

Diaphorina maytenensis sp. nov., a New Species of Psyllids in the *Diaphorina* Genus (Hemiptera, Psyllidae), Associated with *Maytenus senegalensis* (Celastraceae) from Cameroon

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Abstract

Background and Objective: *Diaphorina citri* is known to be the most serious pest of citrus, transmitting the greening disease of citrus; *Diaphorina* is a species-rich genus, native to the tropics and subtropics of the Old World. The aim of this study was to describe a new species of the *Diaphorina* genus associated with a traditional medicinal plant in Africa, *Maytenus senegalensis* (Celastraceae). **Materials and Methods:** Adult psyllids were captured with a sweep net of 0.5 mm mesh size and a mouth aspirator, then preserved dry and slide-mounted or in 70% ethanol. The species was identified under a stereomicroscope, and drawings and measurements were made from slide-mounted material. **Results:** Adults of *Diaphorina maytenensis* sp. nov. have forewings subhyaline, with a distinct dark brown longitudinal stripe extending from the base to the apical margin of R + M + Cu₁, M + Cu₁, R and R_S veins, and a marginal stripe from the apex of the Cu₁ vein to the apex of the Cu_{1a} vein, beyond the apex of the anal vein; the vertex is sub-rectangular without foveae; the male proctiger is invaginated basally and apically, with large lateral lobes; the paramere is slightly broad apically, with the inner surface having an apical hook directed forward and thick setae directed downwards; the female subgenital plate is conical, with the anterior margin incurved at the base and bulging at the base; the margin of the caudal plate of the last instar larvae is beset with a row of more than forty-five pointed lanceolate setae on each side (a group of more than 90); the circumanal pore ring is V reversed-shaped, consisting of two rows of pores, the outer with oblongate pores and the inner with rounded

pores. **Conclusion:** Taxonomic studies indicated that the psyllid species described is a new species of the *Diaphorina* genus from Cameroon.

Keywords

Psyllid, *Diaphorina*, Taxonomic Studies, *Maytenus senegalensis*, Cameroon

1. Introduction

Jumping plant-lice or Psyllids are plant-sap sucking insects belonging to Psylloidea, a superfamily of the Sternorrhyncha suborder. Jumping plant-lice include approximately 4000 described species and at least as many undescribed species [1]. Some species cause serious economic losses to crop plants, forestry, and horticulture; either by phloem feeding and honeydew production or indirectly by transmission of phytopathogenic agents like phytoplasmas [2] [3]. *Diaphorina citri* is known to be the most serious pest of citrus; it is very well known for transmitting the greening disease of citrus (huanglongbing), in the presence of disease pathogens such as *Candidatus* spp. [4] [5]. They are generally very host-specific, in particular as larvae; most species are monophagous or oligophagous and related psyllid species tend to develop on related plant species [2] [6] [7]. The species belonging to the *Diaphorina* genus are related and develop on at least 18 families of plants, mainly on Anacardiaceae, Asteraceae, Loganiaceae, and Apocynaceae in the Afrotropical and Madagascan regions [8]. The taxonomy of psyllids, revised by Burckhardt *et al.* [9] indicated that the *Diaphorina* genus belonging to the Psyllidae family, Diaphorininae subfamily included two genera: *Diaphorina* Löw and *Parapsylla* Heslop-Harrison. *Diaphorina* is a species-rich genus, native to the tropics and subtropics of the Old World, particularly in more arid regions with some 80 species described [8] [10]-[14].

Cameroon is a country located in the tropical zones. The Adamawa region is one of the ten administrative regions of Cameroon. It is situated between 6°49'59"N latitude and 13°15'0"E longitude, with an altitude level between 1000 - 2000 m. The climate of this region is tropical Sudanian type with two main seasons: dry and rainy season. The temperature is rather fresh at an average of 22°C, and rainfall is between 900 - 1500 mm water/year [15]. The type of vegetation of the Adamawa Plateau is Guinean Savanna constituted of shrubs and herbaceous plants [16]. These shrubs are found in the Guinean and Sudanian Savanna.

The Afrotropical and Neotropical biogeographical realms are probably particularly species-rich, like south temperate regions, but also constitute the least known faunas [1] [17]. To date, only four species of *Diaphorina* Löw have been published in Cameroon [13] [14] [18] [19]. The information on the psyllid fauna of Cameroon in general and of the Adamawa region in particular is scarce, with a few studies undertaken on the taxonomy of psyllids. The objective of this study was to conduct taxonomic studies on an undescribed species belonging to the *Di-*

aphorina genus from Cameroon.

2. Materials and Methods

Type locality: University Campus of Ngaoundere, 7°33'05"N, 13°33'23"E, 1375 m.

Type material: Holotype: ♂, University Campus of Ngaoundere, 20 August 2011. Paratype: **Tchabal:** 12♂, 12♀, 23 June 2011; 3♂, 1♀, 12 July 2011; 1♂, 1♀, 18 August 2011; 11♂, 7♀, 22 December 2011; 3♂, 26♀, 2 January 2012; 3♂, 12♀, 21-24 December 2012; 5♂, 9♀, 4 January 2013; 7♂, 13♀, 3 April 2013; 7°32'45.9"N; 13°33'49.0"E; 1365 m. **University Campus of Ngaoundere:** 56♂, 46♀, 3-12-21-31 May 2011; 33♂, 40♀, 9-21-28 June 2011; 12♂, 21♀, 7-26 July 2011; 24♂, 19♀, 4-13-20 August 2011; 35♂, 32♀, 5 larvae, 20-27 December 2011; 7♂, 11♀, 2 January 2012; 7♂, 11♀, 27 March 2012; 15♂, 18♀, 2 April 2012; 4♂, 3♀, 1 September 2012; 8♂, 11♀, 20-26 December 2012; 11♂, 8♀, 3 January 2013; 5♂, 5♀, 28 March 2013; 8♂, 8♀, 2 April 2013. **Dang:** 33♂, 18♀, 7-17-26 May 2011; 41♂, 45♀, 4-14-25 June 2011; 19♂, 24♀, 5-14-23 July; 14♂, 8♀, 2-12 August; 3♂, 12♀, 24-31 December 2011; 13♂, 11♀, 5 March 2012; 11♂, 11♀, 6-11-30 August 2012; 4♂, 6♀, 6 September 2012; 7♂, 22♀, 22-29 December 2012; 3♂, 7♀, 3 January 2013; 3♂, 10♀, 4-8 March 2013; 10♂, 2♀, 4 April 2013; 9♂, 2♀, 22-29 July 2013; 7°24'42.4"N; 13°32'42.4"E; 1077 m. **Mbizoro:** 19♂, 23♀, 3 larvae, 10-19-28 May 2011; 27♂, 43♀, 7-16-30 June 2011; 22♂, 26♀, 9-19-28 July 2011; 11♂, 8♀, 6-16 August 2011; 8♂, 9♀, 29 March 2012; 13♂, 9♀, 4 April 2012; 4♂, 13♀, 9-18-28 August 2012; 2♂, 1♀, 1 larva, 4 September 2012; 5♂, 6♀, 27 December 2012; 7♂, 8♀, 2 January 2013; 4♂, 3♀, 27 March 2013; 5♂, 10♀, 1 April 2013; 1♂, 4♀, 24 July 2013; 7°24'25.7"N; 13°32'55.4"E; 1069 m.

Type series deposit: The type series of *Diaphorina maytenusis* sp. nov. was deposited in the collections of the Laboratory of Zoology, Higher Teacher's Training College, University of Yaounde I, Cameroon (LZUY).

Field survey: The observations and survey took place in various localities of the Adamawa Region, Cameroon, from May 2011 to July 2013. During each survey, host plants were inspected. Adults of psyllids were captured with a mouth aspirator. Nymphs were sampled directly from the buds and leaves of the host plants. The host plants were identified at the National Herbarium in Yaoundé (Cameroon) and are deposited in LZUY.

Observations and illustrations: The specimens are preserved dry and slide-mounted or in 70% ethanol and are deposited in the Laboratory of Zoology, University of Yaoundé I. The measurements were made from slide-mounted specimens using a Leica stereomicroscope. The dissected organs were mounted on an objective slide in a polyvinyl drop and covered with an objective slide cover. The drawings were realized under a Leica microscope equipped with a drawing tube.

Terminologies: The terminology used for the description follows the identification keys of [8] [10] [20].

Head: vertex, median suture, genal cones, ocellus, compound eyes; **Antenna:**

rhinaria, flagellomere; **Wing:** costal break, pterostigma, vein, spinules, cells; **Leg:** metacoxa, meracanthus, metatibia, spurs, arolium; **Male genitalia:** proctiger, paramere, aedeagus, ductus ejaculatorius; **Female genitalia:** proctiger, subgenital plate, dorsal and ventral valvulae, circumanal ring.

3. Results

Description of Diaphorina maytenusis sp. nov.

Adult Coloration. (Figure 1(a) and Figure 1(b)) are generally dark brown. Head and thorax dark brown. Antennae yellowish with two basal segments and two apical segments dark brown. The spaces between the dorsal and ventral sclerites and the rest of the antenna are yellow. Forewings sub-hyaline, membrane of forewings milky white, a distinct dark brown longitudinal stripe extending from base to apical margin of R + M + Cu₁, M + Cu₁, R and R_s veins; a marginal stripe from M₁₊₂ to apex of R_s vein and apical margin of r₁ cell; a marginal stripe from apex of Cu₁ vein to apex of Cu_{1a}, beyond apex of anal vein; one whitish lunate area at apical margin r₁ cell; pterostigma dark brown; veins yellowish to light brown. Hind wing hyaline, C + Sc, R + M + Cu₁, A₁ and A₂ veins entirely dark brown. Abdomen with tergites dark brown, sternites yellowish, pleurites with interrupted points brownish marking opening of spiracles, terminalia dark brown. Forelegs totally dark brown, coxae and femur of hind and median legs also dark brown, tibiae and tarsi yellowish. Tarsal claws blackish.

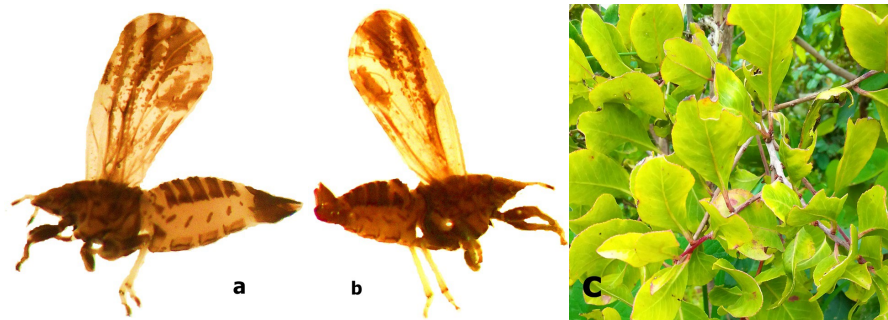


Figure 1. Species of *Diaphorina maytenusis* sp. nov. and host plant, (a) Female adult (25×), (b) Male adult (25×), (c) *Maytenus senegalensis* (Celastraceae).

Structure. The head (Figure 2(2)) is narrower than the body, 0.86 times as wide as the body width, and inclined ventrally on the same plane as the rest of the body. The vertex is about twice as wide as the length of the median suture, sub-rectangular, and lacks foveae; it is deeply emarginated at the posterior margin, with a shallow linear depression extending forward and nearly reaching the anterior border of the vertex. The vertex bears some inconspicuous and simple setae, very scattered. Genal cones are on the same level as the vertex, directed forward, separate, sub-conical at the tips, as long as wide and apically bluntly rounded, divergent and curving outwards; the margin bears a row of some medium-sized and less dense simple setae. Lateral ocelli are located almost on the upper extremities

of the vertex; the median ocellus is clearly visible from the front and located at the base of the genal cones.

The antenna (**Figure 2(3)**) is short and thick; the antennal flagellum is about 0.81 times as long as the head width in both sexes. The antenna is ten-segmented, bearing few simple setae on segments 1 and 2; the two basal segments are robust, the third segment is the longest, and the terminal segment is the smallest, bearing two terminal setae of unequal dimensions, one simple and long and the other rod-shaped and short; subapical rhinaria are present on segments 4, 6, 8, and 9; the rhinarium on segment 6 is only associated with a simple seta. Antenna measurements are 0.56 - 0.76 mm long in males and 0.6 - 0.8 mm long in females.

Forewings (**Figure 2(4)**) 2.08 - 2.14 times longer than wide in males, 2.08 - 2.4 times longer than wide in females, about twice as long as wide in both sexes, long and broadest subapically, rounded at apex, narrow at base; R vein about 1.72 - 1.88 times as long as R + M + Cu₁ vein, M + Cu₁ vein about 0.76 - 0.8 times as long as R + M + Cu₁ vein; pterostigma long and narrow, distinct with conspicuous setae on external margin only; R_s vein is quite long and flexed downward near apex; M and Cu₁ veins straight; M₁₊₂ and M₃₊₄ veins are also straight and oblique, M₁₊₂ vein longer than M₃₊₄ vein; Cu_{1a} vein strongly curved and the Cu_{1b} vein slightly curved. All veins armed with a double row of minute setae. Forewing measurements are 2.4 - 2.92 mm long, 1.12 - 1.4 mm wide in males and 2.6 - 2.92 mm long and 1.08 - 1.4 mm wide in females.

The hind wing (**Figure 2(5)**) is elongate, narrowed, more than triple as long as broad (2.82 - 3.9 times in males and 2.82 - 3.12 times in females), incurved on the apical margin in the anterior part, incurved at the anal break and rounded at the apical margin; the costal vein has 3 + 10 ungrouped setae basally, three setae before the costal break and 10 others after the costal break and one hooked seta apically (hamulus); the R + M + Cu₁ vein has a few small visible setae. Hind wing measurements are 2.5 - 2.6 mm long and 0.64 - 0.92 mm wide in both sexes.

Hind leg (**Figure 2(6)**) with a well-developed meracanthus of medium size and a pointed conical apex. The metatibia (**Figure 2(7)**) lacks a basal spur and has an open crown or a half-crown of seven dark sclerotized spurs on the margin at the apex, with three visible on the internal side and four visible on the external side. Metatibia measurements are 0.64 - 0.8 mm long in males and 0.68 - 0.88 mm long in females. The metabasitarsus has two dark sclerotized apical spurs.

The male genitalia illustrated in **Figure 2(8)** are smaller than the abdomen, the ventral plate has a row of some simple setae at the apex of the posterior part, abruptly upwardly straight and rounded at the extremity. The male proctiger (**Figure 2(9)**) is simple, about 0.40 mm long, longer than the parameres; in profile, the anterior margin is straight, invaginated basally, the lateral lobes are large, the posterior margin is broadly convex and rounded in the middle, and gradually narrowed in the apical part and also gradually narrowed in the basal part, invaginated apically, the apical region narrowed with a truncated margin; the male proctiger has long simple setae on the upper half, the posterior margin bearing a row of rather dense medium simple setae directed upwards.

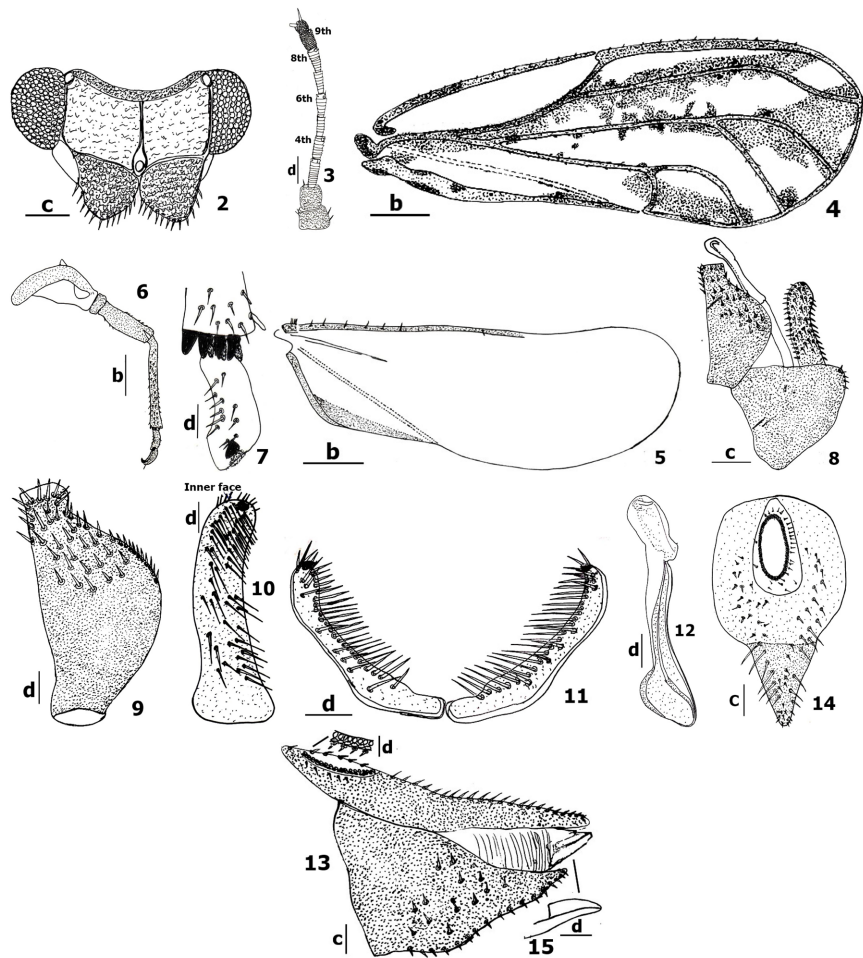


Figure 2. Adult organs of *Diaphorina maytenensis* sp. nov. (2) head; (3) antenna; (4) forewing; (5) hindwing; (6) metathoracic leg; (7) metatibia apical end; (8) male genitalia; (9) male proctiger; (10) paramere, inner face; (11) paramere, lateral view; (12) aedeagus; (13) female genitalia; (14) female proctiger; (15) ventral valvulae, lateral view. Scales: a: 2 mm; b: 0.8 mm; c: 0.4 mm; d: 0.2 mm.

Parameres (**Figure 2(10)**) lamellar, slightly shorter than the male proctiger (about 0.27 mm long), slender, slightly broad apically, bluntly pointed at the apex in profile, narrowed in the middle, posterior margin slightly curved in the middle; anterior margin rounded; wider near the base, narrowed at the base and each paramere bowed towards each other in lateral view (**Figure 2(11)**); apex surrounded by a cluster of small setae, directed upwards, inner surface with an apical hook directed forward and thick long setae directed downwards.

The aedeagus is bi-segmented; the distal segment of the aedeagus (**Figure 2(12)**) has a simple, strongly inflated, apically elbowed base, with the posterior margin incurved and the anterior margin straight. The distal segment is strongly expanded basally, and the sclerotized end tube of the ductus ejaculatorius is short, straight, and directed rearwards. The distal segment of the aedeagus measurements are 0.20 - 0.32 mm long.

The female genitalia (**Figure 2(13)**) are conical and short in profile, smaller

than the abdomen, broad basally and narrow apically with a pointed apical portion. The female proctiger (**Figure 2(14)**) is 1.17 - 1.45 times longer than the subgenital plate, broadest at the basal half part, narrowly and roundly pointed at the apex, with the dorsal margin slightly curved towards the apex, bearing a row of long, sparse setae. The female proctiger measurements are 0.64 - 0.8 mm long. The circumanal pore ring (**Figure 2(14)**) is elongate or somewhat elliptical, consisting of two rows of pores surrounded by small setae, the outer row rounded and the inner one oblongate pores.

The subgenital plate is shorter than the female proctiger; conical, broadest at the base and acutely pointed apically; anterior margin incurved at base; posterior margin with a row of long simple setae directed rearwards. The subgenital plate measurements are 0.44 - 0.68 mm long. Dorsal and ventral valvulae (**Figure 2(15)**) are straight ventrally, the tip of the ovipositor is acutely pointed, and the lateral valve has a rounded swelling. Measurements and ratios are found in **Table 1**.

Table 1. Measurements (mm) and ratios of *Diaphorina maytenusis* sp. nov. adult specimens (N = number of measured specimens).

Parameters	Males				Females			
	N	Min	Max	Average	N	Min	Max	Average
BL	40	2.4	3.68	3.07	40	2.6	3.88	3.36
BW	40	0.8	1.2	0.95	40	0.88	1.16	0.98
HW	40	0.72	0.96	0.82	40	0.72	1.08	0.85
AL	40	0.56	0.76	0.67	40	0.6	0.8	0.69
F ₁ L	40	0.08	0.16	0.1	40	0.08	0.16	0.09
WL	40	2.4	2.92	2.72	40	2.6	2.92	2.72
WW	40	1.12	1.4	1.23	40	1.08	1.4	1.23
wL	40	2.5	2.6	2.38	40	2.5	2.6	2.38
wW	40	0.64	0.92	0.81	40	0.64	0.92	0.81
MTL	40	0.64	0.80	0.76	40	0.68	0.88	0.77
MFL	40	0.4	0.68	0.48	40	0.4	0.6	0.48
MPL	40	0.4	0.6	0.48	/	/	/	/
PL	40	0.24	0.36	0.27	/	/	/	/
FPL	/	/	/	/	40	0.64	0.8	0.73
PSPL	/	/	/	/	40	0.44	0.68	0.56
DAL	40	0.20	0.32	0.26	/	/	/	/
BL/HW	40	3.33	3.83	3.74	40	3.61	3.59	3.95
BL/BW	40	3.0	3.06	3.23	40	2.95	3.34	3.42
AL/HW	40	0.77	0.79	0.81	40	0.83	0.74	0.81
F ₁ /HW	40	0.11	0.16	0.12	40	0.11	0.14	0.10
AL/F ₁	40	7.0	4.75	6.7	40	7.5	5.0	7.66

Continued

WL/HW	40	3.33	3.04	3.31	40	3.61	2.7	3.2
WL/WW	40	2.14	2.08	2.21	40	2.40	2.08	2.21
WL/wL	40	0.96	1.12	1.14	40	1.3	1.12	1.14
MTL/HW	40	0.88	0.83	0.92	40	0.94	0.81	0.90
PL/HW	40	0.33	0.37	0.32	/	/	/	/
FPL/FSPL	/	/	/	/	40	1.45	1.17	1.30
LR	40	1.28	1.72	1.43	40	1.4	1.8	1.50
LM + Cu ₁	40	0.52	0.80	0.6	40	0.52	0.72	0.62
LM ₁₊₂	40	1.0	1.6	1.38	40	1.32	1.6	1.46
LM ₃₊₄	40	1.2	1.4	1.26	40	1.2	1.52	1.32
LPt	40	0.85	1.14	0.99	40	0.88	1.14	1.01
m ₁	40	0.60	0.84	0.75	40	0.64	0.88	0.77

Adult legend: BL, body length; BW, body width; HW, head width; AL, antenna length; F₁L, length of first antennal flagellomere; WL, forewing length; WW, forewing width; wL, hindwing length; wW, hindwing width; MTL, metatibial length; MFL, metafemur length; MPL, male proctiger length; PL, paramere length; DAL, length of distal segment of aedeagus; FPL, female proctiger length; FSPL, female subgenital plate length; LR, R vein length of forewing; LM₁₊₂, M₁₊₂ vein length of forewing; LM₃₊₄, M₃₊₄ vein length of forewing; LPt, pterostigma length; m₁, m₁ cell length of forewing.

Fifth instar larva

Colouration: The fifth-stage larva is dark brown with orange compound eyes. The inner margins of the wing-pads and the antenna at the apex; the sclerotic areas on the dorsal side of the head and thorax, the dorsal sclerites, and also the caudal plate are brown to dark brown. The spaces among spots, the dorsal sclerites, and the rest of the wing-pads are whitish to yellowish. There are six pairs of dark spots or sclerotic areas on the dorsal side of the thorax and three pairs of dark sclerites on the dorsal side of the abdomen.

Structure. The fifth-stage larva (**Figure 3(16)**) is longer than wide and flattened dorsoventrally, broadly oval; it is about 2.62 times longer than wide. The head width is more than the body width. The wing-pads project beyond the general margin of the body, and the humeral lobes are well developed; the outer margin (**Figure 3(18)**) is beset with minute setae. The antenna (**Figure 3(17)**) is long, about 1 mm long, and three-segmented; the two basal segments are slightly broad and transverse, with small simple setae on the margins; the third segment is very long with imperfect segmentations bearing a row of short slender lanceolate scattered setae, with four rhinaria; segment 3 has several pointed lanceolate setae and, near the two basal rhinaria, each has a lanceolate seta; the apex has two terminal thick setae, one longer and slender than the other, which is short, stout, and truncate. The margin of the caudal plate (**Figure 3(19)**) is beset with a row of more than forty-five pointed lanceolate setae on each side (a group of more than 90).

The tip of the abdomen has a deep indentation or nick and bears three very long simple setae on each side (a group of 6 at the tip) and a row of four very long simple setae plus one pointed lanceolate seta on each side of the indentation margins (a group of 8 plus 2). The anal opening or anus (**Figure 3(21)**) is terminal, on the posterior margin of the abdomen; the circumanal pore ring is close to the anal margin, V reversed-shaped, consisting of two rows of pores, the outer with oblongate pores and the inner with rounded pores. The tarsal arolium (**Figure 3(20)**) is triangular fan-shaped, widened apically with a long petiole.

Measurements (1 specimen, in mm). Body length 1.86; body width 0.71; length of antennal segment 3 1.0; forewing pad length 0.88; metatibial length 0.34.

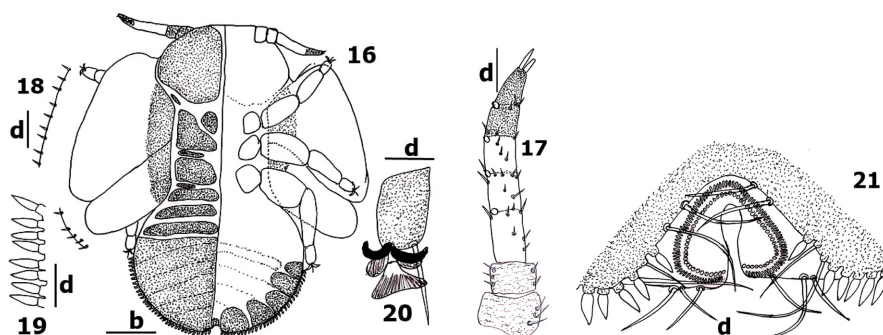


Figure 3. Fifth larval stage organs of *Diaphorina maytenusis*. (16) Fifth larval stage, left dorsal view, right ventral view; (17) antenna; (18) forewing pad; (19) margin of caudal plate; (20) tarsal arolium; (21) circumanal pore ring. Scales: b: 0.8 mm; d: 0.2 mm.

Etymology: Derived from the genus name of the host plant *Maytenus*, collected in the Adamawa and West regions of Cameroon.

Host plant: *Maytenus senegalensis* (Lam.) Exell (Celastraceae) (**Figure 1(c)**).

Maytenus senegalensis, named “ngege” in the local tongue and “Confetti tree” in English, has some uses according to Bonnet *et al.* [21], 2008: the seeds are used to make beads. In veterinary medicine, the leaves are used to treat diarrhoea and flatulence in cattle.

In traditional pharmacopoeia, the plant is recognized as having antitumor properties; the roots and bark are used as healing agents and against boils; the leaves associated with the bark are used against oedema [22]-[26] (Adjanohoun *et al.*, 1980, 1985, 1989; Nacoulma-Ouédraogo, 1996; Zerbo *et al.*, 2007; Sangaré *et al.*, 2012).

Distribution: *Maytenus senegalensis*, the plant is distributed in the Sudanian and Guinean savannas from Senegal to Eritrea, and in southern Africa and Madagascar.

Biology: *Diaphorina maytenusis* sp. nov. provokes discoloured spots on the leaves of its host plant. Adults and larvae feed by sucking the plant sap on the upper and lower surfaces of the leaves. The periods of high adult population growth are the months of May, June, and December, when strong foliar growth is noted.

4. Discussion

Diaphorina maytenusis sp. nov. is close in forewing shape and maculation to *D. virgata* [10] on *Sclerocarya birrea* (A. Rich) Hochst. (Anacardiaceae); *D. zebrana* [10] on *Ozoroa paniculosa* (Sond.) R & A. (Anacardiaceae); *D. gymnosporiae* [27] on *Gymnosporia spinosa* (Forsk.) and *Gymnosporia montana* Benth. (Celastraceae) and *D. bikanerensis* [27] on *Leptadenia spartium* Wight & Arn. (Asclepiadaceae).

In adults of *Diaphorina maytenusis* sp. nov., the forewings are sub-hyaline, the membrane of the forewings is milky white, with a distinct dark brown longitudinal stripe extending from the base to the apical margin of the R + M + Cu₁, M + Cu₁, R, and R_s veins; a marginal stripe from M₁₊₂ to the apex of the R_s vein and the apical margin of the r₁ cell; a marginal stripe from the apex of the Cu₁ vein to the apex of Cu_{1a}, beyond the apex of the anal vein; one whitish lunate area at the apical margin of the r₁ cell; the pterostigma is dark brown; veins are yellowish to light brown. It differs from *D. virgata* [10] in that the forewing membrane is hyaline with two or three longitudinal sepia to black stripes that are different, the anterior one following the radius and radial sector straight to the margin, the posterior one from the anal margin to M₃₊₄; these dark stripes appear to be constant and never unite. It also differs from *D. zebrana* [10] in that the membrane of the forewing lacks a longitudinal stripe following the R_s and M₃₊₄ margins at the base. It equally differs from *D. bikanerensis* [27] in that the maculae form large bands, leaving clear areas in between and small clear spots along the apical margin (m₁ and m₂ cells), and are maculated in all cells except C + Sc; and it also differs from *D. gymnosporiae* [27] in that the maculae form rather large areas all along the veins, with hyaline areas extending in all cells, and the junction of veins R, R₁, and R_s, and the base of Cu₁ and M are dark-black.

Forewing in *Diaphorina maytenusis* sp. nov., long and broadest subapically, rounded at apex, narrow at base; pterostigma long and narrow, distinct with conspicuous setae on external margin only; R_s vein is quite long and flexed downward near apex; it is close to *D. virgata* and *D. zebrana* [10] in forewing shape. Whereas in *D. bikanerensis* [27], it is broadest subapically, radial sector running parallel to costal margin and then abruptly flexed downwards near apex, fork M₁₊₂ with a weak loop. It also differs from *D. gymnosporiae* [27] with membrane thickly beset with minute points.

Vertex in *Diaphorina maytenusis* sp. nov., about twice as wide as the length of the median suture, sub-rectangular and lacking foveae; deeply emarginated at the posterior margin, with a shallow linear depression extending forward and nearly reaching the anterior border of the vertex. Genal cones are on the same level as the vertex, directed forward, separate, sub-conical, as long as wide and apically bluntly rounded, divergent and curving outwards. It differs from *D. virgata* [10] (which has a fovea in a rather large shallow depression in each half; genae subconical, contiguous for the basal two-thirds, apically bluntly rounded). It also differs from *D. zebrana* [10] with a dark fovea in a shallow depression centrally in each

half; genal cones slightly shorter, sub-conical and apically bluntly rounded. It also differs from *D. bikanerensis* [27] with two pairs of foveal impressions on each side of the median suture, posterior to the centre, posterior foveae minute and circular; genal cones directed forward, separate but approximate, apices divergent and roundly pointed; and it also differs from *D. gymnosporiae* [27] with two foveal impressions on each side, posterior to the centre and in the middle of each half, anterior foveae larger than the posterior; genal cones directed forward, separate, subconical, divergent and curving outwards.

Hindwing in *Diaphorina maytenusis* sp. nov., elongate, narrowed, more than triple as long as broad, incurved on the apical margin in the anterior part, incurved at the anal break and rounded at the apical margin; costal vein with 3 + 10 ungrouped setae basally, three setae before the costal break and 10 others after the costal break and one hooked seta apically (hamulus); R + M + Cu₁ vein with a few small visible setae; whereas in *D. bikanerensis* [27], the membrane is uniformly beset with minute points. It differs from *D. gymnosporiae* [27], with hind wings also quite large and thickly beset with minute points, veins quite distinct.

Metatibia in *Diaphorina maytenusis* sp. nov. with an open crown or a half-crown of 7 dark sclerotized spurs on the margin at the apex, three visible on the internal side and four visible on the external side. It is close to *D. virgata* and *D. zebrana* [10] with the same number of dark sclerotized spurs. It differs from *D. bikanerensis* [27] with metatibia bearing apically 6 spurs, and it also differs from *D. gymnosporiae* [27] with metatibia with 5 long and slender black spines.

Male proctiger in *Diaphorina maytenusis* sp. nov., simple, in profile, anterior margin straight, invaginated basally, lateral lobes large, posterior margin broadly convex and rounded in middle, and gradually narrowed in apical part and also gradually narrowed in basal part, invaginated apically, apical region narrowed with truncated margin; male proctiger with long simple setae on upper half, posterior margin bearing a row of rather dense medium simple setae directed upwards. It is close to *D. virgata* and *D. zebrana* [10] however lateral lobes of proctiger less large. It differs from *D. bikanerensis* [27] with anterior margin almost straight or weakly convex, posterior margin broadly convex and slightly invaginated near apex, outer surface sparsely beset with small, thick setae. It also differs from *D. gymnosporiae* [27] with in profile, anterior margin weakly convex in middle, invaginated both basally and apically, apical region attenuated, posterior margin broadly convex in middle, converging both basally and apically.

Male paramere in *Diaphorina maytenusis* sp. nov., lamellar, slender, slightly broad apically, bluntly pointed at apex in profile, narrowed in the middle, posterior margin slightly curved in middle; anterior margin rounded, wider in the basal region; apex surrounded by a cluster of small setae, directed upwards, inner surface with apical hook directed forward and thick setae directed downwards. It differs from *D. zebrana* and *D. virgata* [10] with paramere having a little narrowed at base, covered with setae which are longer on inner surfaces, a small tooth at apex on inner surface. It differs from *D. bikanerensis* [27] with paramere long,

slender, bowed, narrower apically and wider near base, medial margins bearing long, numerous setae; and it also differs from *D. gymnosporiae* [27] with parameres with subparallel sides, bowed towards each other, bluntly pointed at tip.

Distal segment of aedeagus in *Diaphorina maytenensis* sp. nov., with a simple, elongated apical dilatation elbowed at the base, posterior margin straight and anterior margin incurved, slightly dilated at its anterior base, ductus ejaculatorius short and slightly sinuate directed rearwards. It is close to *D. virgata* and *D. zebrana* [10] with the same shape. It differs from *D. bikanerensis* and *D. gymnosporiae* [27] with aedeagus moderately long, elbowed, medial segment curved in the middle.

Female proctiger in *Diaphorina maytenensis* sp. nov., broadest at basal half part, narrowly and roundly pointed at apex, dorsal margin slightly curved towards apex, bearing a row of long, sparsely distributed setae. Circumanal pore ring elongate or somewhat elliptical, consisting of two rows of pores surrounded by small setae, the outer row rounded and the inner one oblongate pores. It differs from *D. zebrana* [10] with circumanal pore oval, with very short setae apically and longer ones in the middle area. It also differs from *D. virgata* [10] with proctiger distinctly longer and less pear-shaped than in *D. zebrana* and in profile slightly curved with a very slight medial bulge. It also differs from *D. bikanerensis* [27] with proctiger pubescent, with six pairs of long setae in the posterior third, circumanal ring composed of a narrow band of pores; and it also differs from *D. gymnosporiae* [27] with proctiger with caudal region armed with small, peg-like setae, circumanal ring large, somewhat elliptical.

The female subgenital plate in *Diaphorina maytenensis* sp. nov. is conical, broadest at the base and acutely pointed apically; the anterior margin is incurved at the base, bulging at the base; the posterior margin has a row of long simple setae directed rearwards. The dorsal and ventral valvulae are straight ventrally, the tip of the ovipositor is acutely pointed, and the lateral valve has a rounded swelling. It differs from *D. virgata* [10] in having the ventral plate more regularly rounded in profile without the pronounced basal bulge, the dorsal valve slightly longer, and more or less planate from the lateral aspect; from *D. zebrana* [10] in having the ventral plate bulging slightly at the base then straight to the tip with scattered fine setae. It also differs from *D. bikanerensis* and *D. gymnosporiae* [27] in having the ventral plate acutely pointed apically, with a bunch of minute setae near the apex.

For the fifth instar larvae, in *Diaphorina maytenensis* sp. nov., flattened dorsoventrally, broadly oval, about 1.86 mm in length; margins of wing pads with minute setae. It is close to *D. gymnosporiae* [27] with body broadly oval, but less long, about 1.35 mm in length. It differs from *D. zebrana* and *D. virgata* [10] with body elongated, and margins of wing pads with sometimes moderately long setae in *D. zebrana* [10].

Margin of the caudal plate beset with a row of more than forty-five pointed lanceolate setae on each side (a group of more than 90). Tip of abdomen with deep indentation bearing three very long simple setae on each side (a group of 6 at tip)

and a row of four very long simple setae plus one pointed lanceolate seta on each side of indentation margins (a group of 8 plus 2). It differs from other species with type of setae: entire margin beset with a continuous series of slender pointed lanceolate setae in *D. gymnosporiae* [27], *D. zebrana* and *D. virgata* [10].

Anal opening terminal, on the posterior margin of the abdomen; circumanal pore ring close to anal margin, V reversed-shaped consisting of two rows of pores, outer with oblongate pores and inner with rounded pores in *Diaphorina maytenensis* sp. nov. It differs from *D. zebrana* [10] with circumanal ring kidney-shaped consisting of a single row of pores, not close to the margin. It also differs from *D. virgata* [10] with circumanal somewhat kidney-shaped and slightly closer to the apical margin, and it equally differs from *D. gymnosporiae* [27] with circumanal ring not close to the margin, outer circumanal pore consisting of a single row of split-like pores and the inner ring of indistinguishable pores.

Tarsal arolium in *Diaphorina maytenensis* sp. nov. is triangular fan-shaped, widened apically with a long petiole. It differs from *D. gymnosporiae* [27] with tarsal arolium small with a very short petiole.

5. Conclusions

Diaphorina maytenensis sp. nov., also newly described, is associated with *Maytenus senegalensis* (Celastraceae); it is morphologically different from other species of the *Diaphorina* genus. Specific characters were described on the forewing subhyaline, membrane milky white, a distinct dark brown longitudinal stripe extending from the base to the apical margin of R + M + Cu₁, M + Cu₁, R and R₅ veins, a marginal stripe from the apex of the Cu₁ vein to the apex of Cu_{1a}, beyond the apex of the anal vein; vertex sub-rectangular without foveae; male proctiger invaginated basally and apically, lateral lobes large; paramere slightly broad apically, apex surrounded by a cluster of small setae, directed upwards, inner surface with an apical hook directed forward and thick setae directed downwards; female proctiger broadest at the basal half part, dorsal margin slightly curved towards the apex, circumanal pore ring elongate; female subgenital plate conical, broadest at the base and acutely pointed apically; anterior margin incurved at the base, bulging at the base.

Margin of the caudal plate beset with a row of more than forty-five pointed lanceolate setae on each side (a group of more than 90). Tip of abdomen with deep indentation bearing three very long simple setae on each side (a group of 6 at tip) and a row of four very long simple setae plus one pointed lanceolate seta on each side of indentation margins (a group of 8 plus 2). Anal opening terminal, on posterior margin of the abdomen; circumanal pore ring close to anal margin, V reversed-shaped consisting of two rows of pores, outer with oblongate pores and inner with rounded pores.

This study enriched the biodiversity of jumping plant lice of the *Diaphorina* genus from Cameroon. Considering the medicinal importance of the host plant, it is imperative to inventory the entomological fauna in order to protect medicinal

plants.

In our future work, we plan to use molecular data to complement the morphological results in order to discriminate among the many species belonging to the genus *Diaphorina*.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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