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Entomology

Trioza messii sp.n., a new species of jumping plant-louse (Hemiptera: Triozidae) from Cameroon associated with *Caloncoba welwitschii* (Oliv.) Gilg. (Flacourtiaceae)

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ABSTRACT

A new species of *Trioza* feed on *Caloncoba welwitschii* (Flacourtiaceae) has been identified for the first time and named *Trioza messii* sp.n.. It belongs to the family Triozidae Löw 1896, to the genus *Trioza* Foerster 1848 and to the group of Neoboutonia Hollis 1984. This Flacourtiaceae is known as a family of host plant for Triozids in the tropical African region.

Key words: Biodiversity, Taxonomy, Psyllid, Triozidae, *Trioza messii* sp.n., Cameroon

RESUME

Une nouvelle espèce de *Trioza* se nourrissant sur *Caloncoba welwitschii* (Flacourtiaceae) est identifiée pour la première fois et nommée *Trioza messii* sp.n.. Elle appartient à la famille des Triozidae Löw 1896, au genre *Trioza* Foerster 1848 et au groupe des Néoboutonia Hollis 1984. Cette Flacourtiaceae est connue comme famille de plante hôte des Triozidés dans la région tropicale d'Afrique.

Mots clés : Biodiversité, Taxonomie, Psylle, Triozidae, *Trioza messii* sp.n., Cameroun

INTRODUCTION

Psyllids or jumping plant-louse are generally very host specific plant-sap sucking insects [1]. They are considered as the pests of cultivated plants [2-6]. Many species of psyllids have been described from Cameroon. These are *Theobroma cacao* psyllid, *Mesohomotoma tessmanni* Aulmann 1912 [3]; *Citrus* psyllid, *Trioza erythrae* Del Guercio 1918 [7]; *Scaphopetalum blackii* psyllid, *Mesohomotoma hollisi* Messi 1993 [8]; *Ricinodendron heudelottii* psyllid, *Diclidophlebia xuani* Messi 1998 [9] and nine new species of *Pseudophacopteron* [10]. Hollis [11] has revealed the presence of 14 species belonging to the genus *Trioza* in Cameroon. Among all these species, no description has been carried out on the immature stages of the 9 species recorded. These species have been collected on yellow traps and there is no information about the host plants. In order to complete the biodiversity of psyllids in Cameroon, it is therefore necessary to find as much as possible, species not yet described by Hollis 1984

or to complete the taxonomy of those already described by the latter author. *Caloncoba welwitschii* (Flacourtiaceae) grows naturally in the secondary forest of tropical and intertropical regions. This type of psyllid has been harvested in Yaounde (Mont Messa) and in the mountainous grassfields of the West-Province (Bamendjou and Dschang). This plant has medicinal and pharmaceutical properties whose usage varies from one region to another and from one social group to another in the Central African region. In the Republic of Central Africa, it is used to treat madness, abortion and sterility [12]; in the Republic of Congo, it is used to treat bronchial infections, rheumatism and abscess [13]; in Gabon, the plant is efficient in treating leprosy [14]; in Cameroon, the plant enables a reduction of fractures by regular massages.

The present work gives a description of psyllid at all stages of its development as well as all the damages caused by this insect on its host plant.

MATERIAL AND METHODS

Psyllids at different stages of development were collected in the woody hills around Yaounde (mont Eloundem, mont Messa) and in the West-Province (Bamendjou and Dschang), Cameroon. Male and female adults were captured with the help of a mouth aspirator. Eggs and larvae were sampled with the leaves of the host plant which served as support. The psyllids thus harvested were conserved in 70% ethanol. The adults and larvae of 4th and 5th stages of development were maintained in NaOH 100g/l during 3 to 4 hours, and then washed in 70% ethanol before being mounted on slides in a drop of polyvinyl. Eggs and larvae at the 1st, the 2nd and the 3rd stages of development were directly mounted on slides as explained above. The following organs were dissected under the magnifying glass: head, antennae, legs, wings and aedeagus. The diagrams were done under the stereomicroscope. The description of the Flacourtiaceae psyllid is compared to those of *Trioza dinaba* Hollis 1984 [11] and *Trioza erytrae* [7], [11]. Specimens of this psyllid are conserved in the Laboratory of Zoology, University of Yaounde I (LZUY) and in the Natural History Museum Basel (NHMB) (Switzerland).

RESULTS

Taxonomy

Trioza Foerster

Trioza Foerster, 1848: 67. Type species: *Chermes urticae* Linnaeus, subsequence designation by Oshanin, 1912: 128 [17].

Powellia Maskell, 1890: 223. Type species: *Powellia vitreoradiata* Maskell, by monotypy. Synonymized by Maskell, 1890: 167 [18].

Spanioza Enderlein, 1926: 400. Type species: *Trioza galii* Foerster, original designation, synonymized by Tuthill, 1943: 546.

Colopelma Enderlein, 1926: 400. Type species: *Trioza thomasii* Löw, original designation, synonymized by Tuthill, 1943: 546 [19].

Siphonaleyrodes Takahashi, 1932: 48. Type species: *Siphonaleyrodes formosanus* Takahashi, original designation, synonymized by Mound & Halsey, 1978: 252 [20].

Hollis 1984 [11] provided a detailed generic description for *Trioza* adults and larvae. Key of *Trioza* genera.

- complete median epicranial suture of the vertex;
- diagonal propleural suture;
- episternum widened;
- epimeron reduced and moved ventrally;
- forewings generally lengthened and ellipsoidal;
- existence of the triangular spinules on the sub-angular apex and a radular area in the cells m₁, m₂ and Cu_{1b};
- claval suture reaches the back margin of the wing not far from the apex Cu_{1b};
- basal article of the tarsus does not have apical spur;
- anal valvula made up of a single article.

Neoboutonia group (Hollis, 1984)

- presence of 2 rhinari on 4th flagellomere;
- 3rd flagellomere relatively short;
- metatibia with only 2 inner spines;
- tendency to the reduction of the external contour of the cells of wax-producing glands in females.

Trioza messii sp.n. (Figures 1-16)

Material examined. Holotype: ♂, Cameroon, Yaounde, mont Eloundem, 3°51'N, 11°31'E, 31 May 1996, secondary forest, *Caloncoba welwitschii* (V.J. Dzokou & J.L. Tamesse). Slide-mounted (LZUY). Paratypes: Cameroon: 62 ♂, 65 ♀, 315 larvae, same data as holotype (mont Messa); 6 ♂, 10 ♀, 2 larvae, same data as holotype (NHMB), preserved in 70% ethanol; 11 ♂, 15 ♀, 10 larvae, West Province, Bamendjou, Mboum, 5°23'N, 10°20'E, 1615 m, 16 January 2005, *Caloncoba welwitschii* (V.J. Dzokou & J.L. Tamesse), preserved in 70% ethanol (LZUY); 7 ♂, 9 ♀, 7 larvae, West Province, Dschang, 5°26'N, 10°04'E, 1385 m, 5 March 2005, *Caloncoba welwitschii* (V.J. Dzokou & J.L. Tamesse), preserved in 70% ethanol (LZUY).

Key of species

- progressive opening of the jugal cones, each one carrying 5 large silks;
- 3rd article of antenna clear;
- métatibia with 3 spurs including 2 inner and 1 external;
- Cu₁ item is detached in front of the radial item; the anal form a double spindle;
- hind wing with 7 silks on the costale and sub-costale;

- male parameres arched with an ovoid base and a frayed top;
- distal portion of aedeagus swollen, its apical end carries a spine form excrescence;
- proctiger of the male with 2 depressions of which one more marked at the apical portion.

Description

The different stages of development are illustrated on figures 1, 2, 3, 4, 5, 6, 7 and 8 and their respective dimensions are found in tables 1 and 2. The egg (figure 1) has an orange-yellow colour during laying and this colour turn to yellow a short time before hatching. The egg has an elongated form, at one of its extremities is found a peduncle which enables it to be attached to the supporting plant tissues.

Larvae (figures 2-6), measurements in table 1.

Colour: cephalothorax is darker than abdomen. Eyes are red and the apical portion of antenna is dark. Aged larvae (4th and 5th stages) are greenish with a significant development of the wing-like prominences.

Morphology: cephalothorax is separated from the rest of abdomen. Body surrounded by silks which are clear with a basal support. Head is partly drowned in the thorax, eyes are almost at the border of the outlines of the wings. Antenna comprises 5 flagellomeres. Wings are well developed but remain coupled with the thorax. Humeral lobe does not extend above the eyes. Anus is on ventral position close to the posterior margin of the abdomen. Silks absent on the dorsal face. The development of the larvae takes place in 5 stages. Young larvae (1st to 3rd stages) are whitish with less developed wing-like prominences; they move in search of favourable points of attachment; fifth instar larvae are also dorso-ventrally flattened and have legs just after hatching.

Adults (figures 7-8), measurements in table 2. Colour: body brownish-yellow or dark. Dorsal

sclerites dark to black. Ventral sclerites brown. Lateral sides contain pleurites, with the extremity of sternites and tergites completely faded and thus form a clear-yellow band skirting the abdomen from the base to the anterior margin of female terminalia. Head is yellowish and the eyes are brown. Antennae are yellowish and only the last articles are dark. Legs are entirely pale yellow; forewings are hyaline and transparent.

Morphology: tegument little covered with short silks. Adults are distinguished by their height and by the organization of the genital parts at the extremity of the abdomen. These genital parts are more or less rounded in males (figure 7), conical and pointed in female (figure 8). Head (figure 9) is globular and is prolonged towards the front by two jugal cones. They each bear 5 bristles of large height. The opening of the jugal cones increases as we move towards the end of the vertex. Head is far from tilted compared to the longitudinal axes of the body giving the impression to be on the same plane. Head in dorsal view is almost as broad as the mesoscutum; occipital margin has a deep median notch. Vertex is in the same plan with thorax; its median epicranial suture is not very deep with a secondary furrow on each lateral side. Frontal lobes are well developed; their former margin rounded. Median ocellus visible from above; lateral ocelli visible on the external sides of tubercle widened on both sides of the median suture; front completely covered by the genal cones; well develop frontal cones, largely conical, slightly depressed compared to the plane of the vertex, in profile view.

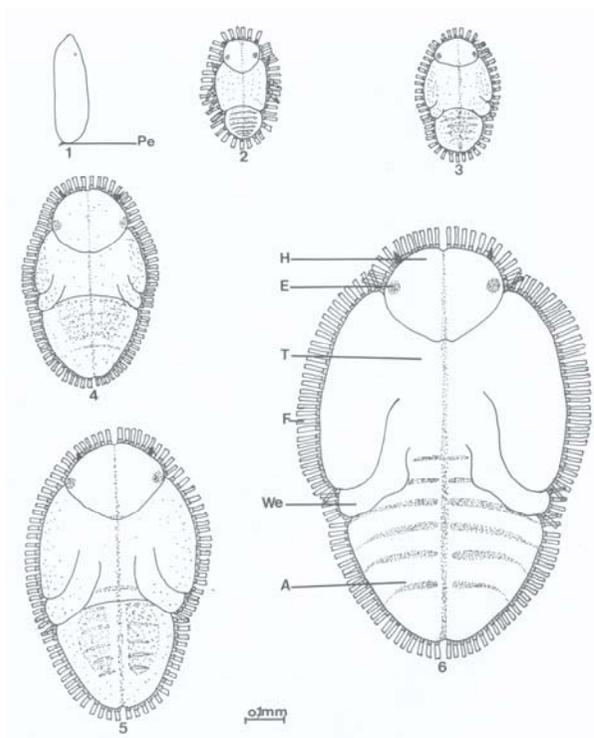


Figure 1: egg of *Trioza messii* sp.n.

Figures 2-6: 2: 1st instar larvae; 3: 2nd instar larvae; 4: 3rd instar larvae; 5: 4th instar larvae; 6: 5th instar larvae.

A: abdomen; E: eye; F: filament; H: head; Pe: peduncle; T: thorax; We: winglike prominence

Table 1: Measurements (in mm) of eggs and larvae *Trioza messii* sp.n

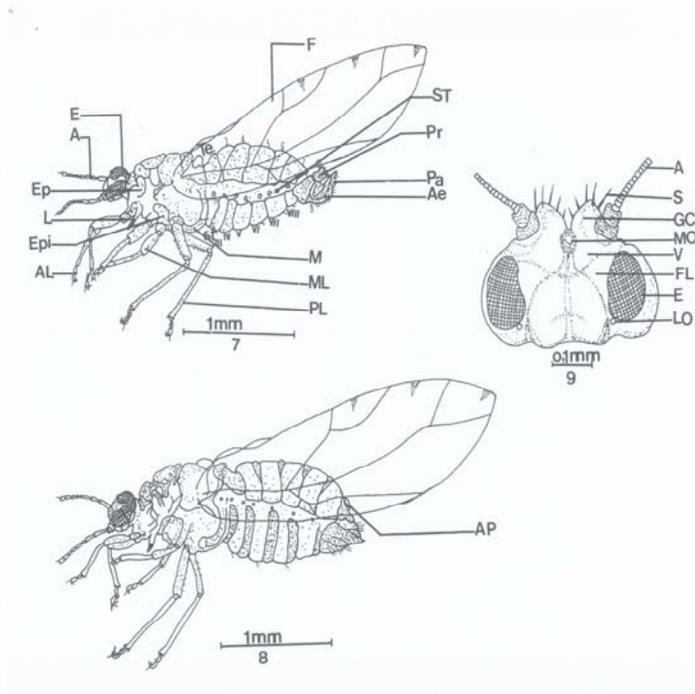
	Eggs n=60		L ₁ n=60		L ₂ n=60		L ₃ n=60		L ₄ n=60		L ₅ n=60	
	length	width	length	width	length	width	length	width	length	width	length	width
Min	0.198	0.083	0.297	0.165	0.594	0.297	0.759	0.297	0.99	0.561	1.089	0.528
Max	0.363	0.132	0.594	0.33	0.726	0.462	0.957	0.726	1.056	0.759	1.257	0.792
Mean	0.289	0.107	0.465	0.241	0.708	0.379	0.799	0.441	1.021	0.656	1.142	0.7

Min= Minimum; Max= Maximum; L₁ to L₅: first to fifth instar larvae; n= number of individuals

Table 2: Measurements (in mm) of adults *Trioza messii* sp.n

	Males (n=60)			Females (n=60)		
	minimum	maximum	mean	minimum	maximum	mean
Length	1.65	2.541	2.101	1.749	2.64	2.297
Width	0.462	0.561	0.515	0.429	0.693	0.584
Forewings	2.145	2.805	2.55	2.541	3.234	2.914
Hind wings	1.122	1.716	1.422	1.221	1.716	1.509
Antenna	0.462	0.594	0.514	0.429	0.594	0.503

n= number of individuals



Figures 7-9. 7: male of *Trioza messii* sp.n. ; 8: female of *T. messii* sp.n. ; 9: head of adult of *T. messii* sp.n. A: antenna; Ae: aedeagus; AL: anterior leg; AP: circumanal pore ring; E: eye; Ep: epimeron; Epi: episternum; F: forewing; FL: frontal lobe; GC: genal cone; L: labium; LO: lateral ocellus; M: meracanthus; ML: median leg; Pr: proctiger; S: seta; ST: sternite; Te: tergite; V: vertex.

Antenna (figure 10) is made up of 10 articles of unequal length. Each of the articles 4, 6, 7 and 8 bears a bristle subterminally. Flagellomere 8 bearing 2 setae, one developed and the other truncated. Flagellomeres 4, 6 and 7 bear a rhinaria at their distal portions while flagellomere 2 bears two rhinari. Clypeus with a pair of silks and the distal article of rostrum also provided with silks. Thorax flattened; pronotum flattened with only its anterior margin abruptly round behind the occiput. Mesopraescutum, from above, is longer than broad with anterior margin largely round in contact with pronotum. In profile, mesopraescutum slightly arched and curved in contact with pronotum. Legs have the same organisational framework. There exist from the point of attachment on the thorax to the distal end, the following articles: coxa, trochanter, femur, tibia and tarsus. The metatibia apex (figure 11) is used as systematic criteria of psyllids according to Hollis 1984 [11]. It is made up of 2 inner spurs and a single out spur. Wings are hyaline and their venations are used to recognize the psyllids at the

species level [2]. Forewings (figure 12) ellipsoidal, oval and strongly tightened with the round subangular apex; radular areas lengthened and triangular; the rest of the membrane without spinules. Veins with very short silks. It comprises a trifurcated zone which bears the radial, medial and cubital vein. Cubital item takes its rise in front of the radial, so that a short R+M item exist; the anal forms a double ovoid area. Median item is divided into 2 branches and also delimit a wingless cell. Hind wings (figure 13) comprise a series of marks in which some define the venation. Costal and subcostal veins bear 7 spurs among which one is curved near the costal break. Male genital block is characteristic. Aedeagus (figure 14) comprise two articulated portions; basal portion is much longer and forked at its proximal apex, distal point is more convex towards the articulated area. Its extremity is prolonged into an outgrowth that forms a spine. Ejaculation tube emerges dorsally not far from the base of the distal extension. Proctiger (figure 15) shows the existence of two depressions, one much more

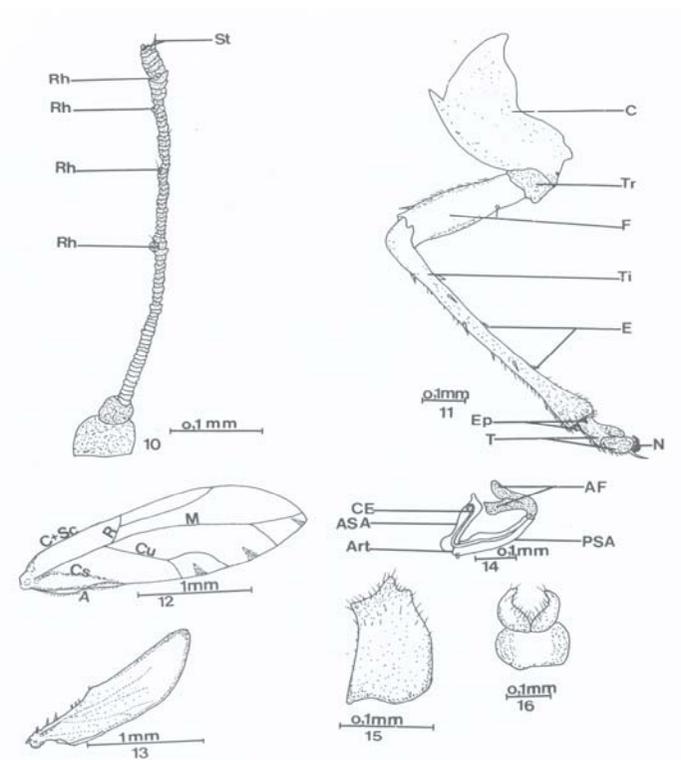
marked at the apical apex. Parameres (figure 16) are arched at their ovoid base and have a pointed apex. They form a space which harbours the aedeagus at rest. Ventral valvula of the ovipositor has three transverse cornices on its ventro-lateral surface.

Host plant and Biology

Caloncoba welwitschii (Flacourtiaceae), species of tropical and subtropical region, secondary forest [15]. In Cameroon, this plant exists in the hills surrounding Yaounde and in all the Divisions in the West Province.

As all Hemiptera, the psyllid feeds mainly on the sap deduced from the tissues of the host plant. Damage caused by larvae are very important (figure 17). The fixation and settling of larvae at the first stage of development produces pit galls or crypts at the lower face of the leaves. The leaves which are highly attacked are clovered and they appear indented and very deformed. A short while after the last moults of the insect, the leaves dry up at the discolouration area. The host plant loses its leaves in most cases when attacked.

Distribution: Cameroon



Figures 10-16: 10 : antenna ; 11 : posterior leg ; 12 : forewing ; 13 : hind wing ; 14 : aedeagus ; 15 : proctiger ; 16 : parameres.

A: anal vein; AF: aedeagus forked; Atr: articulation; ASA: anterior segment of aedeagus; C: coxa; C+Sc: costal and subcostal; CE: ejaculation canal; Cs: claval suture; Cu: cubital vein; Ep: eperon; F: femur; M: median vein; N: nail; PSA: posterior segment of aedeagus; R: radial vein; Rh: rhinarium; St: setae; T:tarsus; Ti: tibia; Tr: trochanter.



Figure 17: Leaves of *Caloncoba welwitschii* with pit galls due to the infection by *Trioza messii* sp. n.

DISCUSSION AND CONCLUSION

Hollis [11] recorded 9 species of *Trioza* from Cameroon: *T. bussei* Zacher 1915, host plant *Kickxia* sp. (Apocynaceae); *T. medleri* Hollis, host plant *Rauvolfia vomitoria* (Apocynaceae); *T. xylopi* Hollis, host plant *Xylopi* sp. (Annonaceae); *T. anomalicornis* Hollis, host plant *Drypetes leonensis* (Euphorbiaceae); *T. bamenda* Hollis, *T. camerounensis* Hollis, *T. fuscivena* Hollis, *T. mirificornis* Hollis and *T. boxi* Hollis without any information about their host plants. *T. erytrae* was announced in Cameroon for the first time by Lavabre [7] and today, its biology is well-known [16]. Comparison of *T. messii* sp.n. with the other afrotrropical species belonging to the same group [11], shows that *T. messii* sp.n. is closer to *T. binaba* Hollis, psyllid whose host plant and larvae are unknown. However, *T. messii* sp.n. is characterized by its jugal cones opening progressively with five big silks; frontal lobe well develop in *T. dinaba*. Cubital vein on forewing begins before radial item both in *T. messii* sp.n. and *T. binaba*, a short item R+M exist; but in *T. erytrae*, cubital and radial item begin at the same point; anal vein double in *T. messii* sp.n. and *T. erytrae* and simple in *T. binaba*; 7 bristles on costal and subcostal vein

(C+Sc) of hind wing in *T. messii* sp.n.; 3 bristles on C+Sc in *T. dinaba*; 10 bristles on C+Sc in *T. erytrae*. Male proctiger with two depressions in *T. messii* sp.n., one in *T. binaba* and no depression in *T. erytrae*. Parameres bowed with ovoid base and strung out apex in *T. messii* sp.n., triangle form with apical dark area in *T. dinaba* and elongated with apical dark area in *T. erytrae*. Distal segment of aedeagus with articulation area bulging, going up with an excrescence as a spine in both *T. messii* sp.n. and *T. dinaba*; narrow with enlarged extremity in *T. erytrae*.

The characteristics described above effectively show that the psyllid which feeds on *Caloncoba welwitschii* is a new species. *Trioza messii* sp.n. belongs to genus *Trioza* and to the group of *Neoboutonia*.

Etymology: The species is dedicated to Prof. Jean Messi, Cameroonian Hemipterist.

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