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Co-Occurring Plant Species of the West African Critically Endangered *Aubregrinia taïensis* Heine, in Côte d'Ivoire

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Abstract

The Upper Guinea Forest is subject to heavy deforestation. In this context, many endemic and/or rare plant species are threatened with extinction. This is the case of *Aubregrinia taïensis* (Aubrév. & Pellegr.) Heine, a critically endangered Sapotaceae species, endemic to Côte d'Ivoire and Ghana. After 3 years of investigation in and around the Tai National Park (TNP) in the West of Côte d'Ivoire, only one individual of this species was located and no sexual reproductive organs (fruits, seeds) were observed. Woody plant species around this individual were inventoried in order to know the species that can co-occur with *Aubregrinia taïensis*. For that a plot of 30 m of diameter was established around the individual and all of the woody species of this circle were inventoried. Then, the taxonomic diversity, the chorology of the species, the conservation status and their life-form were recorded. A total of 130 woody plant species belonging to 51 families were collected in the site. The most represented families are Euphorbiaceae (12 spp.), Rubiaceae (10 spp.), Annonaceae (7 spp.), Fabaceae, Moraceae, Malvaceae (6 spp. each) while the most represented genera are *Diospyros* L. (4 spp.), *Cola* Schott & Endl. and *Vitex* L. (3 spp.). Species from the Guineo-Congolese Region (GC) are the most abundant (72%). They are followed by West African endemic species (GCW, 19%). Microphanerophytes (mp) are the most abundant and represent more than 40% of the species. Three vulnerable species were found in this plot: *Campylospermum amplectens*, *Placodiscus boya* and *Trichoscypha cavalliensis*. Thus, the preservation of this forest is more than necessary.

Keywords

Co-Occurring Species, *Aubregrinia taïensis*, Forest, Threatened Species, Côte d'Ivoire

1. Introduction

Recent studies show that a third of the flora of tropical Africa is potentially threatened with extinction [1]. Overexploitation, loss of natural habitats, deforestation, and shifting agriculture, driven by human development, are all factors that explain the decline of species. The West African Upper Guinean Forest, which extends from eastern Senegal to western Togo (with a gap called the Dahomey gap between Ghana and Togo), is one of the world hotspots of biodiversity [2]. It therefore contains a rich biodiversity and a high rate of endemism. But this forest is subject to heavy deforestation. Despite their biological richness, a number of ongoing threats to biodiversity in the Upper Guinean forests have resulted in the loss of more than 85% of native vegetation cover [3]. For example, in Côte d'Ivoire, the forest which was estimated at 16 million hectares has been reduced to 2.7 million hectares at the end of the 20th century [4]. This has the corollary of the disappearance of ecosystems but also of certain plant species. On the scale of Côte d'Ivoire, more than 30 years ago, 77 plant species in the process of extinction of the flora of the country were listed [5]. In another publication which appeared a few years later, the author adds other species and emphasizes the need to take conservation measures *in situ* and *ex situ*, for species of Sapotaceae (including the one that makes the object of this study, *Aubregrinia taïensis*), in order to avoid their total disappearance from the flora [6]. The Sapotaceae constitute one of the botanical families comprising a high number of threatened trees in Africa and particularly in Côte d'Ivoire [6] [7]. The situation of this family is explained, at least in part, and in addition to the aforementioned factors, by the high endemicity of African species [6] and the "natural" rarity of many species of the family [7]. Moreover, among the 43 native Sapotaceae species of Côte d'Ivoire, 9 are endemic only to the Upper Guinean Forest. Among these species, there is *A. taïensis* which, in addition to being threatened, is endemic to two countries: Côte d'Ivoire and Ghana. It is a unique species in the genus *Aubregrinia* Heine and is classified as critically endangered by IUCN. Indeed, the species is threatened by logging and wood harvesting. As mentioned by Aubréville [7], in the evergreen forest of West Africa, the notion of distribution ranges is difficult to be applied with some species because of the small number of known or reported individuals. *A. taïensis* is one of these rare species. Therefore, *ex situ* and *in situ* conservation strategies must be dedicated to this species once an individual is found. In the frame of an intensive search for *A. taïensis* conducted in and around the Tai National Park in Côte d'Ivoire, one individual was observed in a small fragment of private forest, therefore located outside the park.

This individual did not bear flowers or fruits. The preservation of the individual and species needs not only the conservation of the biotope (the forest) but also the production of seedlings for introduction into botanical gardens or habitats favorable to its development. In such a context, the knowledge of the species associated (co-occurring species) with this individual is extremely important because it is the first level of evaluation of the ecology of the species. Indeed, highlighting co-occurrence patterns is important for understanding the factors that shape plant associations [8] [9]. This requires clear identification of the species present. The current study has been carried out in order to inventory woody plant species associated to the individual of *A. taïensis*.

2. Material and Methods

2.1. Study Area

A. taïensis is a Guineo-congolese species that can grow in evergreen moist or wet evergreen forests or in moister semideciduous forest zone especially on or near hills. The study was carried out in the village of Gahably located in the department of Taï not far from the Taï National Park (**Figure 1**). Indeed, to date, the investigations aimed at locating the individuals of *Aubregrinia taïensis*, in Côte d'Ivoire, have only made it possible to locate a single individual of the species, in this village, in a forest of about 3 hectares, belonging to a peasant. The area is located in the South-West of Côte d'Ivoire. The climate of this region is of the subequatorial type, characterized by heat and humidity during all the year. The average annual rainfall varies between 1400 and 2100 mm [10]. The average annual temperature remains close to 26˚C. There are 4 seasons. The long rainy season (March/April to July) is followed by the short dry season in August. The rain starts again with the small rainy season (September and October). The great dry season which lasts from November until February/March ends the year.

2.2. Studied Species

A. taïenis is a tall tree up to 50 m high and 95 cm in diameter. The bark is pale brown, exuding a white latex. The leaves are alternate, oblong, entire and leathery measuring 13 - 25 cm in length and 5 - 10 cm in width. They are narrowly to broadly obovate, glabrous with base mostly asymmetric, decurrent and arranged at the end of the branches. The venations are very fine and very tight. The fruits are berries containing about 8 seeds. The seeds have a hard, yellow to dark brown, shiny seed coat.

2.3. Inventory and Identification of Co-Occurring Plants

BA surface inventory has been applied and the dimensions used by Tom-Dery *et al.* [11] were adopted. Thus, with a measuring tape and wooden post, a circular plot of 30 m of diameter (*i.e.*, 706.5 m^2) was established around the individual of *Aubregrinia taïensis* (**Figure 2**) which was the center of the circle. All the species present in this circle were recorded. Three circular sub-plots of 5 m radius were

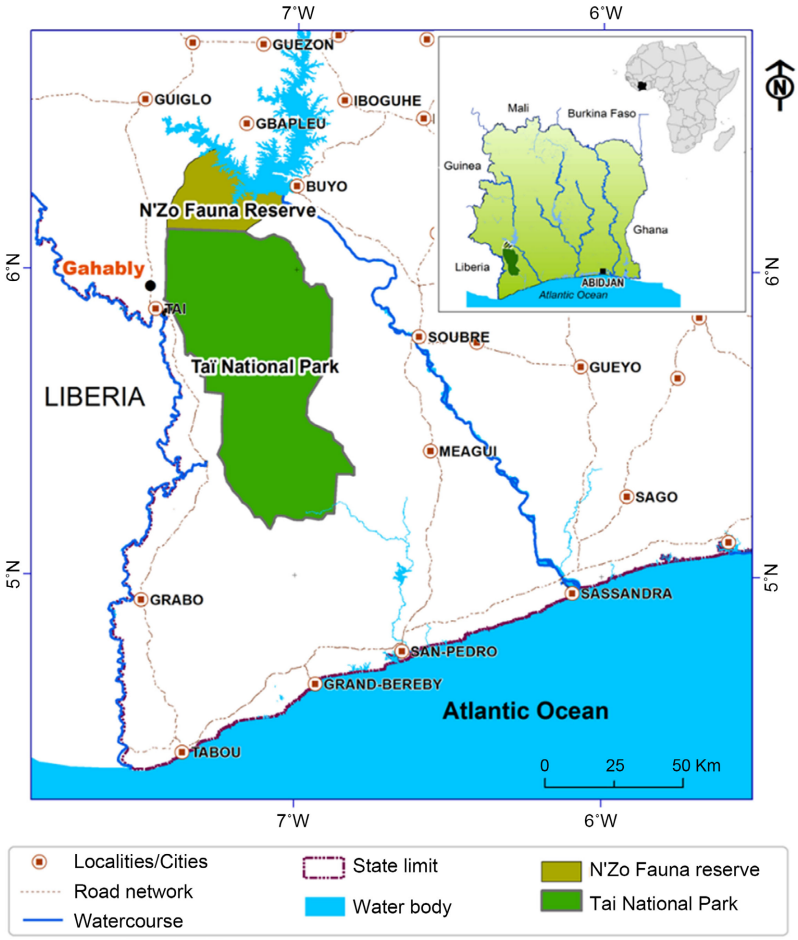

Figure 1. Location of the studied site.

(a) (b)

Figure 2. *Aubregrinia taïensis*; (a) The individual found in the forest fragment of Gahably near Taï National Park (photo Doudjo Ouattara); (b) Leaves from an herbarium specimen of the CSRS (photo Doudjo Ouattara).

placed inside the plot to facilitate the inventory. Recognition of regeneration individuals (seedlings) was carried out with a specialist botanist (Mr. Téré Henri) from the region who has a great knowledge of the flora. The search for possible individuals of *A. taïensis* within this stage of development was carried out by focusing on plants that had latex (Moraceae, Apocynaceae, Sapotaceae, Clusiaceae, etc.). Herbarium samples were collected especially for plants that could not be identified in the field. All the plants were identified at the species level. The samples collected in the field were sent to the herbarium of the "Centre Suisse de Recherches Scientifiques en Côte d'Ivoire". All the specimens are deposited in this herbarium (CSRS). The names of the inventoried species were checked in the online database (https://tnrs.biendata.org/). The nomenclature adopted is that of the phylogenetic classification [12].

2.4. Floristic Analysis

A qualitative analysis of the diversity was carried out in this study. First, the taxonomic diversity was assessed through the number of species, genera and families Then the conservation status, of each species was checked on the IUCN website (https://www.iucnredlist.org/). The chorology of the specimens was determined at the national and regional (West Africa) levels according to the classification proposed by Aké Assi [12]. These are:

-GC: Guinean-Congolese species (represented in the forest areas located in the South of the country);

-SZ: Sudano-Zambesian species (represented in the Center and North of the country;

-GC-SZ: Common species for the Guinean-Congolese and Sudano-Zambesian phytogeographical regions;

-GCW: Endemic species of the forest area situated at the west of Togo, including Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea Bissau, Gambia and Senegal. The life-form of each species has been determined according to Aké Assi [12]. Thus, the megaphanerophytes (MP) are trees over 30 m in height, mesophanerophytes (mP) are trees with heights between 8 and 30 m, microphanerophytes (me) are shrubs with heights between 2 and 8 m, nanophanerophytes (np) are shrubs with heights between 2.25 m and 2 m high. Woody lianas (L) have also been classified on the same model. All these parameters made it possible to acquire an overall idea of the richness and floristic composition of the studied forest. Threatened species and GCW were considered as special status species in this study due to their value for conservation [13].

3. Results and Discussion

3.1. Taxonomic Diversity of Co-Occurring Plants of *A. taïensis*

A total of 130 woody plant species were inventoried in the site (**Table 1**). These species belong to 109 genera and 51 families. The most represented genera are *Diospyros* (4 species), *Cola* and *Vite*x (3 species each). The most representative

families in number of species are those of the Euphorbiaceae (12 species, 9%), Rubiaceae (10 species, 8%), Annonaceae (7 species, 5%) (**Figure 3**, **Table 1**). These families are among the dominant ones identified by Bakayoko *et al.* [14] in forest fragments from the same area, in 2011.

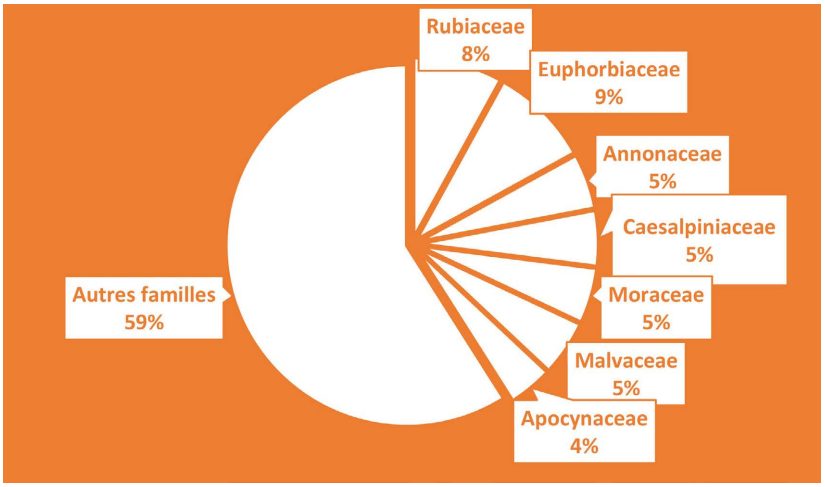

Figure 3. Proportions of most represented families of the co-occurring species of the individual of *Aubregrinia taïensis*.

Table 1. Co-occurring species of *Aubregrinia taïensis* in a forest fragment of Gahably near Taï.

Species	Family	Chorology	Life-form
Acridocarpus longifolius (G. Don) Hook. f.	Malpighiaceae	GC	Lmp
Aganope leucobotrya (Dunn) Polhill	Fabaceae	GC	Lmp
Aidia genipiflora (DC.) Dandy	Rubiaceae	GC	mp
Albertisia scandens (Mangenot & Miège) Forman	Menispermaceae	GCW	Lnp
Albizia adianthifolia (Schum.) W. Wight	Fabaceae	GC	mP
Albizia zygia (DC) J. F. Macbr.	Fabaceae	GC-SZ	mP
Alchornea cordifolia (Schumach. & Tonn.) Müll. Arg.	Euphorbiaceae	GC-SZ	mp
Alchornea floribunda Müll. Arg.	Euphorbiaceae	GC	mp
Amphimas pterocarpoides Harms	Fabaceae	GC	MP
Annickia polycarpa (DC.) Setten & Maas	Annonaceae	GC	mP
Anthonotha fragrans (Baker f.) Excell	Fabaceae	GC	MP
Anthonotha macrophylla P. Beauv.	Fabaceae	GC	mp
Antiaris toxicaria Lesch. var. africana (Engl.) C. C. Berg	Moraceae	GC-SZ	mP
Baphia polygalacea (Hook. F.) Baker	Fabaceae	GC	Lmp
Baphia pubescens Hook. f.	Fabaceae	GC	mp
Blighia welwitschii (Hiern) Radlk.	Sapindaceae	GC	mP
Calpocalyx brevibracteatus Harms	Fabaceae	GC	mP
Campylospermum amplectens (Stapf) Farron	Ochnaceae	GCW	mp
Campylospermum subcordatum (Stapf) Farron	Ochnaceae	GCW	mp

Continued

Canarium schweinfurthii Engl.	Burseraceae	GC	MP
Carpolobia lutea G. Don	Polygalaceae	GC	np
Casearia prismatocarpa Mast.	Flacourtiaceae	GC-SZ	mp
Cercestis afzelii Schott	Araceae	GC	Lmp
Chrysophyllum taiense Aubrév. & Pellegr.	Sapotaceae	GCW	mP
Cleistanthus polystachyus Hook. f. ex Planch.	Euphorbiaceae	GCW	mp
Cleistopholis patens (Benth.) Engl. & Diels	Annonaceae	GC	mP
Cnestis ferruginea DC.	Connaraceae	GC	Lmp
Cola caricaefolia (G. Don) K. Schum.	Malvaceae	GCW	mp
Cola heterophylla (P. Beauv.) Schott & Endl.	Malvaceae	GC	mp
Cola lateritia K. Schum. Var. maclaudi (A. Chev.) Brenan & Keay	Malvaceae	GC	mp
Corynanthe pachyceras K. Schum.	Rubiaceae	GC	mP
Costus afer Ker Gawl.	Zingiberaceae	GC-SZ	np
Crossostemma laurifolium Planch. Ex Benth.	Passifloraceae	GCW	Lmp
Cuviera acutiflora DC.	Rubiaceae	GC	mp
Dacryodes klaineana (Pierre) H. J. Lam	Burseraceae	GC	mP
Decorsella paradoxa A. Chev.	Violaceae	GCW	mp
Desplatsia chrysochlamys (Mildbr. & Burret) Mildbr. & Burret	Malvaceae	GC	mp
Dialium aubrevillei Pellegr.	Fabaceae	GCW	mP
Dichapetalum angolense Chodat	Dichapetalaceae	GC	LmP
Dichapetalum pallidum (Oliv.) Engl.	Dichapetalaceae	GC	LmP
Dicranolepis persei H. A. Cummins	Thymelaeaceae	GCW	np
Didymosalpinx abbeokutae (Hiern) Keay	Rubiaceae	GC	Lmp
Diospyros mannii Hiern	Ebenaceae	GC	mp
Diospyros sanza-minika A. Chev	Ebenaceae	GC	mP
Diospyros soubreana F. White	Ebenaceae	GC	np
Diospyros vignei F. White	Ebenaceae	GCW	np
Distemonanthus benthamianus Baill.	Fabaceae	GC	mP
Dorstenia kameruniana Engl.	Moraceae	GC	np
Dracaena aubryana Brongn. ex E. Morren	Dracaenaceae	GCW	np
Dracaena ovata Ker Gawl.	Dracaenaceae	GC	np
Drypetes ivorensis Hutch. & Dalziel	Euphorbiaceae	GCW	mp
Drypetes klainei Pierre ex Pax	Euphorbiaceae	GCW	mp
Entandrophragma angolense (Welw.) C. DC.	Meliaceae	GC	MP
Eribroma oblongum (Mast.) Pierre ex A. Chev.	Malvaceae	GC	MP
Erythrocacca anomala (Juss. Ex Poir.) Prain	Euphorbiaceae	GC	np
Erythroxylum mannii Oliv.	Erythroxylaceae	GC	mp
Ficus kamerunensis Mildbr. & Burret	Moraceae	GC	mp

Continued

Ficus sur Forssk.	Moraceae	GC-SZ	mp
Funtumia africana (Benth.) Stapf	Apocynaceae	GC	mP
Glyphaea brevis (Spreng.) Monach.	Malvaceae	GC	mp
Griffonia simplicifolia (Vahl ex DC.) Baill.	Fabaceae	GC	Lmp
Heinsia crinita (Afzel.) G. Taylor	Rubiaceae	GC	mp
Hoplestigma klaineanum Pierre	Hoplestigmataceae	GC	mp
Hugonia planchonii Hook. f.	Linaceae	GC	Lmp
Hymenostegia afzelii (Oliv.) Harms	Fabaceae	GC	mp
Landolphia dulcis (R.Br. Ex Sabine) Pichon var barteri (Stapf) Pichon	Apocynaceae	GC	Lmp
Landolphia membranacea (Stapf) Pichon	Apocynaceae	GCW	Lmp
Lannea welwitschii (Hiern) Engl.	Anacardiaceae	GC-SZ	mp
Lasiodiscus mannii Hook. f.	Rhamnaceae	GC	mp
Leptactina densiflora Hook. f. var. densiflora	Rubiaceae	GC	Lmp
Lovoa trichilioides Harms	Meliaceae	GC	MP
Maesobotrya barteri (Baill.) Hutch. var. sparsiflora (Scott-Elliot) Keay	Euphorbiaceae	GCW	mp
Manniophyton fulvum Müll. Arg.	Euphorbiaceae	GC	Lmp
Manotes longiflora Baker	Connaraceae	GC	Lmp
Maranthes glabra (Oliv.) Prance	Chrysobalanaceae	GC	mP
Marantochloa filipes (Benth.) Hutch.	Marantaceae	GC	np
Mareya micrantha (Benth.) Müll. Arg.	Euphorbiaceae	GC	mp
Massularia acuminata (G. Don) Bullock ex Hoyle	Rubiaceae	GC	mp
Microdesmis puberula auct., non Hutch. & Dalziel	Pandaceae	GC	mp
Monodora myristica (Gaertn.) Dunal	Annonaceae	GC	mP
Morinda longiflora G. Don	Rubiaceae	GC-SZ	Lmp
Myrianthus arboreus P. Beauv.	Moraceae	GC	mp
Myrianthus libericus Rendle	Moraceae	GC	mp
Napoleonaea vogelii Hook. & Planch.	Lecythidaceae	GC	mp
Neuropeltis acuminata	Convolvulaceae	GC	LMP
Olax gambecola Baill. (P. Beauv.) Benth.	Olacaceae	GC	np
Olyra latifolia L.	Poaceae	GC	np
Omphalocarpum ahia A. Chev.	Sapotaceae	GCW	mp
Ongokea gore (Hua) Pierre	Olacaceae	GC	mP
Oxyanthus formosus Hook. f. ex Planch.	Rubiaceae	GC	mp
Pentaclethra macrophylla Benth.	Fabaceae	GC	mP
Phyllocosmus africanus (Hook. f.) Klotzsch	Ixonanthaceae	GC	mP
Piptadeniastrum africanum (Hook. f.) Brenan	Fabaceae	GC	MP
Placodiscus boya Aubrév. & Pellegr.	Sapindaceae	GCW	mp
Platysepalum hirsutum (Dunn) Hepper	Fabaceae	GCW	LmP
Pleicarpa mutica Benth.	Apocynaceae	GC	mp

Continued

Plesiatropha paniculate (Pax) Breteler	Euphorbiaceae	GC	mp
Polyalthia oliveri Engl.	Annonaceae	GC	mp
Pterygota bequaertii De Wild.	Malvaceae	GC	MP
Ptychopetalum anceps Oliv.	Olacaceae	GC	np
Pycnanthus angolensis (Welw.) Warb.	Myristicaceae	GC	mP
Raphia hookeri G. Mann & H. Wendl.	Arecaceae	GC	mp
Rauvolfia vomitoria Afzel.	Apocynaceae	GC-SZ	mp
Rhaphiostylis beninensis (Hook. f. ex Planch.) Planch. Ex Benth.	Icacinaceae	GC	Lmp
Ricinodendron heudelotii (Baill.) Pierre ex Heckel subsp. Africanum (Müll. Arg.) J. Léonard	Euphorbiaceae	GC	mP
Rinorea ilicifolia (Welw. ex Oliv.) Kuntze	Violaceae	GC	np
Rinorea welwitschii (Oliv.) Kuntze	Violaceae	GC	mp
Rothmannia longifora Salisb.	Rubiaceae	GC	mp
Scottelia klaineana Pierre var. klaineana	Flacourtiaceae	GC	MP
Sterculia tragacantha Lindl.	Malvaceae	GC-SZ	mP
Strombosia pustulata Oliv.	Olacaceae	GC	mP
Strychnos usambarensis Gilg	Loganiaceae	GC	LmP
Synsepalum afzelii (Engl.) T. D. Penn.	Sapotaceae	GC	mP
Tarrietia utilis (Sprague) Sprague	Fabaceae	GCW	mP
Tiliacora leonensis (Scott-Elliot) Diels	Menispermaceae	GCW	Lmp
Trichilia martineaui Aubrév. & Pellegr.	Meliaceae	GC	mP
Trichilia monadelpha (Thonn.) J. J. de Wilde	Meliaceae	GC	mp
Trichoscypha cavalliensis Aubrév. & Pellegr.	Anacardiaceae	GCW	mp
Triphyophyllum peltatum (Hutch. & Dalziel) Airy Shaw	Dioncophyllaceae	GCW	LMP
Uapaca guineensis Müll. Arg.	Phyllanthaceae	GC	mP
Uvaria afzelii Scott-Elliot	Annonaceae	GC	Lmp
Uvaria anonoides Baker f.	Annonaceae	GC	Lmp
Uvariastrum pierreanum Engl.	Annonaceae	GC	mp
Vepris soyauxii Mziray	Rutaceae	GC	mP
Vitex grandifolia Gürke	Verbenaceae	GC	mp
Vitex micrantha Gürke	Verbenaceae	GCW	mp
Vitex phaeotricha Mildbr. Ex W. Piep.	Verbenaceae	GC	mp
Warneckea guineensis (Keay) Jacq. -Félix	Melastomataceae	GC	mp
Whitfieldia colorata C. B. Clarke ex Stapf	Acanthaceae	GCW	np
Zanthoxylum gilletii (De Wild.) P. G. Waterman	Rutaceae	GC	mP

GC: Guinean-Congolese species; GC-SZ: Common species for the Guinean-Congolese and Sudano-Zambesian phytogeographical regions; GCW: Endemic species of the forest area situated at the west of Togo, including Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea Bissau, Gambia and Senegal; mp: Microphanerophyte; np: Nanophanerophyte; mP: Mesophanerophyte; MP: Megaphanerophyte; Lmp: Liana microphanerophyte; LmP: Liana mesophanerophyte; LMP: Liana megaphanerophyte; Lnp: Liana nanophanerophyte.

3.2. Chorology and Life-Form of the Species

Regarding chorology, species from the Guineo-Congolese Region (GC) are the most abundant (72%). Also 19% of the species are endemic of the West African forest (GCW). Only 8% of the species are from the savannah-forest transition zone (GC-SZ). The different proportions are shown in the Figure 4. The species belong to eight life-forms but all phanerophytes. The dominant life-form is that of microphanerophytes (mp). As shown in Figure 5, more than 40 % of species

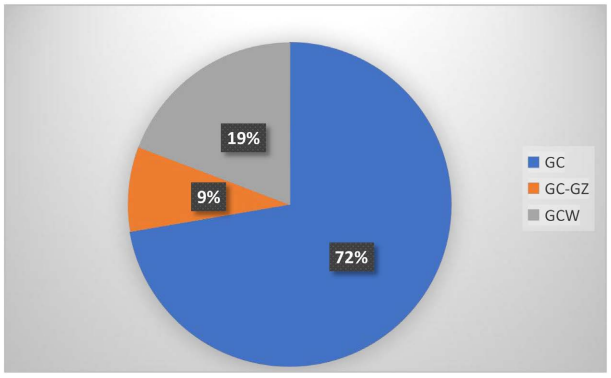

Figure 4. Proportions of the species according to their chorology. GC: Guinean-Congolese species (represented in the forest areas located in the South of the country); GC-SZ: Common species for the Guinean-Congolese and Sudano-Zambesian phytogeographical regions; GCW: Endemic species of the forest area situated at the west of Togo, including Ghana, Côte d.'Ivoire, Liberia, Sierra Leone, GuiGuinea Bissau, Gambia and Senegal.

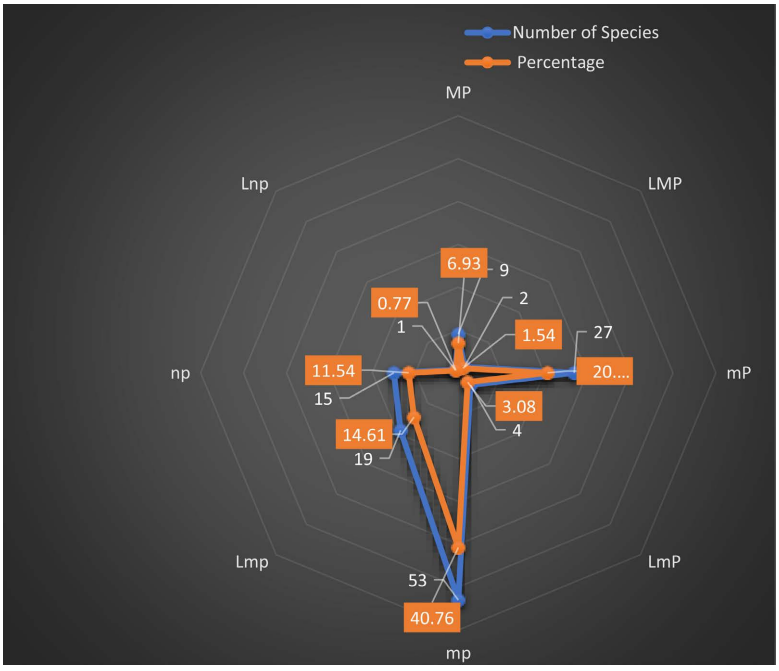

Figure 5. Proportions of the eight life-forms observed in the site around *Aubregrinia taïensis*. mp: Microphanerophyte, np: Nanophanerophyte, mP: Mesophanerophyte, MP: Megaphanerophyte, Lmp: Liana microphanerophyte, LmP: Liana mesophanerophyte, LMP: Liana megaphanerophyte, Lnp: Liana nanophanerophyte.

belong to this life-form. It appears that 20% of the inventoried species are lianas. This relatively high proportion of lianas and the dominance of microphanerophytes show that the forest studied would have undergone degradation. Indeed, the studies of Bakayoko *et al.* [14] on forest fragments in western Côte d'Ivoire have shown that these forests are heavily disturbed by human activities, resulting in an increase of pioneers and lianas. Furthermore, Bongers *et al.* [15] indicated that the main reason for the abundance of lianas would be related to the disturbance. This suggests that *Aubregrinia taïensis* could thrive on anthropized sites if individuals are spared. Also, it appears that the research of the plant should not be oriented only in the National Park of Tai. Community forests, forest fragments, secondary forests and even old fallows should also be visited.

3.3. Special Status Species

The forest is home to 24 species with special status (GCW and/or VU) as indicated in Table 2. Three of these species are listed as threatened (all vulnerable)

Table 2. List of special status species co-occurring with *Aubregrinia taïensis*.

Species	Conservation status	Chorology
Campylospermum amplectens	VU	GCW
Placodiscus boya	VU	GCW
Trichoscypha cavalliensis	VU	GCW
Albertisia scandens	NE	GCW
Campylospermum subcordatum	NE	GCW
Chrysophyllum taiense	LC	GCW
Cleistanthus polystachyus	LC	GCW
Cola caricaefolia	NE	GCW
Crossostemma laurifolium	NE	GCW
Decorsella paradoxa	NE	GCW
Dialium aubrevillei	NE	GCW
Dicranolepis persei	NE	GCW
Diospyros vignei	NE	GCW
Dracaena aubryana	NE	GCW
Drypetes ivorensis	LC	GCW
Drypetes klainei	NE	GCW
Landolphia membranacea	NE	GCW
Maesobotrya barteri	LC	GCW
Platysepalum hirsutum	NE	GCW
Tarrietia utilis	LC	GCW
Tiliacora leonensi	NE	GCW
Triphyophyllum peltatum	NE	GCW
Vitex micrantha	NE	GCW
Whitfieldia colorata	NE	GCW

EN: Endangered species; CR: Critical endangered species; LC: Least Concern species; NE: Not evaluated species; GC: Guinean-Congolese species; GCW: Endemic species of the forest area situated at the west of Togo, including Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea Bissau, Gambia and Senegal.

according to the IUCN categories. These are: *Campylospermum amplectens*, *Placodiscus boya* and *Trichoscypha cavalliensis.* Ake Assi [15] consider *Chrysophyllum taïensis* as an endemic species of Côte d'Ivoire while other authors believe that it is a West African endemic species [16] [17] [18]. We adopted this opinion in the present study. However, for Hawthorne and Jongkind [19] *Chrysophyllum taïensis* could be a synonymous of *Chrysophyllum subnudum* with the level of variety. These authors suggested a detailed review study of the plant and related species across Africa. In Côte d'Ivoire the distribution of this species is limited to the west of the Sassandra River. Such species are called Sassandrian [16]. Among the 24 species, 16 (*i.e.*, 66.66%) have not been assessed according to the IUCN threat categories. This lack of status is a risk of disappearance of these species. Indeed, without conservation status, species are often not among the priority ones in the frame of *in situ* or *ex situ* conservation projects such as in botanical gardens or agroforestry. Yet these species could be in severe threat status. Indeed, all these species are endemic to the Upper Guinea forest, one of the world's hotspots of biodiversity [2]. But this area, is subject to a high rate of deforestation, habitats loss and degradation. The presence of 26 special status species around *Aubregrinia taïensis* (CR species) shows that this forest is important for the conservation [13]. Thus, the forest should be preserved. In addition, no fruit or flower has yet been observed on the individual *Aubregrinia taïensis* observed. Vegetation multiplication trials (cuttings, layering) should be carried out in order to obtain seedlings quickly. Studies of cuttings of *Tieghemella heckelii* (A. Chev.) Pierre ex Dubard, another tree species of the Sapotaceae growing in the same area with *Aubregrinia taïensis*, have given satisfactory results [20].

4. Conclusion

This study made it possible to know the companion flora of an individual of *Aubregrinia taïensis*. Although the site is secondary forest, it is home to priority species for conservation due to their endemicity or conservation status. The floristic composition of the forest shows that *Aubregrinia taïensis* can grow in secondary and/or degraded forests. This fragment of forest, although belonging to a person, and therefore constituting private property, should be preserved. The possibility of accompanying the owner for its erection into a Voluntary Nature Reserve (RNV) is one of the options to be considered for its conservation. The lack of conservation status for the majority of species could favor the disappearance of many plants because they could not be taken into account in species safeguard projects.

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Conflicts of Interest

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

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