



## Local perception and factors affecting conservation status of gallery forests, habitat of orchid species

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### Perception locale et facteurs affectant l'état de conservation des galeries forestières, habitat des orchidées

**Résumé:** Dans un contexte de fragmentation du paysage forestier et d'utilisation durable des espèces d'orchidées, l'analyse de la base des connaissances locales est indispensable pour développer des stratégies de conservation de l'habitat des orchidées. Cette étude vise à : i) Evaluer les facteurs affectant la perception locale de l'état de conservation des galeries forestières, habitats des orchidées et ; ii) Déterminer les facteurs de dégradation de ces habitats et les conséquences selon les populations locales dans les forêts soudaniennes. Nous avons utilisé une enquête basée sur un questionnaire pour croiser les connaissances sur les orchidées et l'état de dégradation de l'habitat des orchidées, de quatre principaux groupes socio-culturels sélectionnés suivant l'âge, le sexe et le niveau d'éducation, pour un total de 390 enquêtés. Nous avons utilisé la régression logistique binomiale et multinomiale pour évaluer la perception locale de l'état de conservation des habitats des orchidées en référence aux paramètres ethno-démographiques. La régression binomiale négative avec le modèle linéaire généralisé a permis de tester l'influence des paramètres ethno-démographiques sur la perception des conséquences liées à la dégradation des habitats des orchidées. L'origine socio-culturelle et le niveau d'éducation influencent significativement les connaissances des orchidées, ainsi que la perception de l'état de conservation de leur habitat ( $p < 0,05$ ). Les groupes socio-culturels Fulani, Gourmantché et Waaba perçoivent une dégradation avancée de leurs galeries forestières, habitat des espèces d'orchidées. Les trois principaux facteurs de dégradation du point de vue local sont la coupe d'arbres (65,64%), l'agriculture itinérante sur brûlis (44,10%) et les feux de brousse (39,49%). Cependant, quel que soit le modèle considéré, il n'y a pas une influence des paramètres ethno-démographiques sur la perception locale des conséquences de la dégradation des habitats des orchidées. Cependant, l'éducation et l'appartenance socio-culturelle influencent de manière significative la perception de l'état de conservation de l'habitat des orchidées. Évaluer comment cette perception locale se traduit en données quantitatives sur le terrain est cruciale pour développer des stratégies d'adaptation pour la conservation à long terme des espèces d'orchidées et l'utilisation durable de leurs habitats.

**Mots clés :** Orchidées, galeries forestière, perception locale, conservation des orchidées, forêts soudaniennes, Bénin.

**Abstract:** In a context of fragmentation of forest landscape and sustainable use of orchid species, an analysis of the local knowledge base is necessary for developing conservation strategies of orchid habitat. This study aims at i) assessing factors affecting local perception of conservation status of orchid habitats, and ii) determining degradation factors of their habitat in Sudanian woodlands and the consequences of the degradation. We used a questionnaire-based survey, to cross knowledges on orchids and habitat degradation, from the four main socio-cultural groups, including the age, the sex and the level of education, translating into 390 respondents. We used the binomial and multinomial logistic regression to assess the local perception on conservation status of orchid habitats with reference to different ethno-demographic groups. We also used the

negative binomial generalized linear model (GLM) to test for an existing dependence relation between the local perceptions of the “consequences” of the degradation of gallery forest (as response variable), and the ethno-demographic variables. Ethnicity and level of education significantly influence knowledge on orchids, as well as the perception on their habitat conservation status ( $p < 0.05$ ). The socio-cultural groups Fulani, Gourmantché and Waaba perceived more the degradation of their gallery forests, habitat of orchid species. The three main factors of degradation from local view are tree cutting (65.64%), shifting agriculture (44.10%) and wildfires (39.49%). Whatever the considered GLMs, there is not a significant influence of the ethnodemographic variables on local perception of the consequences of the gallery forests degradation ( $p < 5\%$ ). However, education and ethnicity significantly influence perception on the conservation status of orchid habitat. Assessing how this local perception translates into quantitative data in the field is crucial to develop adaptive strategies for the long term conservation of orchid species and sustainable use of their habitats.

**Keywords:** Orchids, gallery forest, Local perception, orchid conservation, habitat degradation, Sudanian woodland, Benin.

## 1. Introduction

Ecosystems are habitats for all life and human activities. They provide goods and services that are fundamental to human wellbeing (Raffaelli & Frid, 2010). Many of these services are crucial for man's survival (climate regulation, pollination, air purification) while others contribute to the improvement of his living conditions (Costanza et al., 2014; Singh & Chaturvedi, 2017; Vodouhê et al., 2009). The continued provision of these essential services could be threatened by changes in land use (Assessment, 2005) as part of factors affecting habitat conservation.

Human-induced land use change and forest fragmentation caused the loss of 50 to 1000 times more species than natural processes (MEA, 2005; Haddad et al., 2015). This phenomenon conducting to the most pessimistic, hypothesis of a sixth extinction crisis (Barbault, 2008) requires strategies for monitoring habitat conservation.

Gallery forests in Sudanian woodlands are sensitive ecosystems generally rich in woody plant species. They are postulated as refugia for many vulnerable plant species in the semi-arid climate of Sudanian woodlands (Fandohan et al., 2010a; Zizka et al., 2015), including orchids species (Assédé et al., 2018). Recent studies highlighted a higher orchid density in gallery forests (of conservation gap areas) compared to other vegetation types (Assédé et al., 2018).

Interest in the conservation status of gallery forests has recently gained attention due to the multiple damages to this vegetation type caused by human activities (Niggemann et al., 2009). Fragmentation of gallery forest landscapes happened at an alarming rate causing severe modifications of their spatial arrangement (Had-

dad et al., 2015; Ousséni et al., 2011). Planning conservation policies and management interventions require a fundamental understanding of the local determinants of deforestation and degradation of the gallery forests. In this context, gallery forests are considered as a multi-functional space with socio-diversity as important driver of their conservation status (Pilli & Pase, 2018). Measuring habitat conservation status could seem straightforward, but investigating factors affecting plant conservation require long-term monitoring field data. In the absence of field data collection, a single survey on local perceptions is usually a useful initial approach to assess habitat conservation status and factors affecting its conservation, especially in gallery forests (Sieber et al., 2011).

Djogbenou et al. (2011) noted the multifunctionality that characterizes the perception of forest conservation and management by local populations. Local people's representations about local change in gallery forest landscapes is the starting point to understand forest fragmentation dynamics and planning for conservation strategies of its components (Mouhamadou et al., 2013; Sieber et al., 2011). The perception and adaptation of the rural population is also necessary to detect any change in the flora (Yaro, 2013) in the absence of a reliable scientific basis on the past vegetation. It is essential to consider their perceptions to develop better strategies for the conservation and management of plant habitats such as orchid habitats (Campos & Ehringhaus, 2003; Shackleton et al., 2002). This study aims at i) assessing factors affecting local perceptions of conservation status of orchid habitats, and ii) determining degradation factors of their habitat in Sudanian woodland and the consequences of the degradation. We addressed the following research questions: i) How do ethno-demographic groups (the ethnicity, the gender, the age and the level of education) influence knowledge of orchids? ii) What influences perceptions of the local population on the state of orchid habitat degradation? iii) What are the causal factors and consequences of degradation of gallery forests, habitat of orchids?.

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## 2. Materials and Methods

### 2.1. Study area

The study was conducted in the Atacora department, at the extreme north-west of the Republic of Benin, around the Biosphere Reserve of Pendjari (BRP), located between 10° 30' and 11° 30' N and 0° 50' and 2° 00' E. The reserve is part of the WAP complex (W-Arli-Pendjari), the largest protected areas network of West Africa, covering the communes of Tanguiéta, Matéri and Kérou. The BRP is subdivided into three components: The Pendjari National Park (PNP) with an area of 2660.04 km<sup>2</sup>, the hunting zone of the Pendjari (HZP) of about 1720.08 km<sup>2</sup>, and the Konkombri hunting area estimated at 251 km<sup>2</sup>, all surrounded by the controlled occupation zone (COZ) with various anthropogenic activities (CENAGREF, 2016). The population of localities near the BRP is estimated at 47 627 inhabitants with an annual growth rate of 3% (INSAE, 2013). This population is located into 29 villages and one city. About 13 socio-cultural groups live around the RBP. However, the population bordering the HZP consists mainly of three ethnic groups: Berba, Gourmantchés and Waaba representing 64.9%, 23.4% and 1% of the population respectively (CENAGREF, 2016). To these main groups are added Fulani, essentially herders (CENAGREF, 2016). The local population is largely farmers (96%). The main activities include crop cultivation and livestock farming. Cultivated crops include maize, sorghum, yam, rice, and cotton, with the latter requiring intense use of pesticides (Djibril, 2002). The savanna and gallery forests in farmlands are subject to intensive fuelwood collection (the main source of domestic energy), timber harvesting and agricultural utilization (Assédé et al., 2018).

### 2.2. Sampling design

Six of the 29 villages around the BRP were selected for this study (Tanougou, Sangou, Nanébou, Bournissou, Dassari and Tiélé), based on the dominant ethnic groups (Biali, Bourba, Gourmantché, Fulani and Waaba), and their proximity both to the BRP and to a gallery forest (Assédé et al., 2017). The sample size was generated from the General Population and Housing Census (GPHR 4) (INSAE, 2013). The number (n) of persons surveyed in each village was determined by

the binomial sampling law formula of Dagnelie (1998) as follows:

$$n = U_{1-\alpha/2}^2 * P(1 - P) / d^2$$

where n: size of the study sample;  $U_{1-\alpha/2}$ : is the normal distribution value for a value of 1.96;

d: margin of error; d = 5%; P: estimated proportion of the population holding knowledge on orchid species fixed at 0.05 (Dagnelie, 1998).

A total of 195 households were surveyed with 390 respondents selected based on the gender, the age and the level of education (table 1). The head of the household and the oldest woman were surveyed in each household.

### 2.3. Data collection

The traditional leaders of the study area were contacted at the beginning of the surveys for their support and collaboration. We used a structured questionnaire-based interviews to record the knowledge of respondents on orchids and their habitat degradation.

The questionnaire included the identity of the respondent, knowledge of orchids, perception, factors and consequences of the degradation of gallery forests where orchids had been identified before, and suggestions for corrective measures. We used a photo guide of recorded orchid species in the study area from previous studies (Assédé et al., 2017, 2018).

### 2.4. Data analysis

The data were first explored to remove incomplete surveys. A total of 345 respondents were used for data analysis (table 1).

#### 2.4.1. Influence of ethno-demographic group on knowledge of orchids

We used a binary logistic regression to predict the probability that an individual belonging to an ethno-demographic group (ethnicity, gender, age and level of education) knows or does not know orchids, since the knowledge of orchids is a binary qualitative variable (Table 2). Any person in the sample who recognized at least one orchid species from the photo guide used during the survey as present in a nearby gallery forest was considered to have knowledge of orchids.

Table 1. Distribution of the respondents with regard to ethnicity, education level, gender and age

Tableau 1. Répartition des enquêtés suivant l'ethnie, le niveau d'éducation, le sexe et l'âge

Ethnicity						
Gender	Biali	Bourba	Gourmantché	Fulani	Waama	Total
Man	86	57	29	4	12	188
Woman	104	26	20	5	11	166
Total	190	83	49	9	23	354
Education						
Gender	Informal.education	Not.educated	Primary.level	Secondary.level	Total	
Man	4	135	35	14	188	
Woman	13	140	10	3	166	
Total	17	275	45	17	354	
Age (A)						
	A≤30	30<A≤50	50<A≤70	A>70	Total	
Man	1	92	78	17	188	
Woman	4	98	54	10	166	
Total	5	190	132	27	354	

Table 2. Description of variables included in the binary and multinomial logistic regression

Tableau 2. Description des variables incluent dans la régression logistique binaire et multinomiale

Variable	Type of variable	Level of measurement	Categories
Knowledge of orchids	Response	nominal	Yes, no
State of degradation of gallery forests	Response	nominal	Not degraded, degraded and highly degraded
Ethnicity	Explanatory	nominal	Biali, Bourba, Gourmantché, Fulani and Waaba
Gender	Explanatory	nominal	Male, female
Age	Explanatory	continuous	-
Level of education	Explanatory	nominal	Not educated, Informal education, Primary and Secondary levels

#### 2.4.2. Factors affecting local perception of the conservation status of orchid habitats

We used a multinomial logistic regression to assess the local perception on the degradation of gallery forests. The variable state of degradation is a multinomial qualitative variable with three modalities (table 2). The relative frequencies of each category of informant were calculated.

#### 2.4.3. Factors affecting the degradation of gallery forest from local perceptions

We used graphical representations to present the factors responsible for the degradation of gallery forests from local perception. We also used the negative binomial generalized linear model (GLM) to test for an existing dependence relation between the local percep-

tions of the “consequences” of the degradation of gallery forests (as response variable), and the ethno-demographic variables (ethnicity, gender, age and education level) as explanatory variables. The construction of the best model examined the variables with significant effect on the response variable. Five generalized linear models (m1 to m5) were fitted and compared with each other using the ANOVA function in R 3.6.1:

```
m1 <- glm(Consequences ~ Age + Gender + Ethnicity +
  Education, family=binomial)
m2 <- glm(Consequences ~ Age + Gender + Ethnicity, family=binomial)
m3 <- glm(Consequences ~ Age + Gender, family=binomial)
m4 <- glm(Consequences ~ Age, family=binomial)
m5 <- glm(Consequences ~ 1, family=binomial)
```

The ANOVA test determined if the candidate models were significantly different based on the probability  $p \leq 5\%$ . The simplest model was preferred. The model selection criteria also included the Akaike Information Criterion (AIC) – the smaller its value, the better the fit (Zuur, 2009).

### 3. Résultats

#### 3.1. Knowledge of orchids by the surveyed ethno-demographic groups

Ethnicity influenced the knowledge of orchids, with the Gourmantché and Waaba ethnic groups showing a higher proportion of persons knowing orchids (figure 1).

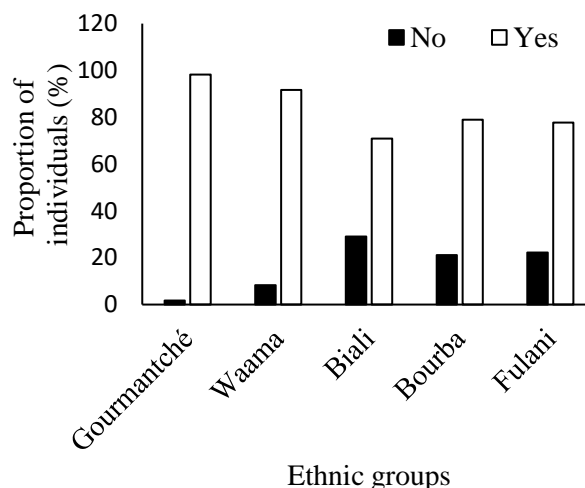


Figure 1. Proportion of individuals with knowledge of orchid species per ethnic group

Figure 1. Proportion des individus ayant des connaissances sur les espèces d’orchidées par groupe socio-culturel

Results of the binary logistic regression (table 3) showed that respondents from the Gourmantché and Waaba ethnic groups have a significant higher probability of knowing at least one orchid species ( $p=0.002$  and  $p=0.035\%$  respectively) unlike the other ethnic groups. However, the variables age, gender, and education level do not significantly influence knowledge of orchids (table 3).

Table 3. Results of the binary logistic regression between the knowledge of orchids (response variable) and the ethno-demographic groups (explanatory variables)

Tableau 3. Résultats de la régression logistique binaire entre les connaissances sur les espèces d’orchidées (variable réponse) et les facteurs ethno-démographiques des groupes d’individus enquêtés (variables explicatives)

Variables	OR	Lower (95% CI)	Upper (95% CI)	Probability
Age	0.99	0.97	1.02	0.93ns
Gender male (reference category)				
Gender female	0.7	0.41	1.2	0.2ns
Ethnic [Biali] (reference category)				
Ethnic [Bourba]	1.53	0.83	2.82	0.17ns
Ethnic [Gourmantche]	22.92	3.1	169.84	2 <sup>e</sup> -3*
Ethnic [Fulani]	1.61	0.319	8.13	0.56
Ethnic [Waaba]	4.948	1.12	21.85	3.5 <sup>e</sup> -2*
Education [not educated] (reference category)				
Instruction [Informal education]	2.4	0.66	8.66	0.18ns
Instruction [Primary]	1.27	0.56	2.88	0.56ns
Instruction [Secondary]	1.64	0.43	6,15	0.46ns

OR: Odds ratio; \*: significant at 5%; ns=not significant

### 3.2. Factors affecting local perception of orchid habitat conservation status

The ethnic group and education level influenced the perception of the degradation status of orchid habitats ( $p < 5\%$ ) (table 3). However, age and gender have no effect on the perception of the degradation status of the gallery forests.

Whatever the ethnicity, the highly degraded level was the dominant conservation status reported for gallery forests in the study area (figure 2). The ethnic groups Fulani, Gourmantché and Waaba, perceived more the deteriorated state of the gallery forests even if this perception is not statistically significant for Gourmantché (table 3). From their observations, there is no gallery forests in their area with a good conservation status. The Biali and Gourmantché have a fairly shared perception of the conservation status of the gallery forests. Even if they are very few ( $< 5\%$ ), some of the respondents from Biali and Gourmantché ethnic groups reported a non-degraded status for the gallery forests.

The education level affected the perception of the conservation status of gallery forests negatively and significantly ( $p < 5\%$ ) (table 3; figure 3). The respondents with the most advanced education level (informal and secondary education levels) reported more frequently the deterioration of the gallery forests (figure 3).

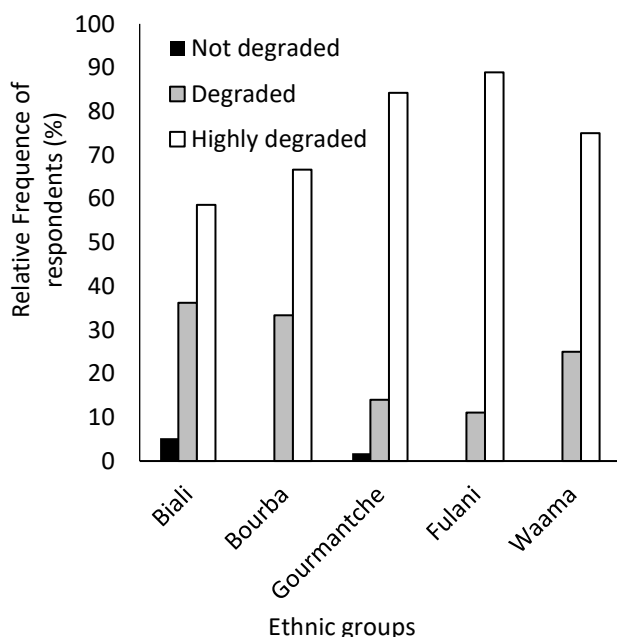


Figure 2. Ethnicity and perception of conservation status of gallery forests

Figure 2. Groupes socio-culturels et perception de l'état de conservation des galeries forestières

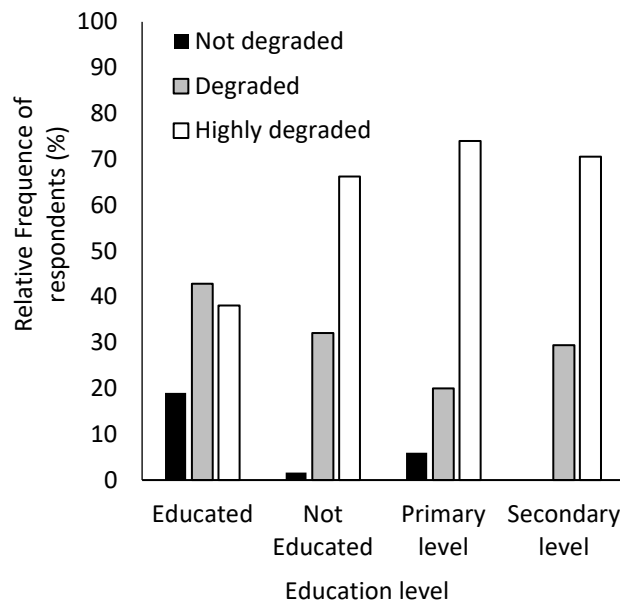


Fig. 3. Influence of education level on the perceived conservation status of gallery forests

Fig. 3. Influence du niveau d'éducation sur la perception de l'état de conservation des galeries forestières

### 3.3. Factors affecting the degradation of gallery forests, consequences and alternative for restoration from local view

In total, six factors of degradation of gallery forests were reported in the study area (figure 4). The three most important factors are tree-cutting, shifting cultivation, and bush fire.

The perceived main consequences of the degradation of gallery forests according to the local population were mainly the reduction of rainfall (39.9%) and loss of biodiversity (33%) (figure 5).

Of the tested models, the model 5 presented the smallest AIC value. However, the Anova test showed no significant difference between the later and the other models (table 5). Whatever the considered GLMs, there is no significant influence of the ethno-demographic variables (ethnicity, gender, age and level of education) on local perception of the consequences of the gallery forests degradation ( $p < 5\%$ ).

The surveyed populations of the different villages opted for reforestation (68%) and monitoring/awareness (21%) as corrective actions for the rehabilitation of degraded gallery forests in their areas (figure 6).

Table 4. Coefficient of multinomial logistic regression between the local perception of the degradation status of gallery forests (response variable) and ethno-demographic factors of the surveyed groups (explanatory variables)

Tableau 4. Coefficients de la régression logistique multinomiale entre la perception des populations locales sur le statut de dégradation des galeries forestières (variable réponse) et les facteurs ethno-démographiques des groupes d'individus enquêtés (variables explicatives)

Variables	Little degraded		Degraded	
	Coefficient	Probability	Coefficient	Probability
Age	2.559	0.138	3.190	0.060ns
Gender [Female] / [Male]	-0.011	0.688	-0.008	0.783ns
Ethnic [Bourba] / [Biali]	0.966	0.168	0.378	0.584ns
Ethnic [Bourba] / [Biali]	30.269	0.000	30.319	0.000*
Ethnic [Gourmantché] / [Biali]	0.265	0.814	1.488	0.168ns
Ethnic [Fulani] / [Biali]	10.302	0.000	11.944	0.000*
Ethnic [Waaba] / [Biali]	19.894	0.000	20.454	0.000*
Education [Informal education] / [not educated]	-1.874	0.016	- 2.606	0.001*
Education [Primary] / [not educated]	-1.366	0.108	-0.922	0.251ns
Education [Secondary] / [not educated]	15.100	0.000	15.229	0.000*

\*: significant at 5%; ns=not significant

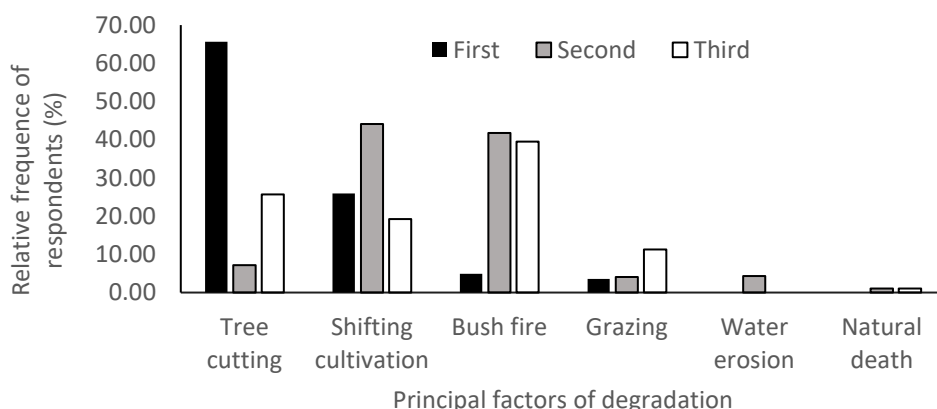


Figure 4. Principal factors of degradation of gallery forests

Figure 4. Principaux facteurs de dégradation des galeries forestières

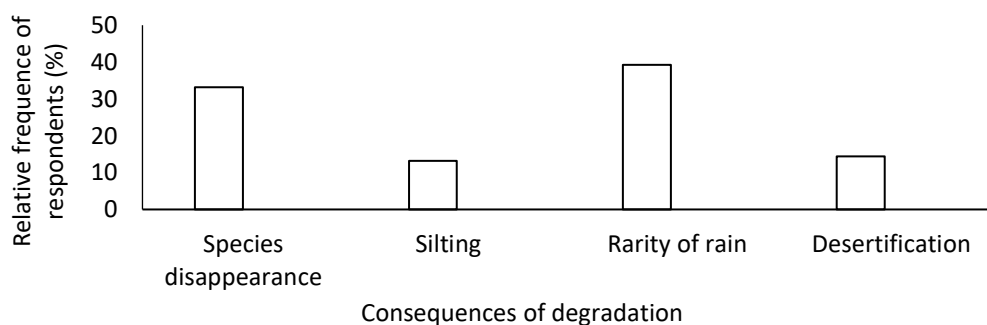


Figure 5. Consequences of the degradation of gallery forest

Figure 5. Conséquences de la dégradation des galeries forestières

Table 5. Generalized linear models results fitted and compared with the ANOVA test on the relation between local perceptions of the “consequences” of the degradation of gallery forest and the ethno-demographic parameters.

Tableau 5. Résultats des modèles linéaires généralisés ajustés et comparés avec le test ANOVA sur la relation entre les perceptions locales des « conséquences » de la dégradation des forêts galeries et les paramètres ethno-démographiques.

Model	df	AIC	Test	Probability
m1	344	133.7	m1 vs m2	0.76ns
m2	347	128.87	m2 vs m3	0.14ns
m3	351	127.71	m3 vs m4	0.12ns
m4	352	128.11	m4 vs m5	0.77ns
m5	353	126.19	-	-

ns=not significant; at 5%; vs=versus; df=degree of freedom; AIC=Akaike Information Criterion

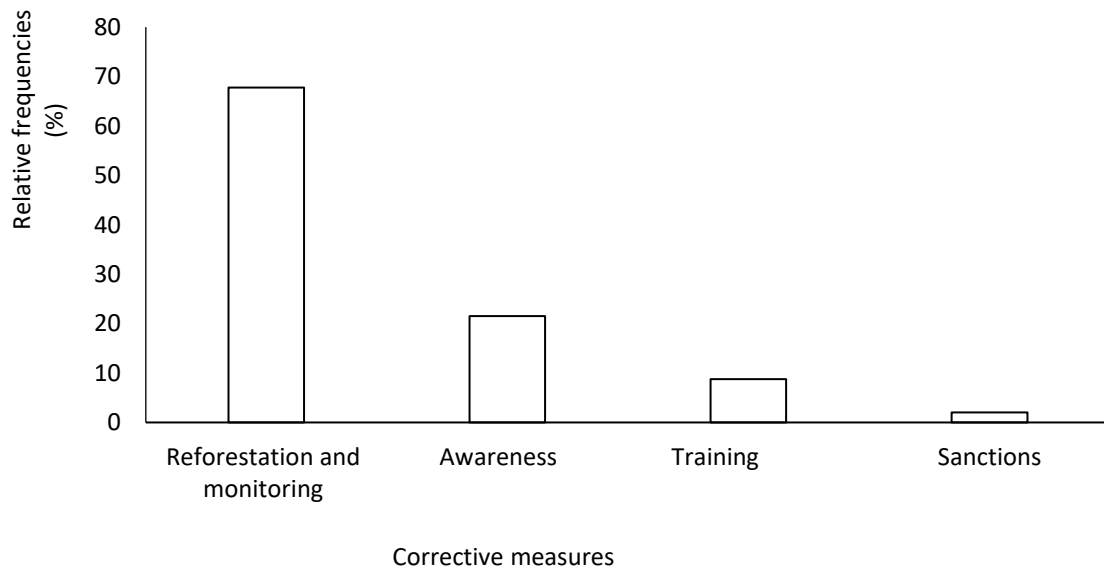


Figure 6. Corrective actions suggested by the local population for the rehabilitation of degraded gallery forests

Figure 6. Mesures correctives suggérées par les populations locales dans la réhabilitation des galeries forestières dégradées

## 4. Discussion

### 4.1. Influence of ethno-demographic groups on knowledge of orchids

The study revealed a variation in the knowledge of orchids with regard to the ethnicity around the Biosphere Reserve of Pendjari in Sudanian woodlands. Such interethnic differences were reported in Ottamari and Dendi socio-cultural groups about their knowledge on the uses of the baobab tree (*Adansonia digitata* L.)

(De Caluwé et al., 2009), and for Fulani and Gourmantché groups for uses of the tamarind tree (*Tamarindus indica* L.) (Fandohan et al., 2010b). Our finding revealed a higher proportion of people knowing orchids from Waaba and Gourmantché compared to Biali, Bourba and Fulani socio-cultural groups. This could be explained by their original hunting activity, proximity to and dependency on the reserve for their livelihood. A previous study (Assédé et al., 2017) highlighted this difference in population knowledge on the uses of several natural resources of the same area. Age and gender



did not influence significantly local knowledges of orchids probably because of sample bias. The study was implemented during the period of crop harvesting in the study area, when mostly men over 45 years were available for the survey. Crop harvesting is primarily done by women and young people. A comparison of results from this study with previous studies in the same area (Fandohan et al., 2010b; Gouwakinnou et al., 2011a, 2011b), where elders and women were more familiar with the study species, should be done with caution. From N'zebo et al. (2018) for instance, the age and gender balance significantly affect knowledge of *Tetrapleura tetraptera* fruit, and women had a higher level of knowledge than the men. All these studies focused on multipurpose fruit tree species. It is common knowledge in Sudanian woodlands of West Africa, that women are central to the collection of non-timber forest products for the nutrition of their households (Boffa, 2015; Fandohan et al., 2010b).

#### **4.2. Factors affecting local perception of orchid habitat degradation**

Ethnicity and the education level influenced the perception of the populations surveyed on the conservation status of gallery forests. The Biali and Gourmantché shared similar perceptions, while, Fulani and Waaba socio-cultural groups expressed a strong deterioration of their gallery forests. The respondents with informal and secondary level of education reported more frequently the deterioration of the gallery forests, probably because they depend on those resources and understand better the ongoing decline and fragmentation of the natural resources. Many local people of the main groups around the Biosphere Reserve of Pendjari (BRP), with no education and very low income, rely on forest resources like timber and non-timber forest products for their daily needs (Vodouhê et al., 2009). Some of them are strongly involved in the informal education programs designed by the conservation projects of the BRP. They interact directly with these resources and with their additional knowledge from their education, can clearly perceive the spatio-temporal dynamics of the resources. Unlike ethnicity and education level, age and gender have no effect on the perception of the degradation status of the gallery forests. There is no significant variation in the mean age between those who perceived the different conservation status of gallery forests probably because the degradation affects the resources used by both men and women, irrespective of the age. For Mouhamadou et al. (2013), landscape degradation affects all resources (soil, water, flora, and fauna) that are used interchangeably by women and men.

As indicated by the surveyed populations, gallery forests in the unprotected area of the BRP can be classified from less degraded to degraded. This finding supports the conclusions of Bouko et al. (2007) and Mouhamadou et al. (2013) who draw the attention to the ongoing fragmentation of forest landscapes in northern Benin. Several studies on land cover change, mainly in the Sudano-Guinean and Sudanian woodlands, highlighted a regressive tendency of gallery forests in Benin (Houessou et al., 2013; Sinsin & Kampmann, 2010; Tchiboze, 2014).

#### **4.3. Factors affecting the degradation of gallery forest according to the local perceptions**

Gallery forests are the main habitat of orchid species in the unprotected area of the Biosphere Reserve of Pendjari (Assédé et al., 2018). The local perceptions indicated the main degradation factors of gallery forests to include agriculture, wildfires, grazing, tree cutting, and natural tree deaths. The three most cited factors are tree cutting, shifting cultivation and induced fire. These factors are common to several landscapes in tropical Africa (Chaturvedi et al., 2017b, 2017a; Miles et al., 2006). Land degradation factors are mainly anthropogenic (tree cutting, shifting cultivation, bush fire and grazing) (Miles et al., 2006). In this study, tree harvesting and an increasing demand of land for agriculture were reported as main causes of forest degradation irrespective to the socio-cultural group and the education level. The population growth (INSAE, 2013) and the low income of most of the population around the BRP (Assédé et al., 2017; Vodouhê et al., 2009) explain in part the pressure on the gallery forests as alternative resource for domestic energy, timber harvesting and land for agriculture. All these anthropogenic factors were incriminated by previous studies as drivers of negative vegetation dynamic (Adjonou et al., 2010; Maazou et al., 2017; Yeo et al., 2013). The absence of significant influence of the ethno-demographic parameters on local perceptions of the consequences of degradation of the gallery forests confirmed the absence of disparity in this perception within the surveyed population. Irrespective of their ethnicity, gender, age and level of education, the local population around the BRP perceived almost similar consequences of the degradation of the gallery forests as they are probably facing similar impacts. This latter aspect needs to be documented and incorporated with the local strategies to mitigate these impacts.

## 5. Conclusion

Ethnic group and education level are the main determinants of local perceptions of orchid habitat conservation. Tree cutting, shifting cultivation and bush fires are highlighted as main degradation factors of gallery forests. From the local population view, an action plan for the restoration and monitoring of orchid habitats is crucial to perpetuate the pivotal role of gallery forests around the Biosphere Reserve of Pendjari.

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## CONFLICT OF INTEREST

The authors did not declare any conflict of interest.

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