoseiidae and Chant & Yoshida-Shaul (1983) for ventral idiosomal setae. All measurements are presented in micrometres . The specimens measured for morphometric analyses were deposited as voucher specimens in the mite collection of the laboratory of Animal Ecology and Biodiversity of Marien Ngouabi University (**MNG**). The type specimens are deposited in MNG, Brazzaville, and registered.

Results

Statistical approaches

The mean (with maximum and minimum values and standard deviation) obtained for each variable considered for all the species studied, *E. fustis*, *E. neodossei, and Euseius* sp. nov. are presented in Table 2. Seven variables corresponded to interspecific variability: j3 = 18.40 and 32.24 µm, z2 = 14.64 and 26.30 µm, z4 = 13.81 and 32.68 µm, Z5 = 51.57 and 75.56 µm, s4 = 26.6 and 52.48 µm, S4 = 13.71 and 26.61 µm, and STIV = 53.58 and 65.11 µm and allowed us to distinguish between *E. fustis* and *Euseius* sp. nov. Two variables corresponded to interspecific variability: Z5 = 75 and 63 µm and SgeIV = 53.4 and 42 µm and allowed us to distinguish between *Euseius* sp. nov. and *E. neodossei*.

Table 2. Mean of each variable measured within of all individuals belong to *E. fustis*, *Euseius congolensis* sp. nov. and *E. neodossei*

	E. fustis	*Euseius sp nov.*	*E. neodossei*
DSL	321,93	308,88	336
DSW	205,71	217,99	243
j1	25,98	32,16	31
j3	18,40	33,25	38
j4	11,11	8,46	9
j5	12,48	8,74	10
j6	14,39	10,51	11
J2	17,32	10,96	13
J5	8,93	5,06	7
z2	14,64	26,31	19
z4	13,81	32,68	34
z5	12,83	8,56	10
Z1	14,67	10,87	13
Z4	15,24	10,90	11
Z5	51,57	75,56	63
s4	26,60	52,48	56
S2	14,76	23,17	15
S4	13,71	26,62	18
S5	15,13	20,38	17
r3	14,80	14,32	8
R1	14,25	8,93	10
StIV	53,58	65,11	57
StilV	29,26	30,96	36
SgeIV	47,25	53,40	42
lenght VAS	91,19	101,48	103
VAS at level of ZV2	42,16	46,09	54
VAS at level of anus	61,53	70,11	70

Taxonomic accounts

***Euseius* Wainstein 1962**

***Euseius congolensis* Belle Mbou & Mbama, sp. nov.**

Figures 1–6

Material examined.

Holotype: *female*, Abelmoschus, Brazzaville, Republic of Congo 2019, deposited at laboratory of Animal Ecology and Biodiversity.

Paratypes: 20 females (on 20 preparations) collected on *Abelmoschus esculentus*, Brazzaville, Republic of Congo, one female collected on *Manihot esculenta* Brazzaville, Republic of Congo, one female collected on *Capsicum* sp., Brazzaville, Republic of Congo, collector: Jacques Dollon Mbama Ntabi.

Diagnosis. setae Z1 present, peritreme extending forward to setae z2, setae Z5 are smooth, setae S2-S5 each at most a third as long as seta Z5, setae Z4 considerably shorter than distances between their base and base of Z5. Ventrianal shield vase-shield smooth with a strong constriction near ZV3, setae JV1 inserted postero-media to setae ZV2, macrosetae of leg IV knobbed, Calyx of spermatheca elongate vase-shaped

Description of adult females

Twenty specimens measured; range is provided in µm.

Adult Female (Figs 1–5). *Dorsum* (Fig. 1): Dorsal shield 308 (284–325) long and 217 (198–239) wide, strongly reticulated on the whole dorsum, 17 pairs of dorsal setae, and two pairs of sub-lateral setae: j1 32 (28–40), j3 33(24-39), j4 8(6-11), j5 9 (7-12), j6 10 (8-12), J2 11 (9-13), J5 5 (2-7), z2 26 (18-33), z4 32 (24-37), z5 8 (5-10), Z1 11(7-12), Z4 11 (8-13), Z5 75 (66-85), s4 52 (43-59), S2 23(16-28), S4 26 (21-31), S5 20 (17-24), r3 13 (11-19), R1 9 (7-12). All setae smooth.

Peritreme (Fig. 1). Extended to z2.

Venter (Fig. 2). All ventral shields smooth. Two pairs of metapodal shields. Primary shield 101 (96-106) long, 46 (40-53) wide at ST2 level, secondary shield 110 (8-10) long and 85 (3-9) wide at ST5 level. Ventri-anal shield with three pairs of pre-anal

setae, JV1, JV2, and ZV2 and one pair of large elliptical pre-anal pores. Membrane surrounding ventri-anal shield with four pairs of setae ZV1, ZV3, JV4, and JV5; ventri-anal shield 100 long, 42 wide at level of anterior corners and 75 wide at level of anus. JV5 30.5 long and smooth.

Chelicera (Fig. 3). Movable digit 21 long with one tooth and fixed digit 18 long with five teeth.

Spermatheca (Fig. 4). Calyx of spermatheca elongate vase-shaped, 7 (5-10) wide and 16 (11-21) long, with a small neck and an atrium at the basis, a visible ductus minor, and a long ductus major.

*Legs*IV (Fig. 5). With three smooth macrosetae, genu 38 (51-54) long, tibia 37 (29–51) long, basitarsus 58 (62-66) long.

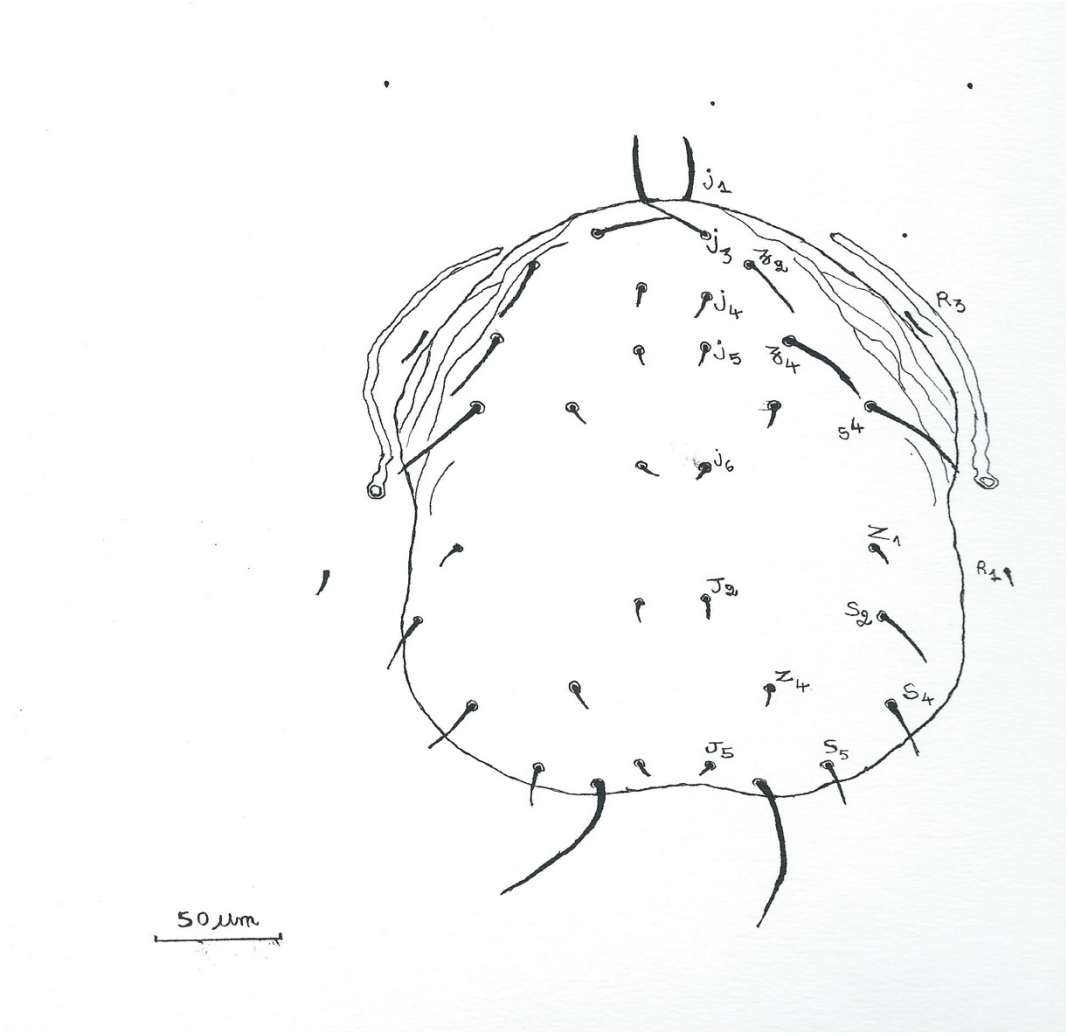

Figure 1. Dorsal shield of the female holotype of *Euseius congolensis* sp. nov.

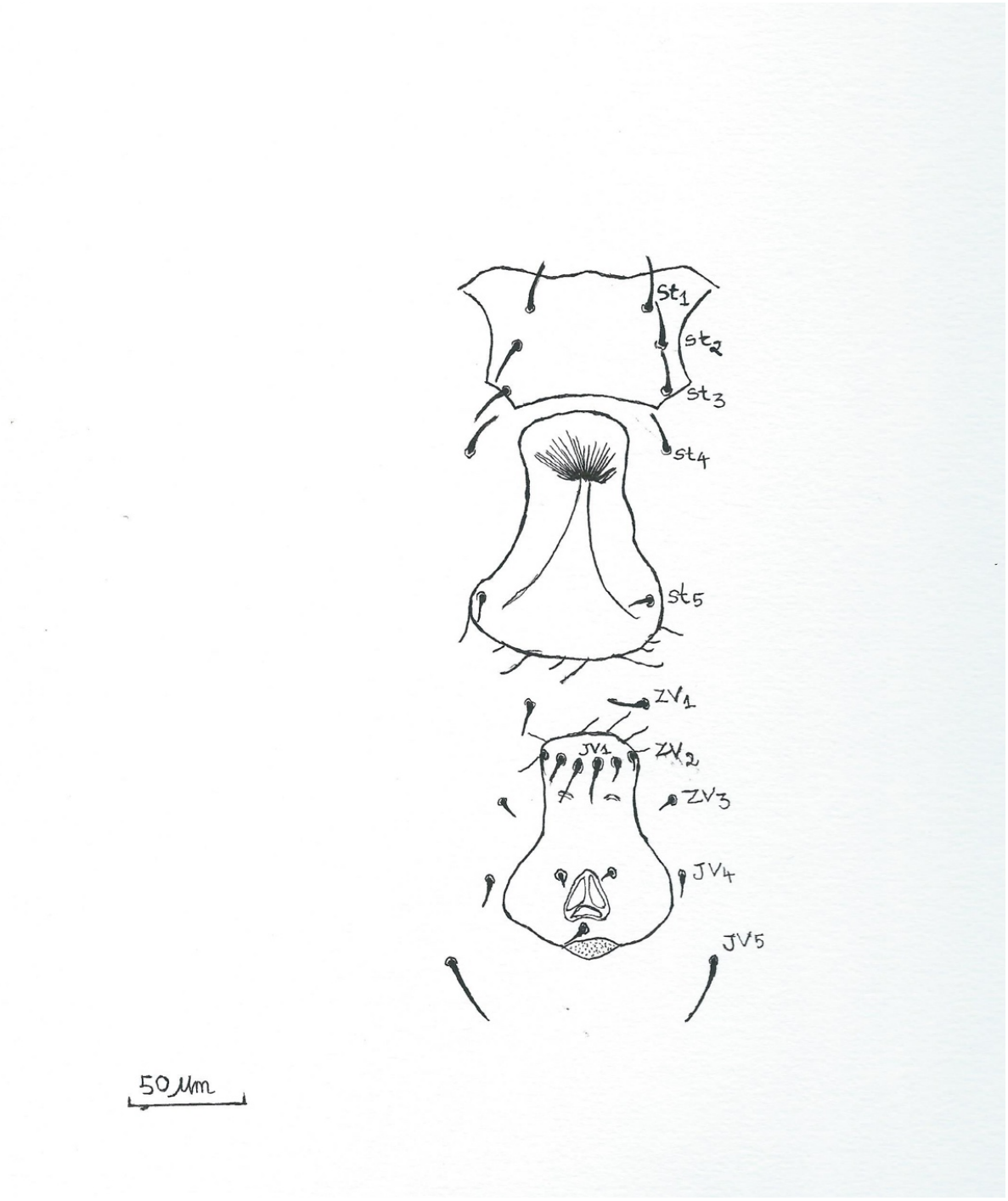

Figure 2. Ventral shields of the female holotype of *Euseius congolensis* sp. nov.

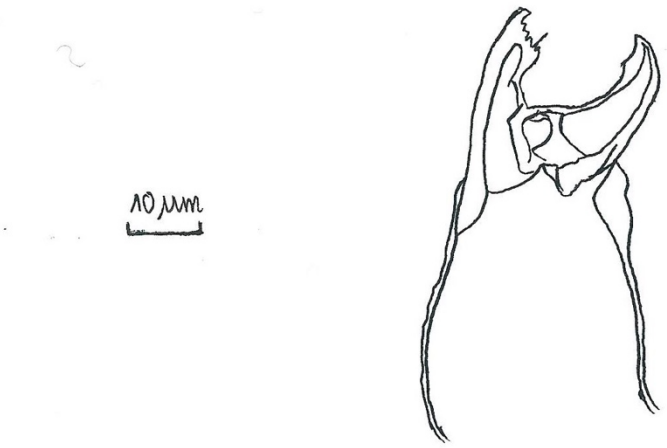

Figure 3. Chelicera of the female holotype of *Euseius congolensis* sp. nov.

Figure 4. Calyx of spermatheca of the female holotype of *Euseius congolensis* sp. nov.

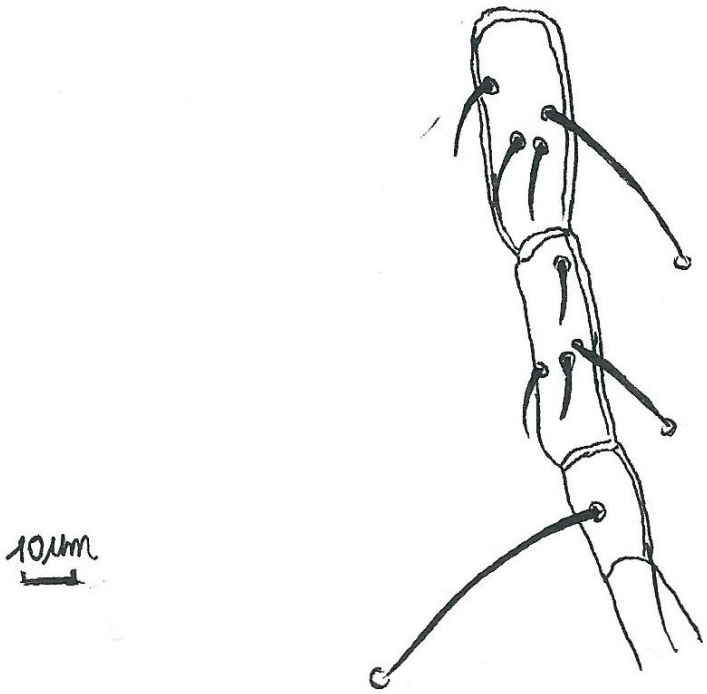

Figure 5. Macrosetae of leg IV of the female of *Euseius congolensis* sp. nov.

Distribution: All specimens were found at sites 1, 2, and 3. The species were found in proportions of 53.57%, 39.28%, and 7.14% of *M. esculenta*, *A. esculentus,* and *Capsicum sp*, respectively (Fig 6).

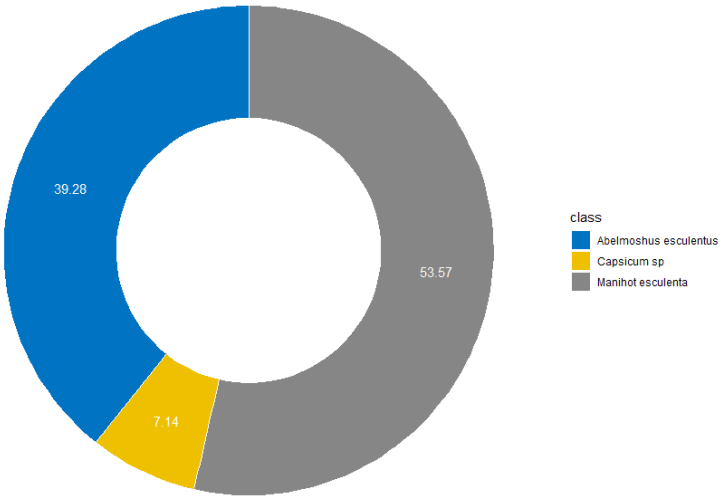

Figure 6. A donut chart with a hole inside, showing the percentage of *E. congolensis sp nov* observed within *Manihot esculenta*

Etymology: The name of the species refers to the country where the species was collected and commonly found.

Taxonomic remarks

The specimens collected were morphologically close to *Euseius neodossei*. The dorsum of *E. neodossei* has a striation on the dorsal shield in the upper part of the z5 seta, whereas *Euseius* sp. does not have this striation. The length of the peritreme stops between setae j3 and z2 for *E. neodossei*, whereas the peritreme stops at setae z2 in specimens of *Euseius* sp. The shape of the macrosetae on the basitarsus of leg IV in *E. neodossei* is sharply tipped, whereas that of *Euseius* sp. is straight and knob-shaped, similar to that of *E. concordis*. Finally, *E. neodossei* has two teeth on the movable digit of the chelicerae, whereas *Euseius* sp. has no teeth. These three characteristics are sufficiently discriminating criteria to differentiate between these two species within the genus *Euseius*. Then, when we applied the procedure proposed by Tixier (2013), we observed that the variables j3, z2, z4, Z5, s4, S4, and the length of the macrosetae on basitarsus IV allowed us to differentiate *Euseius sp.* from *E. fustis.* There are also the dorsal shield imbricate, seta Z5 is serrate and last the shape of spermatheca with calyx long and filamentous.

References

Belle Mbou Okassa M, Ntabi DM, Lenga A (2020) Morphological and molecular identification of specimens in the genus Euseius (Acari: Phytoseiidae) from the Republic of Congo. Zootaxa 4768: 479–498. https://doi.org/10.11646/zootaxa.4768.4.2

Chant DA, Yoshida-Shaul E (1983) A world review of the simplex species group in the genus Typhlodromus Scheuten (Acarina: Phytoseiidae). Canadian Journal of Zoology 61: 1142–1151. https://doi.org/10.1139/z83-151

Chant DA, McMurtry JA (1994) A review of the subfamilies Phytoseiinae and Typhlodrominae (Acari: Phytoseiidae). International Journal of Acarology 20: 223–310. https://doi.org/10.1080/01647959408684022

Chaudhri WM, Akbar S, Rasool A, (1979.) Studies on the predatory leaf inhabiting mites of Pakistan. University of Agriculture, Faisalabad, Pakistan, 243 pp.

DeLeon, DD. (1962). The cervices of some phytoseiid type specimens (Acarina: Phytoseiidae). Acarologia 4: 174-176. http://dx.doi.org/10.2307/3492899

De Moraes. GJ, McMurtry. JA, Denmark HA, Campos CB (2004) A revised catalog of the mite family Phytoseiidae. Zootaxa 434: 1-494. https://doi.org/10.11646/zootaxa.434.1.1

Denmark HA, Muma MH (1970). Some phytoseiid mites of Paraguay Phytoseiidae: Acarina. The Florida Entomologist 53: 219-227. http://dx.doi.org/10.2307/3493192

Denmark HA, Muma MH (1972). Some Phytoseiidae of Colombia Acarina: Phytoseiidae. The Florida Entomologist 55: 19-29. http://dx.doi.org/10.2307/3493192

Denmark HA, Muma MH (1973) Phytoseiid mites of Brazil Acarina: Phytoseiidae. Revista Brasileira de Biologia 33: 235-276.

Gutierrez J, Bonato O (1994) Les Acariens Tetranychidae attaquant le manioc au Congo et quelques-uns de leurs prédateurs. Revue de Zoologie Africaine, 1994, 108, pp.191-200. https://horizon.documentation.ird.fr/exl-doc/pleins_textes/pleins_textes_6/b_fdi_35-36/41303.pdf

Karg W (1982) Diagnostic and systematics of predatory mites of the family Phytoseiidae Berlese in orchards. Zoologische Jahrbucher Systematik 109: 188–210.

Karg W (1983) Systematische untersuchung der Gattungen und Untergattungen der Raubmilbenfamilie Phytoseiidae Berlese, mit der beschreibung von 8 neuen Arten. Mitteilungen Zoologisches Museum in Berlin Germany, 293-328.

Matthysse, J.G. & Denmark, H.A. (1981) Some phytoseiids of Nigeria (Acarina: Mesostigmata). The Florida Entomologist 64: 340–357. http://dx.doi.org/10.2307/3494585

McMurtry JA (1983) Phytoseiid mites from Guatemala, with descriptions of two new species and redefinitions of the genera Euseius, Typhloseiopsis, and the Typhlodromus occidentalis species group (Acari: Mesostigmata). International Journal of Entomology 25: 249–272.

McMurtry JA, Croft BA (1997) Life-styles of phytoseiid mites and their roles in biological control. Annual review of entomology 42: 291–321. https://doi.org/10.1146/annurev.ento.42.1.291

McMurtry JA, De Moraes GJ, Sourassou NF (2013) Revision of the lifestyles of phytoseiid mites (Acari: Phytoseiidae) and implications for biological control strategies. Systematic and Applied Acarology 18: 297–321. https://doi.org/10.11158/saa.18.4.1

Muma, M.H., Denmark, H.A. & De Leon, D. (1970) Phytoseiidae of Florida. Arthropods of Florida and neighboring land areas, 6. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, 150 pp.

Rowell HJ, Chant DA, Hansell RIC (1978) The determination of setal homologies and setal patterns on the dorsal shield in the family Phytoseiidae (Acarina: Mesostigmata). The Canadian Entomologist 110: 859–876. http://dx.doi.org/10.4039/ent110859-8

Santos VVD, Tixier MS (2018) Integrative taxonomy approach for analysing evolutionary history of the tribe Euseiini Chant & McMurtry (Acari: Phytoseiidae). Systematics and Biodiversity 16: 302–319. https://doi.org/10.1080/14772000.2017.140156

Tixier, MS (2013) Statistical approaches for morphological continuous characters: a conceptual model applied to Phytoseiidae (Acari: Mesostigmata). Zoologica Scripta 42 (3): 327–334. https://doi.org/10.1111/zsc.12004

Wainstein BA (1962) Révision du genre Typhlodromus Scheuten, 1857 et systématique de la famille des Phytoseiidae Berlese 1916 Acarina: Parasitiformes. Acarologia, 4: 5-30.