

Myrmecofauna Fruit Trees Infected by *Loranthaceae* Orchards Lokomo (East Cameroon)

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Abstract The objective of this study was to identify the myrmecofauna fruit trees infected by *Loranthaceae* orchards Lokomo (East Cameroon). The collection and identification of myrmecofauna was made on an area of 5 ha. The work was conducted from October to December 2010. The orchards consist of a mixture of exotic ornamental trees, fruit trees for consumption and forest species deliberately left in place. Woody species hosts concerned were *Albizia adianthifolia*, *Caliandra susinamensis*, *Citrus maxima*, *Entandrophragma cylindricum*, *Psidium guajava*, *Macaranga hurifolia*, *Phyllanthus discoides* and *Terminalia mantaly*. A total of seven ant species grouped in six genera and two subfamilies (Formicinae and Myrmicinae) were identified. In Formicinae, two genera have been identified, *Camponotus* and *Oecophylla*. Myrmicinae in turn had three genera, *Atopomyrmex*, *Crematogaster* and *Tetramorium*. The activity of myrmecophilous revealed that ants forage on flowers, fruits and suckers of *T. ogowensis* and *T. preussii*. The suckers dried out and degenerated causing the death of the tufts.

Keywords Myrmecofauna, activity, Loranthaceae, death, Lokomo, Cameroon

1. Introduction

The permanent forest of Cameroon has 14 million ha of forest, including 8 million hectares of production forest and 6 million ha of forest and wildlife reserves[16]. Forest ecosystems are home to 80 % of the carbon of terrestrial vegetation and 40 % of soil carbon. The role of carbon sinks in tropical forests is essential to absorb much of the atmospheric CO₂.

Parts of the forests of Cameroon are located in biogeographic areas experiencing a high degree of endemism. These are the forests of the mountains of Cameroon and Nigeria's forests and plains of western Cameroon and Gabon [19]. The equatorial forests of southeastern region of Cameroon and much more: the "Congo Basin" where some 20 % of the tropical forest is still intact. The Congo basin is the second largest forest in the world in terms of area after the Amazon rainforest. The Congo Basin is known for its exceptional biological and cultural diversity[20]. But over the

last twenty years, the exploitation of tropical forests has reached a level so alarming that the sustainability of this resource is in question. One consequence of logging is the creation of canopy gaps resulting in the proliferation of parasitic *Loranthaceae*[15].

The *Loranthaceae* are flowering, chlorophyll and hemiparasitic epiphytes which are located on the aerial parts of their hosts, and are responsible for economic damage, ecological, technological and morphogenetic varied crops or woody species parasitized[18].

In temperate regions, this plant family comprises of 950 species belonging to 17 genera. In Africa and Arabia, Polhill and Wiens[17], over 500 species has been identified. In Cameroon, Balle[2] listed 7 genera comprising about 26 species. These parasitized species, which have not been sufficiently studied by research structures, is now a real constraint for extension, home gardens, orchards and spontaneous species in Cameroon[4]. The main objective of this study is to contribute to the knowledge of the host species myrmecofauna parasitized by *Loranthaceae* Lokomo orchards in eastern Cameroon. The specific objectives are: (1) Inventory *Loranthaceae* found in orchards Lokomo, (2) identify the associate myrmecofauna and (3) monitor their feeding activity.

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2. Materials and Methods

2.1. Study Site

Lokomo (latitude, 2° 40' and 3° 09' N, longitude 15° 20' and 15° 46' E, altitude ranging between 300 and 500 m) is the forest management unit No. 10-007, located in the Eastern region, department of Boumba and Ngoko, straddling the boroughs and Yokadouma Moloundou. It has a total surface area of 122.294 ha (Fig. 1). The climate is continental influenced by two equatorial winds; the monsoon and the harmattan. These two winds meet to give the intertropical front which regulates the seasonal rhythm. Climatological data provided by the Group Vicwood Thanry dating twenty years (1991-2011) distinguished four seasons (two rainy seasons and two dry seasons), which are divided as follows: mid-March to late June is the early rainy season, late June to

mid-August is the short dry season, mid-August to mid-November is the rainy season and mid-November to mid-March is the long dry season. The region is characterized by high rainfall (1580.99 mm), average temperatures of about 25.19°C and the relative humidity is high throughout the year.

2.2. Data Collection for the Study

2.2.1. Site Selection Study

The site chosen for this study is twenty-five years old occupying about 5 ha and contains orchards and secondary forests degraded. Four surveys were conducted in three orchards (orchards 1, 2 and 3) and in a degraded secondary forest following a transect oriented from homes into the forest.

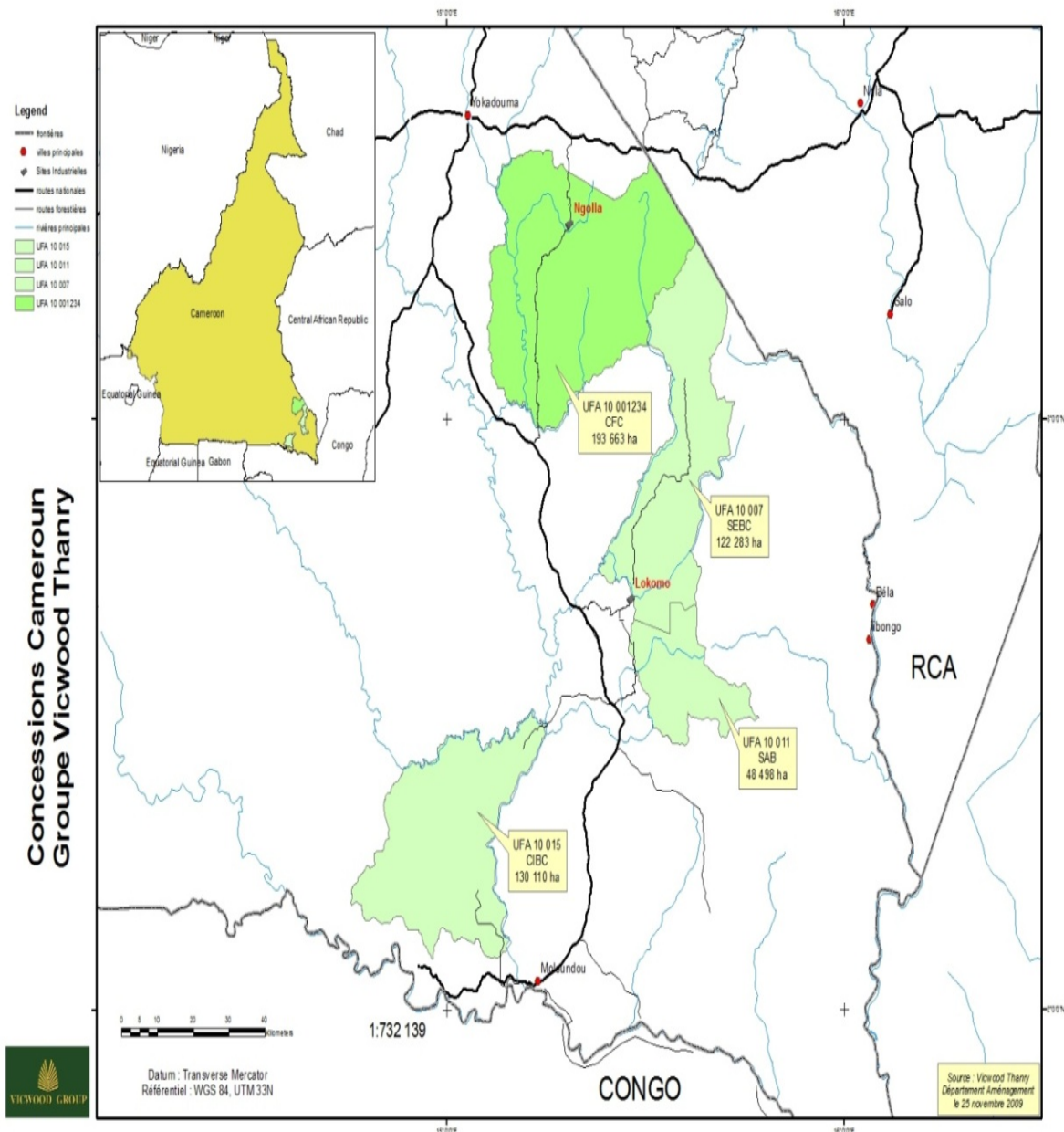


Figure 1. Lokomo site location on the map of Cameroon

2.2.2. Course Site

For observations, the surveys' roaming method was used. It was to browse the site chosen along the slopes, explore the trees or shrubs grown spontaneous which were likely to be infected by *Loranthaceae* in different plant communities.

The collection and identification of myrmecofauna were conducted from October to December 2010. Agroecosystems consist of a mixture of ornamental trees, exotic fruit for consumption and forest species deliberately left in place. Ants working on the host species were harvested using a machete, which left behind raising points of inking. The ants were collected and stored in black boxes containing alcohol at 70°C in the Animal Biology laboratory of the Faculty of Science of the University of Douala.

Identification of the ant species was done using identification keys from the database of African ants (www.antbase.org) and nomenclature approved by specialists of African ants.

2.3. Data Processing

Excel software was used for Data processing as well as for statistical analysis.

3. Results

3.1. Parasitism by orchards Lokomo *Loranthaceae*

A total of 17 host species of *Loranthaceae* were identified. These species were grouped into 10 families and *Rutaceae* is the most diversified with five species (Table 1).

Counts of the number of clumps of *Loranthaceae* identified during the study revealed that *Tapinanthus preussii* was the most wide spread in the study site with a percentage of parasitism of 64.49 %, followed by *Tapinanthus ogowensis* with 35.44 % and lastly *Phragmanthera capitata* with a single clump representing just 0.06 %.

Table 1. Parasitized by fruit trees on the site of *Loranthaceae* Lokomo

No	Families	Species parasitized
1	<i>Annonaceae</i>	<i>Annona miricata</i>
2	<i>Burseraceae</i>	<i>Dacryodes edulis</i>
3	<i>Combretaceae</i>	<i>Terminalia mantaly</i>
4	<i>Ebenaceae</i>	<i>Dyospiros crassiflora</i>
5	<i>Euphorbiaceae</i>	<i>Macaranga hurifolia</i>
6	<i>Fabaceae</i>	<i>Pterocarpus soyauxii</i>
		<i>Entandrophragma cylindricum</i>
		<i>Pentaclethra macrophylla</i>
		<i>Calliandra surinamensis</i>
7	<i>Irvingiaceae</i>	<i>Irvingia gabonensis</i>
8	<i>Myrtaceae</i>	<i>Psidium guajava</i>
9	<i>Rutaceae</i>	<i>Coffea robusta</i>
		<i>Citrus aurantifolia</i>
		<i>Citrus medica</i>
		<i>Citrus lemon</i>
10	<i>Sterculiaceae</i>	<i>Citrus maxima</i>
		<i>Theobroma cacao</i>

3.2. Inventory Myrmecofauna

A total of seven ant species grouped in six genera and two subfamilies were identified (Table 2), Formicinae and Myrmicinae. In Formicinae two genera were identified *Camponotus* and *Oecophylla*. Myrmicinae in turn had three genera, *Atopomyrmex*, *Crematogaster* and *Tetramorium*.

In *Camponotus*, three species of ants were identified *Camponotus acrapimensis*, *C. vividus* and *Camponotus* sp. *Oecophylla*, *Atopomyrmex*, *Crematogaster* and *Tetramorium* each had one species that were respectively *Oecophylla longinoda*, *Atopomyrmex mocqueresy*, *Crematogaster* sp. and *Tetramorium aculeatum*.

It is clear from the above table that the ant species *Camponotus acrapimensis*, *Camponotus vividus* and *Crematogaster* sp. live on several host species parasitized by the *Loranthaceae*. *Oecophylla longinoda* colonizes two host species. *Tetramorium aculeatum* and *Atopomyrmex mocqueresy* (Table 2).

Table 2. Inventory myrmecofauna of host species parasitized by *Loranthaceae* in Lokomo

Ants identified	Host species		
subfamilies	Genus	Species	
Formicinae	<i>Camponotus</i>	<i>Camponotus acrapimensis</i>	<i>Albizia adianthifolia</i>
			<i>Citrus maxima</i>
			<i>Entandrophragma cylindricum</i>
			<i>Phyllanthus discoides</i>
		<i>Camponotus</i> sp.1	<i>Calliandra susinamensis</i>
	<i>Camponotus</i>	<i>Camponotus vividus</i>	<i>Citrus maxima</i>
			<i>Entandrophragma cylindricum</i>
			<i>Psidium guajava</i>
			<i>Terminalia mantaly</i>
	<i>Oecophylla</i>	<i>Oecophylla longinoda</i>	<i>Macaranga hurifolia</i>
Myrmicinae	<i>Atopomyrmex</i>	<i>Atopomyrmex mocqueresy</i>	<i>Psidium guajava</i>
			<i>Calliandra susinamensis</i>
	<i>Crematogaster</i>	<i>Crematogaster</i> sp.	<i>Albizia adianthifolia</i>
			<i>Citrus maxima</i>
	<i>Tetramorium</i>	<i>Tetramorium aculeatum</i>	<i>Phyllanthus discoides</i>
			<i>Psidium guajava</i>

3.3. Interaction between Host/Ant and *Loranthaceae* Lokomo

The myrmecophilous activity revealed that ants forage on flowers, fruits and suckers of *T. ogowensis* (Fig. 2) than on *T. preussii* (Fig. 3). A freehand cut with a machete showed that these ants dug many galleries where their presence was remarkable and significantly abundant. In all *Tapinanthus* identified, the tunnels in the wood suckers host eventually rot.



Figure 2. Sucker rotten *Tapinanthus ogowensis*



Figure 3. Sucker rotten *Tapinanthus preussii*

Ants by their burrowing action into the suckers as well as their forage activity in search of sweet substances caused the dryness of these suckers leaving a door in the heart of the wood whereby the host will continue to rot (Fig. 4).

The galleries were dug when the cells of host plants in the sucker are destroyed by the *Loranthaceae*. Consequently, there was no connection between the host plant xylem and the *Loranthaceae* resulting in a decreased activity of the sap collection on the host plant in the *Loranthaceae* and sometimes death of the latter.



Figure 4. Gallery dug in the heart of the wood of the host by ants (yellow arrow)

4. Discussion

Three species of *Loranthaceae* have been recorded in the Lokomo site. This is *Tapinanthus ogowensis* (Engler) Danser, *Tapinanthus preussii* (Engler) and Van Tieghem *Phragmanthera capitata* (Sprengel) S. Balle. These parasites are not specific to Lokomo which belongs to the Guinea-Congolian, semi-deciduous rain forest area. Other areas in Africa have also been reported to have these parasites. These areas include Benin, Cameroon, Gabon, Ghana, Guinea, Liberia, Mali, Niger and Senegal[5,6] *al.*, 2009, 2010c).

It appears that the ant species *Camponotus acrapimensis*, *C. Vividus* and *Crematogaster* sp. live on multiple hosts parasitized by the *Loranthaceae*. It should be noted that these are the dominant ants. Mony *et al.*[12,13] noticed that *Crematogaster* ants were the most abundant at 90.19 % in orchards and gardens of the Logbessou boxes.

Crematogaster ants are often dominant in their communities. In New Guinea, a species living in the canopy (*Crematogaster major*), represents 56-99 % of the ants collected on trees[10]. *Crematogaster irritabile* can occupy, in turn, over 99 % of the trees on one quadrant of a hectare in New Guinea[11]. *Crematogaster parabiatica* overwhelmingly dominates the Peruvian Amazon.

The plants myrmecophilous are mostly associated with one or a few species of specialized ants and the association is mandatory for the survival of the partners[21,1,14,7,9]. The loyalty of these interactions is favored by the housing and/or food provided by plants. In return the ants protect their host against defoliators and competitors and can even supply them with nutrients. On the side of the plants, the production of housing for ants (domatia) is a fundamental nature of myrmecophilous species. These domatia are hollow structures that can be localized on the trunk, petiole, stipules or leaf blade. In addition, the settlement of certain myrmecophytes requires drilling of the entry of domatia on the part of the ants[3,8].

Observations on the activity in the myrmecophilous site Lokomo showed that ants foraging on flowers, fruits and suckers of both *T. ogowensis* and *T. preussii*. A freehand cut with a machete shows that these ants dig many galleries where their presence is remarkable and significantly abundant. In all *Tapinanthus* identified, the tunnels in the wood suckers host eventually rot. The sucker serves as fodder for ants. Ants by burrowing in search of sweet substances will feed inside the suckers, causing desiccation and hence will leave a door in the heart of the wood of the host and the decay will continue.

5. Conclusions

The study performed in the industrial site of the Group Vicwood Thancy of Lokomo in the departments of Boumba and Ngoko (Eastern Region) revealed that there are 3 species of *Loranthaceae*: *Tapinanthus preussii* (Engler) Van Tieghem, *Tapinanthus ogowensis* (Engler) Danser and

Phragmanthera capitata (Sprengel) S. Balle. The records of the couple myrmecofauna associated with host/ *Loranthaceae* showed seven ant species grouped in six genera and two subfamilies. They are: *Camponotus acrapimensis*, *C. vividus*, *Camponotus* sp., *Oecophylla longinoda*, *Atopomyrmex mocqueresy*, *Crematogaster* sp. and *Tetramorium aculeum*. The two subfamilies are Formicinae and Myrmicinae. Interactions between host/*Loranthaceae*/ant showed that these ants created galleries in the haustorium of *Loranthaceae*. These galleries interrupt the collection of sap from their hosts of *Loranthaceae* and precipitated death.

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