



## **Botanical Survey of Plant Species Diversity in the Ajenjua Bepo and Mamang River Forest Reserves, Ghana**

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# Chapter 1

## Botanical Survey of Plant Species Diversity in the Ajenjua Bepo and Mamang River Forest Reserves, Ghana

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### SUMMARY

A total of 376 plant species belonging to 76 families were recorded during a rapid biological assessment of the Ajenjua Bepo and Mamang River forest reserves in Eastern Ghana. At Ajenjua Bepo, 325 plant species in 73 families were recorded, including three Black Star species (botanical species of the highest priority in Ghana's color-coded conservation categories): *Monocyclanthe vignei*, *Berlinia occidentalis* and *Albertya scanden*. At Mamang River, 215 species in 58 families were confirmed including three Black Star species: *Aubreginia taiensis*, *Leptoderis miege* and *Tapura ivorensis*. Of the two reserves, Mamang River had a larger area of continuous good forest and hence conservation effort should be emphasized here to preserve biodiversity. It is furthermore recommended that indigenous rather than exotic species solutions be used in the rehabilitation of degraded natural forests.

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### INTRODUCTION

West African rainforests rank among the 34 most important biodiversity hotspots of the world (Mittermeier et al. 2004). Ghana's forest and wildlife are a vital source of national revenue as well as source of livelihood for many of Ghana's people. Everyone, from farmers to the private sector, relies on sustainable, healthy and well managed forests. Because these natural resources are fundamental to Ghana's social and economic development they must be protected and sustainably managed.

Ajenjua Bepo and Mamang River are primary forests of the tropical Moist Semi-deciduous forest subtypes (MSSE) (Hawthorne and Abu-Juam 1995). These forests have been logged for long periods, leading to threats including the encouragement of fire due to breaks in the canopy and the increased access to the heart of the forest by hunters. The main challenge in maintaining Ghana's forest diversity is to preserve natural forest while minimizing threats to forest integrity and associated biodiversity. To do this requires, in part, that each species' value, whether commercial, genetic, or ecological, be fully understood. This study aimed to explore the diversity of vascular plant species which these two forest reserves support.

The Ajenjua Bepo Forest Reserve was created in 1930. It is located near Kade, in the Eastern Region of Ghana. It is Forest Management Unit (FMU) 40 by the Forest Services Division (FSD) categorization of reserves and is given a forest condition score of 4 (mostly degraded). It has an area of approximately 6 km<sup>2</sup>, and the northern half is hilly with 55% of its slopes being greater than 15 degrees. Ajenjua Bepo was designated a Hill Sanctuary and then was legally logged in 1989. Much of the reserve has been replanted with *Cedrella odorata* under an ongoing reforestation program (Conversion Working Circle) of the FSD. The last botanical survey was on 19 August 1990 and 181 species were recorded (Hawthorne and Abu-Juam 1995).

The Mamang River Forest Reserve was established in 1938 and has an area of 54 km<sup>2</sup>. It has been reported that the northern portion is burnt and badly degraded (Hawthorne and Abu-Juam 1995). However, the southern portion, the site of the August 2006 RAP survey, is in better condition. The last botanical survey of this reserve was on 15 August 1991 and 111

species were recorded of which 39 were trees (Hawthorne and Abu Juam 1995). The reserve is surrounded by an oil palm plantation of over 20,000 acres (personal communication from a local inhabitant) on the side of James town and the Abenaso area. There are also citrus and cocoa plantations in the area. The Mamang River Forest Reserve has a forest condition score of 2 (good) inside the Abenaso area where the understory is not closed and a lot of high-quality forest remains.

## METHODS AND DESCRIPTION OF STUDY SITES

Four Temporary Sample Plots (TSP) of 50m x 50m were set up at each site along the four cardinal geographical coordinates and vascular plant species occurring within each TSP were enumerated. Within each plot, subplots of 10 m x 10 m were delimited and species of diameter at breast height (DBH) less than 5 cm were identified. A Garmin GPS 76 was used to record georeference positions and altitudes of sample plots. Additionally, transect walks of at least 6 km were traversed to look for and record tree species that had not yet been recorded. Existing footpaths, lines cut through the forest, roads and timber hauling tracks were used as transects. Leaf samples of plant species difficult to identify in the field were collected and pressed for identification at a herbarium.

The period of 24-30 August 2006 was spent at the Ajenjua Bepo site. The RAP campsite was located at the edge of the best remaining patch of natural forest at GPS coordinates N 06° 22.038', W 001° 01.977' (altitude 307 m). Altitudes at the site reached up to 500 m. The natural forest was restricted to the hill and at the hilltop the canopy was rather open, probably due to windfalls. The period of 31 August to 5 September 2006 was spent at the Mamang River site. To reach the RAP campsite, we entered the forest following a footpath which hit the reserve boundary at coordinates N 06° 14.970', W 001° .01.978. The footpath is about 100 m north of the reserve boundary pillar 41 (N 06° 15.108., W 001° .01.978). Altitude of the campsite was 167 m a.s.l. and the whole reserve generally has low altitudes. See Gazetteer for further site details.

The two reserves are located in the moist semi-deciduous ecological zones (Hall and Swaine 1981) whose key indicator species are *Triplochiton scleroxylon* and *Celtis* species. Annual rainfall in the region is 1000-1500 mm and the soils here are base rich. Dry forests have suffered serious disturbances due to logging and subsequent wildfire damage.

## RESULTS FOR EACH SITE AND OVERALL

A total of 376 plant species from 76 families were recorded (Appendix 1). In total, six Black Star species, botanical species of the highest priority in Ghana's color-coded conservation categories (Table 1.1), were recorded in the two study sites.

In Ajenjua Bepo, 73 plant families and 325 plant species were recorded. Species indicating degradation such as *Trema orientalis*, *Musanga cecropioides*, *Chromolaena odorata* and *Panicum maximum* were recorded. Common or abundant species included the *Rinoria* group, *Celtis wightii* and *C. mildbraedii*. Many different species are present here because light-demanding and pioneer species have become established and undergoing ecological succession. Portions of the remaining natural forest were given a forest condition score of 3 (partly degraded). Within the natural forest was an area with an abundance of *Heliotropium indicum*. Three Black Star species were recorded from this site: *Monocyclanthe vignei*, *Berlinia occidentalis* and *Albortesia scanden*. The record of *Monocyclanthe vignei* at Ajenjua Bepo is notable since the species is very rare in Ghana and previously known only from the Ankasa Forest Reserve (Hawthorne 1995). Seven Gold Star species *Cussonia bancoensis*, *Albortesia scandens*, *Isolona deightonii*, *Trichilia martineaui*, *Placodiscus boya*, *Cola boxiana* and *Psychotria articulata* were also recorded. Other notable species included 22 Pink Star, 7 Red Star species and 11 Scarlet Star species as indicated in Appendix 1.

In Mamang River, 58 families and 215 species were recorded. Three Black Star species were recorded: *Aubreginia taiensis*, *Leptoderis miege* and *Tapura ivorensis*. Three Gold Star species were also recorded at this site: *Cola boxiana*, *Uvariadendron occidentale* and *Trichilia martineaui*. Six Red Star species were recorded: *Ptergota macrocarpa*, *Bombax brevicuspe*, *Antrocaryon micraster*, *Antiaris toxicaria*, *Entandrophragma angolense* and *Thaumatococcus daniellii*. In addition, 10 Scarlet Star and 17 Pink Star species were observed (Appendix 1). Common and abundant species were the *Celtis* group, *Hymenostigia afzelli*, *Trichilia preuriana* and *Cola laterilata*. Recorded species indicating habitat degradation included *Trema orientalis*, *Musanga cecropioides*, *Broussonetia papyrifera*, *Panicum maximum*, *Lantana camara*, *Chromolaena odorata*, and *Ricinodendron* sp., but these were few in numbers. Species which indicated that the forest was still in good condition were *Tieghemella heckellii*, *Klainedoxa gabonensis*, *Aubreginia taiensis*, *Aningeria altissima*, *Nesogordonia papaverifera* and *Cyclicodiscus gabonensis*.

**Table 1.1.** A key to Ghana's star ratings for botanical species

Star	Description
Black	Globally rare – high priority for careful management
Gold	Globally restricted
Red	Heavily exploited in Ghana
Scarlet	Threatened in Ghana by overexploitation
Pink	Of commercial interest
Blue	Somewhat rare in Ghana
Green	Of little conservation concern

Sources: Hawthorne and Abu-Juam 1995; Hawthorne and Gyakari 2006

The paper mulberry tree, *Broussonetia papyrifera*, introduced into Ghanaian research plots in the 1970's from southeast Asia was also found in Mamang River. Around the Afram Headwaters Forest Reserve where it was first introduced (the Research Working Cycle Plots), at Abofour, in the Ashanti Region of Ghana, this species is becoming invasive and is dominating patches of secondary forest in burnt areas and dry semi-deciduous forests. The botanical biodiversity value of *Broussonetia* thicket is lower than other secondary woody vegetation nearby. *Broussonetia* thickets are not associated with healthy timber regeneration and do not provide a suitable habitat for larger-leaved Marantaceae and other non-timber commodities (Hawthorne 1995). Finding *Broussonetia* occurring in Mamang River in the Eastern Region of Ghana means the species has dispersed over 200 km from where it was first introduced.

### CONSERVATION RECOMMENDATIONS

Ajenjua Bepo had higher species diversity (325 species) than Mamang River (215 species) probably due to the opening of the canopy at Ajenjua Bepo allowing light-demanding and pioneer species to become established and begin succession. Comparing the two reserves, Mamang River has a larger area of continuous good forest and hence conservation effort should be emphasized here to preserve biodiversity. Mamang River has high quality forest which should be protected from fire. Hawthorne (1995) reported that the northern part of Mamang River exhibited serious degradation and fire damage. The local farmers we came across inside the forest were using fire to distill ethanol from *Raphia hookeri*. Especially during the dry season, this practice poses a serious fire threat.

The RAP campsite at Ajenjua Bepo was bordered by a one-year-old *Cedrella* plantation among various food crop plants. Throughout Ghana, the FSD has effectively converted portions of numerous forest reserves into *Cedrella odorata* tree plantations by taungya (a system whereby farmers are permitted to use reserved lands for a few years, providing that they plant tree species to take over when a farm is exhausted). The hilly portion of Ajenjua Bepo bears good natural forest and this should be conserved to serve as potential seed banks to replenish the areas of plantation with indigenous species.

It is furthermore recommended that indigenous species solutions rather than exotic species be used in the rehabilitation of the degraded natural forests, and that the invasive behavior of *Broussonetia* thicket observed in Mamang River be further investigated.

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