



# First Report of the Crapemyrtle Aphid *Tinocallis kahawaluokalani* (Hemiptera : Aphididae) and its Related Natural Enemies in Gabon

Poligui René Noel <sup>a\*</sup>, Apinda Legnouo Emelie Arlette <sup>b</sup>  
and Nzandi Henri <sup>a</sup>

<sup>a</sup> Crops Production Department, National Higher Institute of Agronomy and Biotechnology (INSAB),  
University of Sciences and Technologies of Masuku (USTM), Gabon.

<sup>b</sup> Research Institute in Tropical Ecology (IRET), National Center for Scientific and Technological  
Research (CENAREST), Gabon.

## Authors' contributions

This work was carried out in collaboration among all authors. Author PRN designed the study, performed, wrote the protocol, wrote the first draft of the manuscript and provide significant sampling efforts and identification expertise. Authors ALEA and NH provided valuable participation in sampling investigations and literature searches. All authors read and approved the final manuscript.

## Article Information

DOI: 10.9734/AJAHR/2023/v10i1219

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:  
<https://www.sdiarticle5.com/review-history/96050>

Original Research Article

Received: 20/11/2022

Accepted: 28/01/2023

Published: 02/02/2023

## ABSTRACT

A study was carried out among some green spaces in Gabon, mainly in Libreville, Lambarene, Mouila, Franceville and Mitzic, from August 2019 to October 2021. The aim was to assess the presence and impact of the Japanese aphid *Tinocallis kahawaluokalani* Kirkaldy (Hemiptera : Aphididae), and its related natural enemies, using one time visual observations on Crapemyrtle

\*Corresponding author: Email: [rnpoligui@gmail.com](mailto:rnpoligui@gmail.com);

shrubs. This ornamental plant pest was recorded, occurring on leaves of *Lagerstroemia indica* (L.) Pers. (Lythraceae). Seven local beneficial insect species were observed preying on this aphid, mainly three hoverflies *Ischiodon aegyptius* Wiedemann, *Paragus borbonicus* Macquart, *Asarkina* sp. (Diptera : Syrphidae), three ladybird species *Platynaspis capicola* Crotch, *Scymnus interruptus* Goeze and *Chilocorus nigritus* Fabricus (Coleoptera : Coccinellidae), and the brown lacewing *Micromus* sp. (Neuroptera : Hemerobiidae), as natural enemies of *T. kahawaluokalani*, highlighting a local promising way for biocontrol of this pest. These findings are a new record for this insect pest from the Gabon and Africa.

**Keywords:** *Tinocallis kahawaluokalani*; leaf infestation; *Lagerstroemia indica*; natural enemies; biocontrol.

## 1. INTRODUCTION

Ornamental plants are widely present in all of the human artificially green spaces because of their beautiful flowers and ability to be managed in various aesthetic shape within home and public gardens. Some of them are frequently attacked by insect pest species such as aphids (Hemiptera : Aphididae) [1]. The crape myrtles are common woody plants cultivated as shrubs with aesthetically pleasing design, particularly *Lagerstroemia* spp (Lythraceae) which contribute to urban landscape beautification [2]. The major insect pest species reported as infesting this plant belong to sap sucking group, which major foliage pest is the Crape myrtle aphid (CMA) *Tinocallis kahawaluokalani* Kirkaldy (Hemiptera : Aphididae) [1,3-5], followed by the Crape myrtle Bark Scale *Acanthococcus Lagerstroemiae* (Kuwana) (Hemiptera : Eriococcidae) [6]. The main damages resulting from their attacks consist on black sooty mold on leaves due to their honey-dew excretions [6]. Heavy infestations may conduct to aesthetic alteration and reduce visual appeal or lead to leaf drop. The plant health could decline in cases of heavy attacks of the CMA [5]. This aphid species is reported to occur in some Asian countries as China, Japan, Thailand [2], India [7], Taiwan, some of North America as USA [4,6], Hawaii [2], Central America as Mexico [6], Latine America as Argentina [8], Brazil [9], Eastern South of Europa [10,11], and middle Orient as Iran [12]. For long time the CMA *T. kahawaluokalani* was an exotic pest species for Africa, for it has only been cited in Cameroon [13] but not in any other region nor country of this continent. Therefore, its favourable condition areas, impact and role in this continent are not well known. This first report in Gabon highlights main Knowledge on its

distribution and the presence of its natural enemies.

## 2. MATERIALS AND METHODS

### 2.1 Sampling Data

Field surveys were conducted within shrubs of cultivated *Lagerstroemia indica* (L.) Pers. (Lythraceae), in five provinces. The number of sites and shrubs varied according to the ornamental plant's population per locality. The data were based on a global number of 30 sampling sites (avenue sides) from localities of Libreville, Lambarene, Mouila, Franceville and Mitzic, from august 2019 to October 2021 (Table 1).

### 2.2 Pest and Enemies Identification

The earliest aphid samples were collected with the help of fine paintbrush and preserved in 70% ethyl alcohol in 15ml glass vials for later identification at laboratories, as well for some larvae or adults of natural enemies kept in rearing plastic boxes on twigs bearing their preys (CMA). To confirm the field direct identification, the collected insects (CMA and predators) from Franceville, Lambarene, Mitzic and Mouila were brought at the Crop Plants Protection Laboratory (CPPL) of the Institut National Supérieur d'Agronomie et Biotechnologies (INSAB) from the University of Sciences and Technologies of Masuku (USTM) (Haut-Ogooué Province), whereas those collected from Libreville were analyzed at the Institut des Recherches Agronomiques et Forestières (IRAF) from the Centre National de la Recherche Scientifique et Technologique (CNAREST) (Estuaire Province).

**Table 1. Sampling sites of survey from August, 2019 to October, 2021, in Gabon**

| No. | Locality (Province)              | City location                    | Coordinates (latitude, longitude) |
|-----|----------------------------------|----------------------------------|-----------------------------------|
| 1   | <b>Libreville (Estuaire)</b>     | Carrefour Démocratie             | 0°25'33"N ; 9°27'24"E             |
| 2   |                                  | Carrefour Awendje                | 0°23'12"N ; 9°28'26"E             |
| 3   |                                  | Carrefour Sogatol                | 0°22'38"N ; 9°28'19"E             |
| 4   |                                  | Oloumi                           | 0°22'26"N ; 9°27'49"E             |
| 5   |                                  | Nzeng Ayong                      | 0°25'46"N ; 9°29'06"E             |
| 6   | <b>Franceville (Haut-Ogooué)</b> | Yéné                             | 1°38'24"S ; 13°34'21"E            |
| 7   |                                  | Gare ferroviaire                 | 1°37'54"S ; 13°34'49"E            |
| 8   |                                  | Carrefour Sogafric               | 1°37'51"S ; 13°35'11"E            |
| 9   |                                  | Echangeur                        | 1°37'46"S ; 13°34'57"E            |
| 10  |                                  | Avenue tribunal                  | 1°37'35"S ; 13°36'00"E            |
| 11  |                                  | Hôtel Evoula Palace              | 1°38'28"S ; 13°36'17"E            |
| 12  |                                  | Ngobounda                        | 1°37'20"S ; 13°36'09"E            |
| 13  |                                  | Potos                            | 1°37'54"S ; 13°34'49"E            |
| 14  |                                  | Ngoungoulou                      | 1°36'24"S ; 13°36'13"E            |
| 15  |                                  | Mega mall                        | 1°35'43"S ; 13°36'13"E            |
| 16  |                                  | Djamiti                          | 1°35'43"S ; 13°36'13"E            |
| 17  |                                  | Ondzei                           | 1°37'28"S ; 13°36'50"E            |
| 18  |                                  | Ongali                           | 1°37'19"S ; 13°36'55"E            |
| 19  |                                  | IDA**                            | 1°38'09"S ; 13°34'19"E            |
| 20  | Makana                           | 1°38'02"S ; 13°33'34"E           |                                   |
| 21  | USTM                             | 1°38'24"S ; 13°34'21"E           |                                   |
| 22  | <b>Mouila (Ngounié)</b>          | <b>Carrefour Ecole St Martin</b> | <b>1°51'58"S ; 11°03'34"E</b>     |
| 23  |                                  | Complexe administratif           | 1°58'24"S ; 13°03'37"E            |
| 24  |                                  | Hôtel Lac Bleu                   | 1°52'18"S ; 11°03'34"E            |
| 25  |                                  | Palais de Justice                | 1°52'05"S ; 11°03'25"E            |
| 26  |                                  | Place indépendance               | 1°51'54"S ; 11°03'25"E            |
| 27  | <b>Lambaréné (Moyen-Ogooué)</b>  | <b>Lycée Adiwa</b>               | <b>0°41'31"S ; 10°13'42"E</b>     |
| 28  |                                  | Hôtel de Ville                   | 0°42'30"S ; 10°13'21"E            |
| 29  | <b>Mitzic</b>                    | <b>Hôpital Général</b>           | <b>0°46'31"N ; 13°34'21"E</b>     |
| 30  | <b>(Woleu Ntem)</b>              | Village Afia                     | 1°04'12"S ; 11°41'31"E            |

### 2.3 Pest Distribution

With the purpose of recording the CMA occurrence on other host plants, complementary observations were carried out on *Largestroemia speciosa* (L) Pers and *Lawsonia alba* L. (Lythraceae) at Franceville, Okondja and Onguia village, because literatures reported these species as other host plants of CMA [5,7]. All the visible trees were examined for observation of the CMA *T. kahawaluokalani* and relate natural enemies. All the infested plants were taken into consideration basing on presence of the Crapemyrtle aphid and enemies.

### 2.4 Pest Infestation Level and Impact

The assessment of the pest infestation was based on evaluating individuals rate of aphids per plant tools. Therefore, five twigs were randomly chosen per tree, and aphids and relate enemies were counted on five leaves from tip of each twig, following OILB/SROP recommended method [14] and used in this area [15]. This method consist on selecting a same representative number of tools per observed tree, and recording tools with aphids and their natural enemies. Therefore, the aphid's infestation levels were established on five twigs per tree, and per site using following basic formula:

### Infestation level

$$= \frac{\text{Number of infested stools}}{\text{Total of infested stools}} \times 100[\%]$$

Infested tools in this study correspond to a number of plants, twigs or leaves bearing aphids. Therefore, total number of stools represent all the sampling plants, twigs or leaves. The CMA colonies were evaluated by calculating Abundance rate of individuals per twig. Five twigs were randomly selected within the shrub canopy, at the human height [15], and for each twig, five leaves were observed from it tip. As some leaves were abundantly infested, the Aphid Rate Level per twig (ARFLT) was calculated from a free scale with rates ranging from 1 to 10 aphids (very weak level), 10 to 30 (weak level), 30 to 100 (middle level), and 100 to 200 individual insects (high level).

The impact on infested twigs was observed according literature levels pointing out honey-dew, black sooty mold and plant decline [5]. Honey dew is a clear, sticky liquid on upper side of leaves, left by many insect species, namely aphids, scale insects, whiteflies and cochineals. This honey-dew is damageable for crops because often turning on a black sooty mold (Fig.1b) altering the plant photosynthesis. From this alteration, our scale to evaluate the impact resulting from the honey-dew of *T. kahawaluolani* consisted on recording attacked shrubs

according to five damage levels, as level 1 (no damage, no honey-dew, green leaves), level 2 (little honey-dew), level 3 (much honey-dew), level 4 (black sooty mold), and level 5 (leaves dropping-off).

## 2.5 Occurrence of Natural Enemies

The occurrence of natural enemies was determined simultaneously than the pest assessment. Then, on the same five twigs randomly selected per tree, the enemies were counted on five leaves from tip of each twig, following the OILB/SROP recommended method [14]. The hoverfly, coccinellid and the brown lacewing larvae observed feeding on the aphid *T. kahawaluokalani* were collected and brought to the Crops Plant Protection Laboratory of INSAB, for conservation and/or rearing into plastic rearing vials, still the imagos hatching, for identification. All the CMA and relate natural enemies were identified following systematic keys provided by some available literature references [4,5,9]. Real nature and manifesting pictures (under a Binocular stereoscopic microscope Leica SZB 200) were taken with a Techno park4® camera.

## 2.6 Data Analysis

Descriptive statistics, such as frequency tables, charts, simple means and percentages was used to describe and present data generated.

# 3. RESULTS AND DISCUSSION

## 3.1 Insect Identification

### 3.1.1 Pest diagnosis

*Tinocallis kahawaluokalani* Kirkaldy (Hemiptera : Aphididae) is small aphid of about 1.6 mm long, and known as the major aphid pest of *Largestroemia indica* (Lythraceae). It can easily be recognized with regard of its alate adults broad-bodied shape, and wings held roof-like over the back of the body. Alive alate adults are pale yellow or yellow-green color, with black spots and body markings. Head possess black patterns and pinkish eyes (Fig. 2). The antennae, shorter than the body are pale and compound with six segments having each one a darkened apex. Thorax has dark longitudinal strips (Fig. 2). Forewings are especially characterized by dark markings along the main vein (pterostigma fully dark pigmented) ; media branches are also dark

or dusky color. Abdomen is yellow, with two dark spots on tergite I, large and transversal dark patch on tergite II bearing a spiny paired tubercle (double-pronged hump) (Fig. 2). Foreleg is yellow pale, the media and hind legs are yellow brownish, with dark apex of femorae, and dark base of tibia. Siphunculi are smooth, small and dark color, with equal length and width. Cauda is pale and knobbed. Immature instars are yellow pale with pinkish to red eyes. The body is spotted covered with greyish tubercles bearing each one a black bristle. The prominent paired tubercle observed on the adult abdominal tergite II is absent (Fig. 2), and the cauda and the siphunculi are pale.

### 3.1.2 The natural enemies

Seven beneficial species were recorded predated on the crapemyrtle aphid, namely predatory hoverflies, coccinellids, and hemerobiid species (Figs. 3, 4), from Franceville, Libreville and Mitzi.

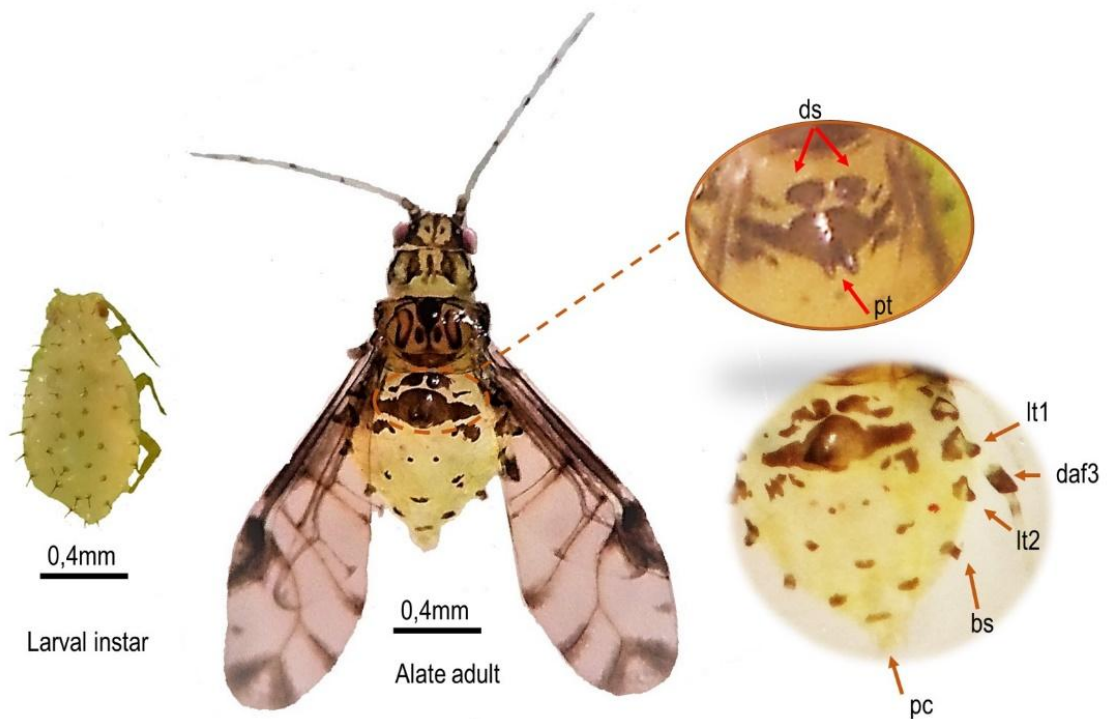
Predatory hoverflies (Diptera : Syrphidae) predated in CMA were *Asarkina* sp., *Ischiodon aegyptius* and *Paragus borbonicus*.

*Asarkina* sp. (Macquart ,1842) specific characteristics were glabrous green larvae and pupa with a thin brown paired apex, and a yellow adult with transversal black bold stripes on abdominal tergites (Fig. 3a to c). *Ischiodon aegyptius* (Wiedemann, 1830) has spiny green larval instars and pupae, and adults both male and female have a yellow pale body color. Abdominal transversal stripes, eye and thorax are dark color (Fig. 3 d to g). *Paragus borbonicus* (Macquart ,1842), compared to former hoverflies, has smallest and very spiny brown larvae and pupae. Adult has a broad body with a large transversal orange stripe in abdominal mid tergum (Fig. 3h to k).

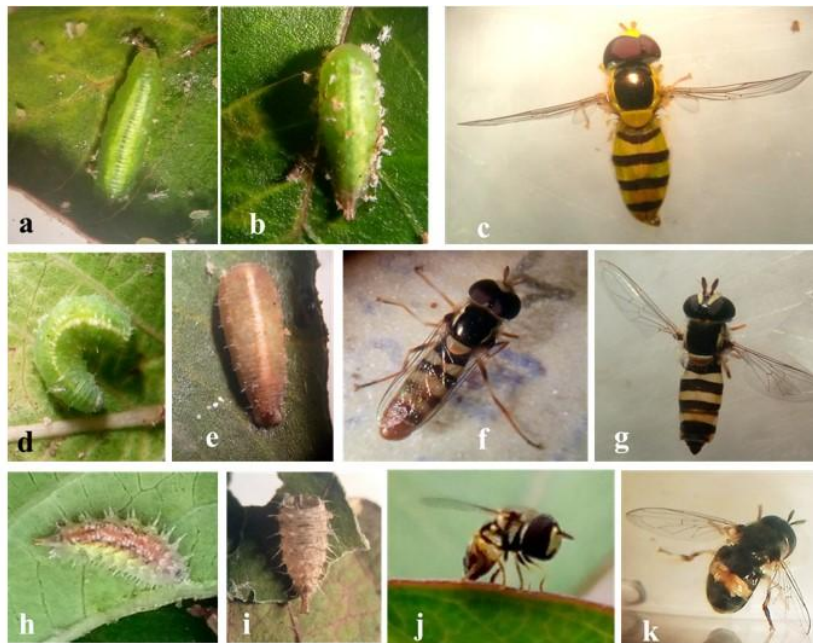
Predatory coccinellids (Coleoptera : Coccinellidae) observed predated in CMA were *Chilocorus nigrinus* (Fabricius, 1798), *Platynaspis capicola* (Crotch, 1874), *Scymnus interruptus* (Goeze, 1777). *Chilocorus nigrinus* has greyish yellow to brown larvae with spiny hair-covered their dorsal surface. The adults have a semi-spherical , black and brightening elytra with orange areas between the eyes and on the antero-lateral tips of the pronotum (Fig. 4a to d).



**Fig. 1. *Tinocallis kahawaluokalani* observed in Gabon : heavy infestation of the CMA on a young leaf of *Largestroemia indicia* showing a green syrphid larva (a), upper side of leaves covered with black sooty mold growing on aphid honeydew (b), nymph (c) and adult (d), typical tubercle on abdomen (e)**



**Fig. 2. *Tinocallis kahawaluokalani* and its characteristic abdominal organs (ds:dark spots ; pt : paired tubercle ; lt1,2 : lateral tubercles 1,2, daf3 : dark apex of femora 3 ;bs : brown siphunculi ; pc : pale cauda)**



**Fig. 3. Hoverflies (Diptera : Syrphidae) predated in CMA : *Asarkina* sp. (a : larval instar, b : pupae, c : adult) ; *Ischiodon aegyptius* (d : larval instar, e : pupae, f : male, g : female), *Paragus borbonicus* (h : larval instar, i : pupae, j : laying female, k : male)**



**Fig. 4. Coccinellids and Hemerobiid predators: *Chilocorus nigritus* ( a : larva, b : nymph, c : adult on twig , d : 3.5x magnifying adult), *Platynaspis capicola* ( e : minute and 5x magnifying adult), *Scymnus interruptus* ( f : adult), *Micromus* sp. (g: nymph, h: adult)**

*Platynaspis capicola* is a very small ladybeetle of large ovale shape (2.7 mm long) covered with short hairiness. Elythrae are black color and marked each one by two orange spots (Fig. 4e).

*Scymnus interruptus* is as mall ovale ladybeetle with about 2mm length. The common design of this species features is a black body with a lateral orange or reddish spot on the

anterolateral half of the elytra, not touching the base or the suture (Fig. 4f).

*Micromus* sp. is a neuropteran insect belonging to family of Hemerobiidae, also called lacewings with weakly hairy campodeiform larvae and brown adults. Both insect instars are CMA predatory (Fig.4g, h).

### 3.2 Pest Distribution

The assessment of the Crapemyrtle aphid throughout 30 sites of five gabonese localities showed presence of *Tinocallis kahawaluokalani* (Fig. 1) on 75% of *Largestoemia indica* of all the investigated provinces (Table 2). The major observed crape myrtles were highly infested, as for the Western province (Estuaire), the Center (Moyen-Ogooué and Ngounié), the Eastern (Haut-Ogooué) and the Northern (Woleu-Ntem). The insect was present in all the sampling regions of the country. The earliest infestations were recorded on August 2019 at Libreville (infested trees were 85,71%), July 2020 at Lamabaréné (60 %) and Mouila (83,33%), whereas latest records occurred on October 2021 at Franceville (84,09%) and Mitzic (71,43 %) (Table 2). Observations on potential alternative hosts at Franceville and surrounding localities, especially on ten individuals of *Largestoemia speciosa* (L) Pers and twelve *Lawsonia alba* L. (Lythraceae) showed any CMA infestation, certainly because the CMA host preference in this town goes exclusively on *L. indica*.

### 3.3 Infestation and Impact Level

Weak, heavy and very heavy infestation were recorded inducing presence of honey-dew, black sooty mold, and plant defoliation, mainly in Estuaire, Ngounié and Haut-Ogooué provinces (Table 2).

### 3.4 Occurrence of Natural Enemies

The predominant hoverfly species were respectively *Asarkina* sp present on 20 to 25% of twigs, *Ischidon aegyptius* (50 to 100%), and *Paragus borbonicus* (10 to 100%) (Table 3). Coccinellid species were *Platynopsis capicola* (20%), *Chilochrus nigritus* (20 to 80%) and *Scymnus interruptus* (20%). The hemerobiid predatory species was the brown lacewing *Micromus* sp. (8 to 20%) (Table 3). In addition, numerous individuals of *Deraeocoris* sp. (Hemiptera : Miridae) and *Orius* sp. (Hemiptera : Anthocoridae) were found associated with the CMA populations.

### 3.5 Discussion

Among prospected localities, Franceville revealed highest natural enemies abundance and diversity

because of deeper sampling effort. This study is a first time report of the *T. kahawaluokalani* occurrence and relate aphidophagous species in Gabon, and certainly a second record in Africa, because within literatures studying CMA, only one mention notices observations of the CMA at Younde and Douala in Cameroon [13], at our knowledge. Any other study was found emphasizing on this pest occurrence in Africa. Moreover, the latest entomofaunic studies in inhabting localities of Gabon [15,16] did not report any infestation of the CMA. Nevertheless, monitoring of this pest at Franceville provided unsuccessful results from 2019 to 2020. The record of CMA that very 2021 year is to indicate it's newly arrival and expansion in this locality. Furthermore, the introduction of the CMA in Gabon seems to be recent, and could have been occurred from Cameroon, or another neighboring or farway country, in the context of global fast world and incrising exchanges. Heavy infestations on shrubs of the train station site (Gare ferroviaire) could lead to suspect the train as having been a transport mean that facilitates that insect occurrence and outspread from Libreville to Franceville. Elsewhere, within the local enemies observed, the syrphid species group, namely *Asarkina* sp., *Ischidon aegyptius* and *Paragus borbonicus* were the major predatory beneficial insects, frequently being predated on the crapemyrtle colonies, whereas the other predators occurred occasionally in some sites. The predatory coccinellids, and Anthocorid *Orius* sp, possibly *Orius insidiosus*, observed on blossoming crape myrtles are other interesting cases needing deeper scientific investigations because, known as predatory enemies of the crapemyrtle aphid [17]. This presumable anthocorid predator is recognized as an omnivorous insect predilecting small hemipterans and flower resources, with behaviour to aggregate in areas with high concentrations of pollen [18]. The synergist aphidophagous predation on CMA allowed to record very few has an effective and depressive action the CMA. month later after first observations [19,20]. Indeed, we observed very few presence of the CMA one month later after first observations, confirming then effectiveness of local natural enemies on the crapemyrtle aphid [19,20]. Some of these predators had previously been recorded by local former local authors [15,16], and are potential biological candidates for mass rearing to reinforce their effectiveness as an IMP promising way. The study did not find mummified aphids,

**Table 2. Occurrence and distribution of *Tinocallis kahawaluokalani* Kirkaldy (1906) (Hemiptera : Aphididae) (on 5 twigs per tree)**

| Locality (Province)         | Sites (& N shrubs)           | Infested trees (%)  | Prevalence of <i>Tinocallis kahawaluokalani</i> |                   |                                    |
|-----------------------------|------------------------------|---------------------|---|-------------------|------------------------------------|
|                             |                              |                     | Infestation rate (ARFLT*)                       | Infestation level | Damage level                       |
| Libreville (Estuaire)       | Carrefour Démocratie (2)     | 100                 | 500 - 1000                                      | +++++             | Much honey-dew, Leaves drop        |
|                             | Carrefour Awendje (8)        | 100                 | 30 - 100  | +++               | Little honey-dew                   |
|                             | Carrefour Sogatol (3)        | 100                 | 30 - 100  | +++               | Little honey-dew                   |
|                             | Oloumi (3)                   | 100                 | 30 - 100  | +++               | Little honey-dew                   |
|                             | Nzeng Ayong (2)              | 0                   | 0   | -                 | No damage                          |
|                             | Yéné (3)                     | 0                   | 0   | -                 | No damage                          |
| Franceville (Haut-Ogooué)   | Gare ferroviaire (2)         | 100                 | 500 - 1000                                      | +++++             | Black sooty mold                   |
|                             | Carrefour Sogafric (2)       | 0                   | 0   | -                 | Green leaves                       |
|                             | Echangeur (7)                | 62,5                | 150 - 500                                       | ++++              | Much honey-dew,                    |
|                             | Avenue tribunal (1)          | 100                 | 50 - 150  | +++               | Little honey-dew                   |
|                             | Evoula Palace (12)           | 100                 | 50 - 150  | +++               | Little honey-dew                   |
|                             | Ngobounda (4)                | 100                 | 30 - 100  | +++               | Honey-dew                          |
|                             | Potos (1)                    | 100                 | 50 - 150  | +++               | Very little honey-dew              |
|                             | Ngoungoulou (2)              | 100                 | 30 - 100  | +++               | Honey-dew                          |
|                             | Mega mall (2)                | 0                   | 0   | -                 | No damage                          |
|                             | Djamiti (3)                  | 100                 | 5 - 50  | ++                | Very little honey-dew              |
|                             | Ondzei (1)                   | 100                 | 30 - 100  | +++               | Little honey-dew, Black sooty mold |
|                             | Ongali (3)                   | 100                 | 150 - 500                                       | ++++              | Black sooty mold                   |
|                             | IDA** (3)                    | 0                   | 0   | -                 | No damage                          |
|                             | Makana (3)                   | 66,67               | 5 - 50  | ++                | No damage                          |
|                             | USTM (10)                    | 66,67               | 1-10  | +                 | No damage                          |
|                             | Mouila (Ngounié)             | Ecole St Martin (3) | 66,67   | 30 -100           | +++                                |
| Complexe administratif (2)  |                              | 100                 | 30 - 100  | +++               | Little honey-dew                   |
| Hôtel Lac Bleu (3)          |                              | 66,67               | 30 - 100  | +++               | Little honey-dew                   |
| Palais de Justice (2)       |                              | 100                 | 30 - 100  | +++               | Little honey-dew                   |
| Place de l'indépendance (2) |                              | 100                 | 30 - 100  | +++               | Little honey-dew                   |
| Lambaréné<br>(Moyen-Ogooué) | Lycée Adiwa (2)              | 0                   | 0   | -                 | No damage                          |
|                             | Hôtel de Ville (1)           | 100                 | 30 - 100  | +++               | Little honey-dew                   |
| Mitzic<br>(Woleu Ntem)      | Hôpital Général (5)          | 100                 | 50 - 150  | +++               | Black sooty mold                   |
|                             | Village Afia (2)             | 0                   | 0   | -                 | No damage                          |
| <b>Total</b>                | <b>30 sites (104 shrubs)</b> | <b>75</b>           |   |                   |                                    |

Legend : \*ARFLT = Abundance rate on five leaves per twig ; \*\*IDA = Inspection Déléguée d'Académie



**Table 3. Occurrence of beneficials (on 5 twigs per tree) according to the pest aphid level**

| Localities (Province)     | City location        | Pest aphid<br><i>Tinocallis kahawaluokalan</i> i Kirkaldy (1906) (Hemiptera : aphididae) | Beneficials' insects (natural enemies of CMA) |              |  |           |  |           |  |           |  |              | Associated insects   |           |  |           |   |           |  |           |
|---------------------------|----------------------|--|---|--------------|--|-----------|--|-----------|--|-----------|--|--------------|--|-----------|--|-----------|---|-----------|--|-----------|
|                           |                      |  | <i>Asarkina</i> sp (Diptera : Syrphidae)      |              | <i>Ischidon aegyptius</i> Wiedemann (1830) (Diptera : Syrphidae) |           | <i>Paragus borbonicus</i> (Macquart (1482) (Diptera : Syrphidae) |           | <i>Platynaspis capicola</i> Crotch (1874) (Coleoptera : coccinellidae) |           | <i>Chilocorus nigritus</i> Fabrcus (1798) (Coleoptera : coccinellidae) |              | <i>Scymnus interruptus</i> Goeze (1885) (Coleoptera : coccinellidae) |           | <i>Micromus</i> sp (Neuroptera : Hemerobiidae) |           | <i>Deraeocoris</i> sp (Hemiptera : Miridae) |           | <i>Orius</i> sp (Hemiptera : Anthocoridae) |           |
|                           |                      |  | n   | % tb*        | n  | % tb      | n  | % tb      | n  | % tb      | n  | % tb         | n  | % tb      | n  | % tb      | n   | % tb      | n  | % tb      |
| Libreville (Estuaire)     | Carrefour Démocratie | +++++  | -   | -            | 6  | 80        | -  | -         | -  | -         | -  | -            | -  | -         | -  | -         | -   | -         | -  | -         |
| Franceville (Haut-Ogooué) | Gare ferroviaire     | +++++  | 1   | 20           | 10   | 100       | 1  | 10        | -  | -         | 1  | 20           | -  | -         | -  | -         | 3   | 30        | 3  | 20        |
|                           | Echangeur            | ++++   | 2   | 25           | 9  | 60        | 5  | 100       | 1  | 20        |  |              | 3  | 20        | 2  | 8         | -   | -         | -  | -         |
|                           | Ngobounda            | +++  | -   | -            | 7  | 50        | -  | -         | -  | -         | -  | -            | -  | -         | -  | -         | -   | -         | -  | -         |
|                           | Quartier sable       | +++  | -   | -            | 6  | 80        | -  | -         | -  | -         | -  | -            | -  | -         | -  | -         | -   | -         | -  | -         |
|                           | Ongali               | ++++   | -   | -            | 6  | 80        | -  | -         | -  | -         | 11   | 80           | -  | -         | -  | -         | -   | -         | -  | -         |
| Mitzi (Woleu Ntem)        | Hôpital Général      | +++  | -   | -            | -  | -         | -  | -         | -  | -         | -  | -            | -  | -         | 1  | 20        | -   | -         | -  | -         |
| <b>Total</b>              |                      |  | <b>3</b>                                      | <b>23,08</b> | <b>44</b>  | <b>69</b> | <b>6</b>   | <b>15</b> | <b>1</b>   | <b>20</b> | <b>12</b>  | <b>63,16</b> | <b>3</b>   | <b>20</b> | <b>3</b>                                       | <b>12</b> | <b>3</b>                                    | <b>30</b> | <b>3</b>                                   | <b>20</b> |

Legend : \*tb= twigs bearing beneficial or associated insects

as to confirm unsuccessful assessment from former authors pointing out the lack of parasitoids attacking CMA [13]. Some of these predators previously had been recorded by local former authors [15,16], and are potential biological candidates for mass rearing to reinforce their effectiveness as an IMP promising way. Considering current observations, efforts are to be made to develop deeper knowledge and efficient strategies to control the CMA in this environment.

#### 4. CONCLUSIONS

The Japanese aphid is well established and spreading in Gabon. From the Estuaire Western province, the Ngounié Center province, the Haut-Ogooué Eastern province, and the Woleu-Ntem Northern province, the crape myrtle aphid occurrence is recorded, with local natural enemies belonging to syrphids, coccinellids, hemerobiids and minute pirate bugs (anthocorid). Regular monitoring is recommended and control measures might to take in account rearing, release and preservation of natural enemies of *T. kahawaluokalani*. Nevertheless, since this insect pest is newly recorded in Gabon and now reported from the African continent, assessment efforts are needed to state on its economic threshold of infestation, in order to develop global management strategies against this ornamental threat in Africa.

#### ACKNOWLEDGEMENTS

We are grateful to the Staff of University of Sciences and Technologies of Masuku (USTM), Franceville (Gabon) for having allow us to carry out this study, particularly travelling from Haut-Ogooué to Woleu-Ntem provinces. Special thanks go to anonymous reviewers for their helpful comments and suggestions, which contributed to improve the manuscript. We're grateful to all the colleagues of USTM for their patience during our travel to Oyem, when the bus was stopping sometimes to allow field investigations. Thanks to the student Odjele Cornelie Brishka for her help during some sampling times in Franceville.

#### COMPETING INTERESTS

All authors disclose any financial and personal relationships with other people or organizations that could inappropriately influence their work. This work was performed without funding, consultancies or other potential involvement that

could lead to conflicts of interest. Authors declare that no competing interests exist.

#### REFERENCES

1. Blackman RL, Eastop VF. Aphids on the World's trees. An identification and information guide. CAB International, Wallingford, Oxon; 1994.
2. Gilman E F, Watson D. G. *Lagerstroemia indica* Crape-Myrtle. Fact Sheet ST-342. Environmental Horticulture Department, Florida Cooperative Extension Service, IFAS, University of Florida, USA ; 1993.
3. Baker J, Carter C C, Horn KF, Kline D, Scott J, Singletary H, Stephan D. Pests of Crape Myrtle : Key to Crape Myrtle Pests. *NC State Extension Publications* USA (published online). 1993. <https://content.ces.ncsu.edu/insect-and-related-pests-of-shrubs/pests-of-crape-myrtle>
4. Herbert J J, Mizell R, Mc Auslane H. Host preference of the Crape Myrtle Aphid (Hemiptera : Aphididae) and host suitability of Crape Myrtle cultivars. *Environ. Entomol.* 2009;38 :1155-1160.
5. Herbert JJ, Mizell R. Crape Myrtle Aphid, *Tinocallis kahawaluokalani* (Kirkaldy) (Insecta : Hemiptera : Aphididae). Fact Sheet EENY365. Department of Entomology and Nematology, UF/IFAS Extension, University of Florida, USA. ; 2018.
6. Wang Z. Biology and Ecology of Crape Myrtle Bark Scale *Acanthococcus lagerstroemiae* (Kuwana) (Hemiptera : Eriococcidae) LSU Master's Theses ; 2017.
7. Agarwala BK, Mahapatra SK, Ghosh AK. Description of sexual morphs of *Tinocallis kahawaluokalani* (Kirkaldy) (Homoptera: Aphididae) from India. *Entomon.* 1989 ; 14 :273-274.
8. Alfonsina S. Aphididae (Hemiptera) on ornamental plants in Córdoba (Argentina). —Rev. Soc. Entomol. Arg. 2008;67(1-2) :49-56.
9. Lúcia A, Peronti BG, Sousa-Silva CR. Aphids (Hemiptera : Aphidoidea) of ornamental plants from São Carlos, São Paulo state, Brazil. *Rev. Biol. Trop.* 2002;50(1):137-144.
10. Tsitsipis JA, Nikos KI, John MT, Dionyssios LP, Apostolos AD, Ioanna G. A contribution to the aphid fauna of Greece. *Bull. Insectology.* 2007;60(1):31-38.

11. Schoeny A, Gognalons P. Data on winged insect dynamics in melon crops in southeastern France. Data in Brief, Elsevier, 29. 2020 ; 105132.  
Available :<https://doi.org/10.1016/j.dib.2020.105132>.
12. Chitgar MG. First report of the aphid *Tinocallis kahawaluokalani* (Hemiptera : Aphididae) from Iran. J. E. S. I. 2017 ; 37(3):369-370.
13. Mizell R F, Bennett F D, Reed D K. Unsuccessful search for parasites of the crapemyrtle aphid, *Tinocallis kahawaluokalani* (Homoptera : Aphididae). Fla. Entomol. 2002;85(3):521-523.
14. OILB/SROP. Contrôles, seuils, et indications pour la lutte (Pommier III). In Acta (Eds.). Contrôles périodiques en verger. Acta, Paris, France. French ; 1977.
15. Poligui RN. Étude de l'entomofaune au sein d'associations culturales comprenant le Safoutier (*Dacryodes edulis*) dans le Haut-Ogooué (Gabon). Thèse de doctorat. Gembloux université de Liège Belgique. French ; 2014.
16. Bayendi Loudit SM, Poligui RN, Verheggen F, Francis F. Occurrence of Aphids and their predators within vegetable crops in peri-urban areas in Libreville (Gabon). Commun. Agric. Appl. Biol. Sci. 2017;82(2):199–205.
17. Parsons SE, Frank SD. Urban tree pests and natural enemies respond to habitat at different spatial scales. J Urban Econ. 2019;5(1) :1–15.
18. Isenhour D J, Marston N L 'Seasonal Cycles of *Orius insidiosus* (Hemiptera : Anthorcoridae) in Missouri Soybeans', Journal of Kansas Entomological Society .1981;54:129–42.
19. van den Berg H, Cock MJW. African bollworm and its natural enemies in Kenya. CABI Africa Regional Centre, Second Edition ; 2000.
20. Ssymank AA. contribution to the Syrphidae (Diptera) fauna of Cameroon, with a preliminary checklist of the family. Afr. Invertebr. 2012;53(1):249–266.

© 2023 Poligui et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:  
<https://www.sdiarticle5.com/review-history/96050>