**Dynamic of Sacoglottis gabonensis – Aucoumea klaineana couple in the Congolese coast Forest (Brazzaville – Congo)**

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**Abstract**

The ecological markers of Sacoglottis gabonensis in the Congolese coast forest highlight that this species develops at the limit of its geographic area. This species is often associated to Aucoumea klaineana in forest typology or characterizing forest on the Atlantic littoral. It posts a degree of sociability contrary to the known data of the Gabonese forest. Moreover our study confirms the absence of the typical Biafra forests on the Congolese littoral, and the non concomitance of the distribution of Sacoglottis gabonensis and Aucoumea klaineana.

**Keywords:** Costal forest, ecology index, geographic area, Sacoglottis gabonensis, Aucoumea klaineana.

**Introduction**

Aucoumea klaineana forests of the Atlantic littoral of the Nigero-Camerono-Gabonese area are often characterized, in their typology, like facies with Aucoumea klaineana and Sacoglottis gabonensis (Baill.) Urban in co-dominance or monodominance1,4. Many data confirm the coupling from these two species like the symbol with the endemism low-Guinean with the Guineo-Congolese area, and especially characteristic of the “biafréennes” forests of the Atlantic element of the Nigero-Camerono-Gabonese2.

In spite of Sacoglottis gabonensis presence on the Congolese littoral, the existence of the forests dominated by this species remains an enigma in this area1. The typology studies on the forest facies with Aucoumea klaineana and Lophira alata of the Congolese littoral, show that the ecological parameters raised on Sacoglottis gabonensis, are contrary to the known data of the Cameroono-Gabonese forests1,6,9.

Thus, the objective of this study is answer interrogations on existence of typical “biafréenne” forest on the Congolese littoral. This work is focused on the ecological and structural markers of Sacoglottis gabonensis in the Aucoumea klaineana forest of the Congolese littoral.

**Physical data of the Congolese littoral: Climate:** The various forest facies of the Congolese littoral develop under a climate qualified subequatorial or low Congolese6,7,10–16. Its main characteristics are: i. precipitations average ranging between 1200 and 1400 mm/year6,7,14,16, ii. one dry and fresh season of 4 - 5 months (May-September) and a rainy and hot season from October to May, with a very marked attenuation of precipitations during January and February1,15,16, iii. an annual average temperature of 25°C and an annual thermal amplitude of 4–6°C1,13,16.

**Soils:** The general presentation of the soils of the area shows that they belong primarily to the subclass of the impoverished psammitic and ferrallitic soils17. Their description distinguishes three principal horizons: i. humus-bearing horizon (A1) of approximately 40 cm thickness. It consists of two pennies horizons: a surface horizon (0 – 10 cm), covered by a thick layer with litter (10 – 15 cm) often made up of the three horizons L, F and H. the subjacent horizon (10 – 40 cm) is distinguished from the precedent, primarily by its physical properties (compaction, structure) which are different; ii. horizon of transition (A3 or B1), of colour brown dark having a thickness varying between 15 and 25 cm; iii. horizon of accumulation (B2), yellowish colour brown. It is characterized by a content of clay slightly more important than in the overlying horizons.

**Vegetation:** The description and the characteristics of the natural vegetation and the flora of the Congolese littoral are reported by many authors6,10,12–14,18,19.

**Material and Methods**

**Localization of the zones of the botanical statements:** The various statements of inventory and floristic investigations are carried out in the sectors identified under the denominations of Kayes “A” and Kayes “B” (figure-1). These contiguous sectors cover each one an area going of the Atlantic border to the buttresses of Mayombe.

The geographical contact of Kayes “A” is presented below7: i. 11° 28’ 34” S 33 E – 03° 53’ 13” S, ii. 11° 39” 22” E – 03° 53’ 13” S, iii. 11° 39’ 22”7.70 E – 03° 55’ 53”.89 S, iv.
11° 40’ 04’’.66 E – 03° 55’ 53’’.37 S, v. located at the junction of the line of coordinate East of point 4 with sea border, vi. located at the junction of the line of coordinate East of point 1 with sea border.

**Methodology:** The investigations on *Sacoglottis gabonensis* and *Aucoumea klaineana* are based on two complementary approaches. They rest on: i. data collected on the station: inventories of vegetable biodiversity, ethnotebotany investigations and botanical prospection; ii. bibliographical compilation: phytosociological and inventories flora data analysis are available.

**Inventories:** The inventories are carried out according to the methodology of the transects, in forest facies of various ages and degree of disturbance. The trees selected have a diameter at breast height (dbh at 1.30 m from the ground) equal or higher than 10 cm. According to the dbh, the listed trees set out again in 9 classes of diameter, whose progression is of 10 in 10 cm. The 9th class gathers all the individuals having a dbh ≥ 90 cm.

During the botanical prospection, all the *Sacoglotis gabonensis* individuals are listed. The raised parameters are the biological type, of dbh, and the degree of sociability (isolated or gregarious individual).

**Data on the statements of floristic inventory:** The floristic inventory of the monospecific forest with *Aucoumea klaineana* of the Congolese littoral is based on 22 statements. According to the surface of inventory and dbh, they divide into 3 category.13 raised of 1 ha for the trees of dbh ≥ 10 cm; 1 statement of 1.2 ha for the trees of dbh ≥ 10 cm; 8 statements of 0.04 ha for the trees of dbh ≥ 5 cm but lower than 10 cm.

**Results and Discussion**

The results presented in table-1 characterize the floristic statements of higher or equal to surface 1 ha; the statements of low area did not highlight the specimens of *Sacoglottis gabonensis*. This floristic inventory highlights 42 trees of *Sacoglottis gabonensis* for an area of approximately 13 ha, that is to say an average 3.2 trees.ha⁻¹ (table-1). In this woody settlement, the densities of *Sacoglottis gabonensis* vary from 1 to 37 trees.ha⁻¹; while basal area oscillate, of the young facies to oldest, between 0.75 and 1.8 m².ha⁻¹. These specimens are distributed in 6 diameter classes, with a better representation of classes 1 (57.14%) and 2 (23.81%). They include almost 81% of individuals.

The basal area by density report, which is an ecological index making it possible to characterize a population or a species, its lies between 0.45 and 5.7. The relative frequency of *Sacoglottis gabonensis* is on the other hand very weak.

As a whole, the ecological markers of *Sacoglottis gabonensis* are parameters described as weak (table-1). The clearest traces are obtained in the young forest facies under installation where *Aucoumea klaineana* typify a facies almost monospecific, as shows it statement 1 of the sector Kayes “B”. On the contrary, the oldest or disturbed forest stages, has a weaker presence of *Sacoglottis gabonensis*.
The botanical prospection made it possible to note a space and temporal distribution disparate specimens of *Sacoglottis gabonensis*. This species often meets in zone of savanna like precursor of colonization by *Aucoumea klaineana*. The individuals observed are, as Table-1 shows it, of low diameter with a clear predominance of classes 1 and 2, and low branchy. The maximum diameter recorded on three isolated specimens, in grassy savannas with *Hyparrhenia diplandra* and shrubby lies between 45 and 60 cm to 1.30 m of the ground.

The phytopharmacological, traditional uses of its bark, and artisanal of the physical properties of its wood make *Sacoglottis gabonensis* well-known and is exploited by the populations\(^{10,20}\). The dendrometric analysis reveals a bad recruitment of *Sacoglottis gabonensis* in the various classes of diameter. Indeed, except a statement which has 2 trees, it is recorded in the 4/5 only one class of diameter and a tree specimen (table-1). The inexistence of the individuals in certain classes of diameter reveals its bad regeneration on the Congolese littoral\(^{5,6,21}\). That is not observed on the Gabonese littoral. This species does not accompany *Aucoumea klaineana* in the forests by the Congolese littoral\(^{5,6,7,8,9}\).

On the other hand, one notes on the Gabonese littoral perfect a co-dominance between *Sacoglottis gabonensis* and *Aucoumea klaineana* or with *Lophira alata* in the characterization of the forest facies, on the one hand, and, on the other hand, of the typical facies with *Sacoglottis gabonensis*\(^{1,3,4,10}\). That is not observed on the Congolese littoral. This species has behaviour different in these two parts of its area dispersion.

The floristic statements being made between the Atlantic Ocean and the buttresses of Mayombe, the got results show that the *Sacoglottis gabonensis* area is restricted with the littoral fringe, whereas that of *Aucoumea klaineana* reaches the buttresses of Mayombe. This reduced space-time distribution of *Sacoglottis gabonensis* is at the origin of the weak frequencies observed for the whole of the region\(^{6,7}\). Indeed, this species which is rather abundant in the young stages of installation of the forest with *Aucoumea klaineana*, rarefies as progresses forest dynamics towards the old stages, as the curve of density of figure-2 shows it. The data analysis on the densities shows that *Sacoglottis gabonensis* badly supports the interspecific competition\(^{8,9,21}\).

The data of basal area show that *Sacoglottis gabonensis* occupies a weak surface per unit of area. This one is in fluctuating from one statement to another (figure-2). The best occupancy rates of the soil are observed in the statements with strong density of *Sacoglottis gabonensis* or having trees of large diameter. This parameter coupled with biological specificities of the species, in particular its lack of interspecific competitiveness, is a factor limiting to its regeneration under dense cover. This observation is supported by the index of report ST/D (basal area /density). Indeed, the values are very weak and lower than 1, for the majority (Figure-2). *Sacoglottis gabonensis* is characterized on the Congolese littoral, whatever the stage of development forest facies, by weak parameters of density and diameter.

### Table-1

<table>
<thead>
<tr>
<th>Sector</th>
<th>Number of statements</th>
<th>N° of order and area</th>
<th>Structure and ecologic parameters of <em>Sacoglottis gabonensis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>N° of statement</td>
</tr>
<tr>
<td>Kayes B</td>
<td>3</td>
<td>1*</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2*</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3*</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Kayes A</td>
<td>5</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>1,2</td>
</tr>
</tbody>
</table>

(*) Reference No. 8, 9, 4, 6.
In spite of the mechanisms of dissemination which are respectively endozoochore for *Sacoglottis gabonensis* (mainly by the elephant: *Loxodonta africana cyclotis*) and anemochore for *Aucoumea klaineana*, these two taxa have biological and ecological behaviours very similar. These qualified species pioneers and the heliophilous ones are at the base of the colonization of savannas by the forest. In this dynamics of occupation of the soil, the progression is assured almost exclusively by *Aucoumea klaineana* which forms a monospecific pioneer face. Though these two species are badly adapted to the interspecific competition, taking into consideration *Sacoglottis gabonensis*, their ecological characteristic seems to be more vulnerable. The endozoochore dissemination seems to justify the precocity of this species in coastal savannas.

Ecological characteristics of *Sacoglottis gabonensis* in the forest facies of the Congolese littoral, compared with those noted in the other zones of its dispersion area (ex: Gabonese littoral), show that this species seems badly adapted to the conditions of this station. This species which has a primarily low-Guinean distribution is restricted with the sector of the littoral of the Atlantic element of the Nigero-Camerouno-Gabonese area. In spite of a noticed presence, the conditions of an optimal development are not met on the Congolese littoral. The values of all its ecological parameters mentioned seem to prove that it would be found in extreme cases of its distribution area. This seems more obvious by integrating this data in the chorology system of the Guineo-Congolese area. *Sacoglottis gabonensis* is a low-Guinean endemic species whose optimum of development is in the Cameroono-Gabonese forest sector of the Atlantic element of the Nigero-Camerouno-Gabonese area.

The comparison of the various ecological and structural parameters, characterizing *Sacoglottis gabonensis* on the Congolese littoral, shows that these forests form the skirt of biafréenne forest, which is the typical ecosystem of the Atlantic element of the Nigero-Camerouno-Gabonese area. The development of *Sacoglottis gabonensis* would be correlated at the rhythm and the precipitation degree.

**Headings:** *Aucoumea klaineana* forest of the Congolese coast

**Conclusion**

The typology of the forest facies of the Congolese littoral shows that those are primarily in *Aucoumea klaineana* in the first stages of development. These formations are definitely different from those of the Cameroono-Gabonese littoral, where the principal species, *Aucoumea klaineana* and *Sacoglottis gabonensis*, are Co-dominant, or characterize facies individually. The supposed importance of *Sacoglottis gabonensis* in the formations with *Aucoumea klaineana* of Congolese littoral is not found. To the phytogeographical plan, the various analyzed ecological parameters bring the proof on the southern limit of the geographical area of *Sacoglottis gabonensis*. Consequently, the forests with *Aucoumea klaineana* would be located at the edge of the Cameroono-Gabonese area of the Atlantic element. Notwithstanding the presence of *Sacoglottis gabonensis* within their floristic woody, the forests of the Congolese littoral are almost with the margin of the development area of this species.

The data obtained on *Sacoglottis gabonensis* show that its duality with *Aucoumea klaineana* is not proven in the floristic
contribution of the Congolese littoral, as it is the case in its field of optimal development. In our region, *Sacoglottis gabonensis* adopts an evolving degree of sociability in an opposite way to that observed in the Cameroono-Gabonese forest, of the Niger-Cameroono-Gabonese area of the Atlantic element. So the analysis of the ecological and structure markers of *Sacoglottis gabonensis* confirms the inexistence of true forest facies characteristic of the biafréenne forest.

**References**