

# *Traditional Uses Of The Plants Consumed By Propithecus Deckenii (Peters, 1870) In Mandrozo Protected Area, Western Madagascar*

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**Abstract** – This study focused on the diet of Decken's sifaka (*Propithecus deckenii*) and was carried out in Mandrozo Protected Area (MPA), in western Madagascar. The main objective was to identify the plants consumed by sifakas and their traditional uses by the local people within and surrounding MPA. For this purpose, we observed and recorded the feeding behavior of four groups of sifakas in two forest fragments (Andapabe and Ampiliravao), during two periods: from March to April 2018 for the wet season and from September to October 2020 for the dry season, using the Focal Animal Sampling method. Sifakas consumed 37 plant species belonging to 20 families and 31 genera and they ate mainly the plant leaves. We found that the sifaka's diet is more diversified during wet season. We also interviewed 168 local persons from eight villages and recorded their ethnobotanical knowledge on the plant species eaten by sifakas. Local people utilized 70% (n=26) of the plant species eaten by sifakas. Five categories of human uses were recorded: house construction and tools for domestic use, phytotherapy, making of handicrafts, as food sources and traditional culture. Among these, the construction of houses and tools for domestic use and traditional medicine constitute the main mentioned human uses by the queried locals. For the indigenous people, three species of trees: *Dalbergia humbertii*, *Tamarindus indica* and *Cedrelopsis grevei* were used as part of their habits and customs.

**Keywords** – Lemur, Sifaka, diet, Ethnobotany, Mandrozo Protected Area

## I. INTRODUCTION

Madagascar's human population is estimated at 25.7 million with more than 81 % living in rural areas [7]. Malagasy people are intimately dependent on local resources from the forests for their livelihoods such as firewood, material for house construction, food and traditional medicine [3]; [16]. However, plants are negatively affected by human use activities. Medicinal plants sold in the country's capital are mostly from natural forests [24]. Charcoal production or firewood use alters the structure of the native habitat ([18], [22]). Some species, such as *Ravenala madagascariensis* (Strelitziaceae), *Avicennia marina* (Acanthaceae), *Anacardium occidentale* (Anacardiaceae) are highly exploited and subjected to multiple uses ([19], [24]). Human needs for forest resources evolve through the years and increase with the ever-increasing populations but their availability is not

without limit. Indeed, human activities have devastating negative impacts on the forest resources on their structure and species composition of the natural forest ecosystems [32].

Lemurs are primates that live in forests. They are also part of the national wealth, share the same resources within the forest with human population for surviving. Many studies have already examined relationships between human disturbance and lemur's social behavior, habitat utilization, health and parasite load ([4], [8], [11], [12], [28], [29]). Earlier studies have demonstrated that several lemur species like Diademed sifaka (*Propithecus diadema*) groups spend much more time foraging in small forest blocks than in larger ones with a lower energetic and less consistent diet [9], Black-and-white ruffed Lemur (*Varecia variegata*) supplements its diet with other additional resources to survive in degraded habitat at Manombo [25] and Ring-tailed Lemur's (*Lemur catta*) diet is mixture of plants that are eaten in abundance regardless of frequency than those that are locally available [33].

For the present investigation, we search to identify the plants consumed by lemurs, in particular Decken's sifaka within Mandrozo PA (MPA), and also the ways in which these plants are used locally by people live surrounding MPA. Then, it can help to manage the natural resources within MPA in same time finding conservation strategies of both plants and sifaka. Our study focused mainly on this lemur species for the following reasons: it is poorly studied in nature ([14], [35]); and its conservation status has recently downgraded from endangered (EN) to critically endangered (CR) [10] due essentially to habitat loss and anthropogenic disturbances increase [13].

MPA was selected to conduct this investigation in order to preserve the ethnobotanical knowledge locally, to reinforce the conservation actions for this species by finding a compromises to decrease or mitigate human-sifaka conflicts in this area. MPA was also chosen as study area because it hosts an important population of Sifaka [23]; [26]. Furthermore, The Peregrine Fund has established a community-based conservation model which a local traditional culture is reinforced to manage sustainably natural resources and to conserve biodiversity [31].

## **II. MATERIAL AND METHODS**

### **II.1. Study area**

This study was carried out in Mandrozo Protected Area (MPA) which is located in western Madagascar between S17°29'-S17°39' and E043°59'-E044°11' (**Figure 1**). It is classified as Protected Harmonious Landscape equivalent to IUCN category V. It has an area of 15,145.18 ha encompassing five ecosystems: lakes, marshes and swamps, dry deciduous and palm forests, and grasslands [17]. MPA is subdivided in two different areas such as core area (908.82 ha) and buffer zone (14,236.36 ha). As a Protected Harmonious Landscape, the buffer zone is allowed for natural resources harvesting by local people.

Moreover, MPA was designated as Ramsar site in 2012. Also, two distinct seasons occur at this area: a dry season from May to October, and a hot and wet season from November to April.

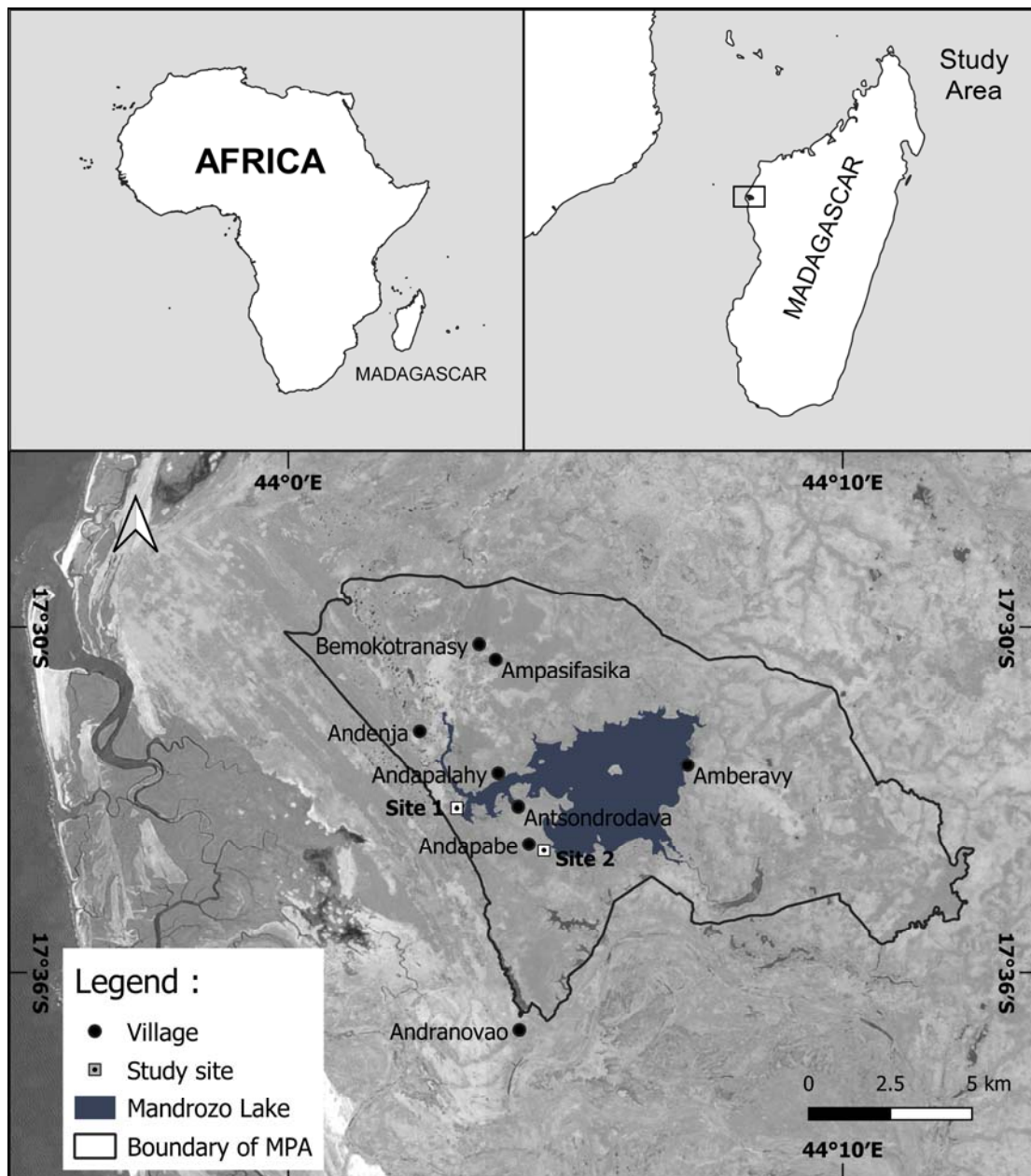


Figure 1. Map showing the study area of the Mandrozo Protected Area.

## II.2. Foraging behavior

According to previous studies conducted in western Madagascar, sifaka's diet may change from season to season [15]. For this case, we monitored sifakas foraging behaviour during wet (from March to April 2018) and dry (from September to October 2020) seasons. The research team was composed of one researcher for recording data and one local guide for providing local names of all plants eaten by the focal sifakas. Data was collected from two groups of sifakas in the buffer zone at Ampiliravao and from two groups in the core area at Andapabe within MPA. One adult male and one adult female per group were chosen as focal sifakas.

Each focal sifaka was followed using the Continuous Focal Animal Sampling method [1] for an entire day from when the animal woke up in the morning until it went to sleep in the evening. Our observation lasted from 8 to 14 days per focal sifaka per season. We recorded the following parameters: plant species and parts eaten, time spent consuming each specific part, height of

the focal sifaka when eating, and geographical coordinates of the feeding event. Specimens of each plant eaten were collected and dried and then put in a herbarium press with the following notes: local name of plant, date of collection and geographic coordinates. These specimens were deposited at the herbarium of the Botanical and Zoological Garden of Tsimbazaza and at the Department of Biology Ecology of the University of Antananarivo. We consulted the online database Tropicos ([www.tropicos.org](http://www.tropicos.org) accessed in October 2022) in order to add and update the scientific plant names.

### II.3. Ethnobotanical survey

We conducted an ethnobotanical survey with local people living inside and surrounding MPA to identify how they use the plants consumed by Decken's sifaka. We carried out a formal interview through a focus group method and used a questionnaire that asks respondents to specify their age, gender, ethnic group and occupation. We interviewed 20 people per village, which were divided in two groups of 10 people. All of them were in the age range of 20-60 years old. We selected eight villages where up to 80% of their inhabitants depend on MPA natural resources [31].

For each group interviewed, we noted the following parameters: local name of plant species, part of plant collected, and how it was used. Each interview lasted between 20 and 30 minutes. We always worked with a local guide to translate in case of linguistic misunderstanding, to avoid distrust and to introduce the researcher team to the interviewee. We also asked each person's permission before taking notes or pictures.

### II.4. Statistical analysis

Statistical analysis was undertaken using R 3.6.0 (R Core Team 2019). Indeed, Chi-square test was applied to compare the proportion of feeding time of each plant part consumed. We also analyzed the proportion of feeding time of each plant part consumed between seasons via ANOVA with two-factors.

## III. RESULTS

### III.1. Foraging behavior

The focus sifakas were observed for 235.3 h during 90 days. Sifakas spent on average  $157.25 \pm 7.63$  minutes foraging per day. They consumed a total of 37 plant species belonging to at least 20 families and 31 genera (**Annex 1**). We unidentified the scientific name of one of these plant species. Sifaka's diet vary according to the season, they ate more plant species during the wet season ( $n = 28$  plant species) compared to the dry season ( $n = 17$  plant species). But statistically, a test resulted that there is no significance difference within composition species ( $X^2 = 27.983$ ,  $dll = 36$ ,  $p = 0.828$ ). Eight plant species (21.62%) out of 37 were common to both seasons (Annex 1). The most dominated families are Fabaceae, Euphorbiaceae and Malvaceae, which composed 37.84% ( $n = 14$ ) of whole plant consumed.

The endemism rate of plant eaten by sifakas was about 81.1% ( $n = 30$ ). The following plant species are threatened according to IUCN Red list: *Drypetes thouarsii* (VU), *Dalbergia humbertii* (VU), *Givotia madagascariensis* (VU), *Terminalia rhopalophora* (EN) and *Cleidion capuronii* (CR).

The focal sifakas spent the majority of their feeding time eating four plant species (*Cordyla madagascariensis*, *Mangifera indica*, *Tamarindus indica* and *Antidesma petiolare*) (**Figure 2**), for a total of 90.84 minutes (57.8% of the feeding time). Sifakas ate different parts of plants such as leaves, fruits, flowers, seeds, buds and stem. They were always mainly folivorous along the year and whatever the season ( $X\text{-squared} = 121.62$ ,  $df = 5$ ,  $p = 0.001$ ) (**Figure 3b**). We also noted a significant difference on Sifaka's feeding time eating leaves and fruits between the two seasons (**Table 1**).

They spent 54.86% ( $n = 86.27$  minutes) of their feeding time per day eating leaves and 21,95% ( $n = 34.51$  minutes) of their feeding time per day eating fruits (**Figure 3a**). The rest of feeding time was passed eating flowers, seeds, buds and stem.

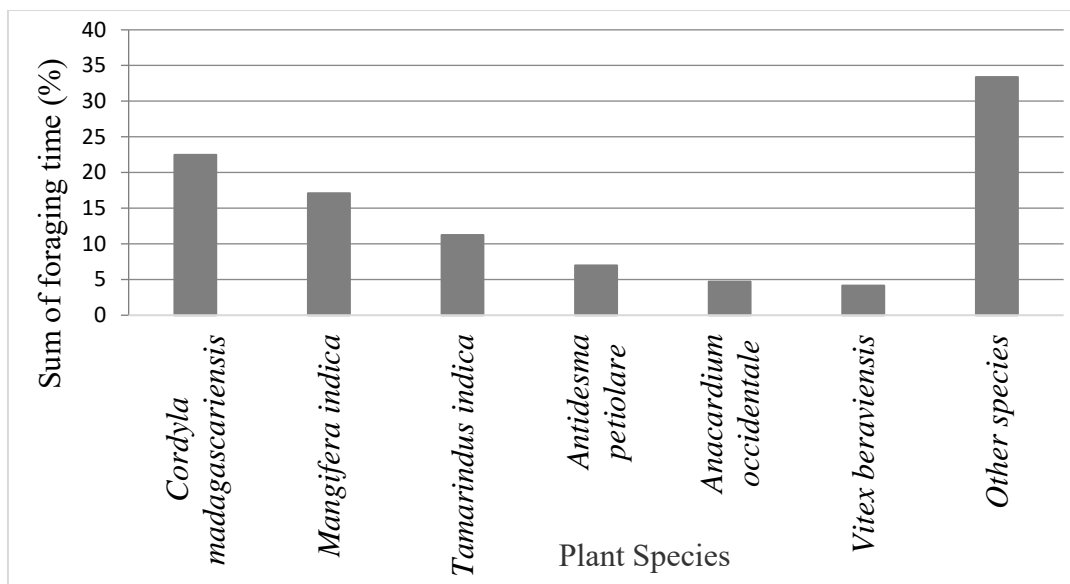


Figure 2. Major plant species consumed by Decken’s sifakas relative to time spent foraging at Mandrozo Protected Area, western Madagascar

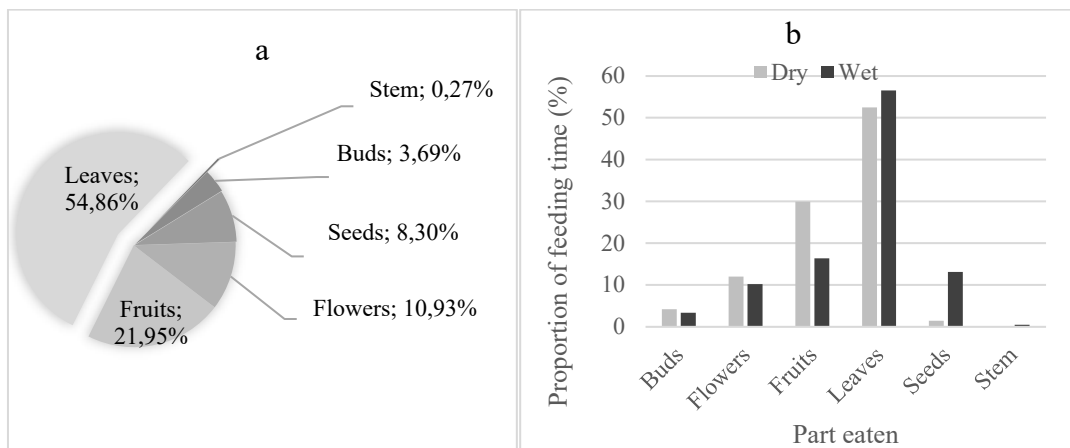


Figure 3. Repartition of feeding time of Decken’s sifakas at Mandrozo Protected Area, eating plant parts (a) during each season (b).

Table 1: Comparison of proportion of feeding times eating different parts of plants by season

-	Estimates	SD	p
(Intercept)	0.37	2.89	0.90
Flowers	3.62	3.79	0.38
Fruits	9.13	3.79	<b>0.04*</b>
Leaves	25.59	3.79	<b>0.001*</b>
Seeds	2.31	3.79	0.57
Stem	1.71	3.79	0.67

### III.2. Traditional uses of plants eaten by sifakas

During the ethnobotanical survey, we visited eight villages: Andapabe, Ampasifasy, Andranovao, Bemokotranasy, Andenja, Andapalahy, Amberavy and Antsondrodava (**Figure 1**). We interviewed 160 people, all users of natural resources within MPA. They were composed of women (33.75%) and men (66.25%). And they were farmers (60%), fishermen (20%), unemployed (10%), teachers (5%) and students (5%). According to their ethnic groups, they are belonging to the Sakalava (75%), Antesaka (15%), Betsileo (5%) and others (5%).

According to the interviewees, 70.27% (n=26 plant species) plant species consumed by Decken's sifakas are used by local people as well. Then, we recorded five categories of use: house construction and tools for domestic use, phytotherapy, handicrafts, food and traditional use on local culture. The table on Annex 2 shows the list and detailed uses of the traditional uses of plants eaten by Decken's sifakas.

#### *Construction use*

About 69.23%, i.e., 18 out of 26 plant species used by local people are cited as materials for various construction needs such as for houses, huts, roofs, furniture and fences.

#### *Phytotherapy*

Phytotherapy have an important place in the daily life of local people in terms of healthcare. Thirty-two percent (n = 12) of plant species eaten by the sifakas have medicinal properties. Some of them have multiple medicinal uses like *Cedrelopsis grevei*, *Stereospermum euphorioides*, *Albizia gummifera* and *Grewia lavanalisensis*. Most treatments for diseases are given as Tea therapy, locally known as *Tambavy*. In many cases, leaves or bark are the parts of plants that are mostly used.

#### *Handicraft use*

Among plant species eaten by sifakas, only *Bismarckia nobilis* is used for making baskets, hats and mats. This activity provides for local women a source of income. Products are till now sold in local markets, and many handicrafts are generally intended for domestical use and sometimes for commercial purposes.

#### *Food use*

We identified four plant species in this category. The fruits of three species *Anacardium occidentale*, *Mangifera indica* and *Tamarindus indica* are collected by local people for dietary supplement and for selling. The pith of the stipe and the terminal bud of *B. nobilis*, also known as "heart of the palm", which consists in food for local people and their livestock during the lean period (from January to March). For this food source, the trees need to be cut down. For human consumption, we noted two types of food: *Kabija* and *Hovaky*. *Kabija* is an artisanal flour obtained by processing the pith of the stipe, while *Hovaky* is the heart of the palm. For livestock-feed, the processing consists of cutting the plants in order to recover the stipe pith when other food sources were scarce.

#### *Cultural use*

Three plants *Dalbergia humbertii*, *Tamarindus indica* and *Cedrelopsis grevei* have values for Sakalava ethnic community in this area. Two trees of tamarind found in two places (Andapabe and Anjigorabe) within MPA are considered by local people as sacred trees called locally *Kilimasy*, which are worshiped during the following ceremonies: *Sasarano* as request of purification of Mandrozo Lake and *Misoloho* as request for blessing from ancestors and cult of possessions and wishes. Those events always need a sacrifice of a zebu as an offering. During *Misoloho* ceremony, local people used the wood of *D. humbertii*, which has a spiritual value for them.

About *Cedrelopsis grevei*, this plant has cultural value during a funeral ceremony. Eight posts of *Cedrelopsis grevei* are always installed by the Sakalava ethnic around each grave locally called *Valamena* or fence. These posts are placed in the following order: three in each front and behind of the grave and one in each left and right side.

## IV. DISCUSSION

Decken's sifakas within MPA were mainly folivorous, and this predominance of leaves in the diets was consistent during the dry and wet seasons. This suggests this species is always florivorous during any season. This species, like other sifakas species,



have a special gastrointestinal tract and wide cecum for digesting dietary fiber [5]. Sifakas in the Kirindy area fed on various plant parts (leaves, flowers, fruits, seeds, buds, stems) like sifakas at MPA [15]. This shows that the diet in the genera *Propithecus* depend predominantly on food availability. In this sense, leaves are most often available during the wet season in the study area due to phenology of plants. The dietary patterns of the focal sifakas are broadly similar to another species of sifaka, Diademed sifaka (*P. diadema*) in Tsinjoarivo preferred more foliage than other plant parts all-year round [9]. In addition, [20] also reported that Crowned sifaka *P. coronatus* at Amboloando fragmented forest was folivorous too from March to April. However, the diet of *P. verreauxi* varies and follows the seasonality in the Kirindy dry forest [15]. It was dominated by fruits during the wet season, and leaves during the dry season. We suggest that the genera *Propithecus* might gradually switch feeding behavior following the weather season. The choice of food items is normally influenced by food availability in herbivores ([2], [34]).

We identified 37 plant species eaten by sifakas in MPA. Their diversity are lower than the Kirindy dry deciduous forest, in which sifakas eaten until 120 plant species [15]. Two main reasons can explain this difference: (1) the study duration of only two month per season (March - April and October - November) while [15] spent 12 months (from January to December) for studying the dietary habits of sifakas in Kirindy; and (2) habitat type: we estimated that the diet is likely more diverse in forest continuous like in Kirindy than in the fragmented forest as Mandrozo. According to [30], Kirindy forest has 140 plant species, which is richest than Mandrozo forest with 108 plant species.

The transmission of the knowledge on traditional use of certain plant species consumed by *P. deckenii* is by oral tradition, word-of-mouth, from father to son and from generation to generation. [27] confirmed the fragility of this transmission system and the lack written support and documents which may lead to the loss of the conservation of some intangible cultural heritage. Consequently, some important knowledge will be forgotten sooner or later. In addition, the mistrust of native people towards non-residents would also lead to the loss of traditional knowledge.

Sifakas in MPA are highly respected by local people, especially the Sakalava ethnic tribe which considered this animal as sacred. Our informants confirmed this respect towards the sifakas, and this dates back many centuries but is still practiced now. The hunting and consuming of this species are traditionally forbidden. This attitude is linked to their belief which highlights the relationship between human and sifaka. Harpet *et al.* reported that all sacred relationships towards lemurs described by [21] in Ankazomborona in 1976 are still in practice [6]. This means, that tradition based on belief can also still endure. In addition, the presence of "Kilimasy" contributes directly to the conservation of this lemur community by the fact that there is restricted access to its vicinities. Only *Mpisoloho*, the person leading the ceremony *Misoloho* and his assistants selected by himself have access to it.

## V. CONCLUSION

This work has shown that local communities depend partially or entirely on natural resources within Mandrozo Protected Area, especially those in the dry forest. Then, they share with *P. deckenii* certain plant species for traditional medicine, for food, for cultural item, for various constructions and for handicraft. These traditional uses and ethnobotanical knowledge are important to preserve and pass to the future generations. We suggest that they could be a tool for harmonizing sustainable uses and conserving biodiversity, whether it be for lemurs or for useful plant. Some of the plants were used in different ways, which should be monitored carefully to maintain, and always be able to support the needs of humans and sifaka's population in this area.

## ACKNOWLEDGEMENT

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## ANNEX

**Annex 2:** List of plant species consumed by Decken's Sifakas at MPA

Season: Wet and dry seasons (**WDS**), Wet season (**WS**), and Dry season (**DS**).

IUCN Red List Status: Data Deficient (**DD**), Least Concern (**LC**), Near-threatened (**NT**), Vulnerable (**VU**) and Endangered (**EN**)

Species name	Vernicular name	Family	Part consumed	Season of observation	Endemism	IUCN Red List Status (2022-2)
<i>Cordyla madagascariensis</i>	Anakaraky	Fabaceae	Leaves, Buds, Flowers	WDS	Endemic	LC
<i>Ficus marmorata</i>	Aviavy	Moraceae	Seeds	WS	Endemic	LC
<i>Drypetes thouarsii</i>	Betabaky	Euphorbiaceae	Leaves, Seeds	WS	Endemic	VU
<i>Albizia gummifera</i>	Bonara	Fabaceae	Leaves	DS	Endemic	LC
<i>Albizia lebbek</i>	Bonara	Fabaceae	Leaves	WS	No data	LC
<i>Ouratea deltoidea</i>	Boramena	Ochnaceae	Leaves	DS	Endemic	No data
<i>Givotia madagascariensis</i>	Farafatra	Euphorbiaceae	Leaves	WS	Endemic	VU
<i>Carissa obovata</i>	Hazomboro	Apocynaceae	Leaves	DS	Endemic	No data
<i>Cleidion capuronii</i>	Hazompasy	Euphorbiaceae	Leaves	WS	Endemic	CR
<i>Crateva excelsa</i>	Kobakala	Capparaceae	Leaves	WS	No data	No data
<i>Cedrelopsis grevei</i>	Katrafay	Rutaceae	Leaves, Flowers, Seeds	WS	Endemic	LC
<i>Tamarindus indica</i>	Kily	Fabaceae	Leaves, Flowers, Fruits	WDS	Introduced	LC
<i>Anacardium occidentale</i>	Mahabibo	Anacardiaceae	Leaves, Fruits	WDS	Introduced	LC
<i>Diospyros perrieri</i>	Maintifototsy	Ebenaceae	Leaves	DS	Endemic	NT
<i>Dalbergia humberitii</i>	Manary	Fabaceae	Leaves, Seeds, Buds	WS	Endemic	VU
<i>Mangifera indica</i>	Manga	Anacardiaceae	Fruits	WDS	Introduced	DD
<i>Stereospermum euphorioides</i>	Mangarahara	Bignoniaceae	Leaves	WDS	Endemic	LC
<i>Baudouinia fluggeiformis</i>	Mpanjakabetany	Fabaceae	Leaves, Seeds	WS	Endemic	LC
<i>Commiphora simplicifolia</i>	Matambelo	Burseraceae	Leaves, Stem	WS	Endemic	No data
<i>Bismarckia nobilis</i>	Mokoty	Areaceae	Fruits	WDS	Endemic	LC
<i>Capurodendron sakalavum</i>	Nanto	Sapotaceae	Leaves, Flowers, Fruits	WS	Endemic	No data



Species name	Vernacular name	Family	Part consumed	Season of observation	Endemism	IUCN Red List Status (2022-2)
<i>Phyllanthus pervilleanus</i>	Sagnira	Phyllanthaceae	Leaves	WDS	Endemic	LC
<i>Grewia grandifolia</i>	Selibe	Malvaceae	Leaves	DS	No data	No data
<i>Grewia boinensis</i>	Selimalinika	Malvaceae	Leaves	DS	Endemic	No data
<i>Grewia lavanalensis</i>	Sely	Malvaceae	Leaves	WS	Endemic	LC
<i>Securinega seyrigii</i>	Soalafika	Phyllanthaceae	Leaves	WS	Endemic	LC
<i>Terminalia rhopalophora</i>	Talihinala	Combretaceae	Leaves	WS	Endemic	EN
<i>Hyperacanthus perrieri</i>	Tolankena	Rubiaceae	Leaves	WS	Endemic	LC
<i>Macphersonia gracilis</i>	Tsiengena	Sapindaceae	Leaves	WS	Endemic	LC
<i>Millettia richardiana</i>	Tsimamasabary	Fabaceae	Leaves	WS	Endemic	LC
species unidentified	Tsivakimbaratra	Undentified	Leaves	DS	No data	No data
<i>Strychnos madagascariensis</i>	Vakakoa	Loganiaceae	Leaves	DS	Endemic	LC
<i>Diospyros sakalavarum</i>	Vatoa	Ebenaceae	Leaves	DS	Endemic	LC
<i>Vitex leandrii</i>	Vatoa	Lamiaceae	Leaves, Flowers	WS	Endemic	No data
<i>Antidesma petiolare</i>	Voafogna	Phyllanthaceae	Leaves, Flowers, Seeds	WDS	Endemic	No data
<i>Vitex beraviensis</i>	Voamea	Lamiaceae	Leaves, Seeds	WS	Endemic	LC
<i>Broussonetia greveana</i>	Vory	Moraceae	Leaves	WS	Endemic	LC

**Annex 2:** Traditional uses of plants eaten by Decken's Sifakas by the riverains of MPA

Categories	Species	Utilities	Part used
Construction	<i>Antidesma petiolare</i>	Wood for house (doors), canoes, ox cart construction	Trunk
	<i>Baudouinia fluggeiformis</i>	Wood for house (doors)	Trunk
	<i>Bismarckia nobilis</i>	House roofs	Leaves
		Rope for roof	Leaf bud
	<i>Broussonetia greveana</i>	Wood for house (doors), canoes and ox carts	Trunk
	<i>Capurodendron sakalavorum</i>	Wood for house (doors), canoes, ox carts	Trunk
	<i>Cedrelopsis grevei</i>	Wood for house (posts, doors), furniture (beds, tables) and other house products	Trunk

Categories	Species	Utilities	Part used
	<i>Commiphora simplicifolia</i>	Wood for fences	Trunk
	<i>Cordyla madagascariensis</i>	Round logs, chevron and timber products	Trunk
	<i>Dalbergia humbertii</i>	Wood for house (posts, doors), furniture (beds, tables) and other products	Trunk
	<i>Diospyros perrieri</i>	Wood for house (posts, round logs, rafter), furniture (beds, tables) and other wood products	Trunk
	<i>Diospyros sakalavarum</i>	Wood for house (posts, doors), furniture (beds, tables) and other wood products	Trunk
	<i>Givotia madagascariensis</i>	Wood for house (posts, doors), furniture (beds, tables) and other wood products	Trunk
	<i>Grewia boinensis</i>	Rope for roof, wood for house and spade handle	Bark, Trunk
	<i>Grewia grandifolia</i>	Rope for roof, wood for house and spade handle	Bark, Trunk
	<i>Grewia lavanalensis</i>	Rope for roof, wood for house and spade handle	Bark, Trunk
	<i>Stereospermum euphorioides</i>	Wood for house construction (posts), knife handles and other derived products (boards, planks)	Trunk
	<i>Strychnos madagascariensis</i>	Wood for house (posts, doors), furnitures (beds, tables) and other wood products	Trunk, Stem
	<i>Terminalia rhopalophora</i>	Wood for house (posts)	Trunk, Stem
Phytotherapy	<i>Albizia gummifera</i>	Treatment of Wounds, boils, diarrhea (Tea therapy or dermal application)	Leaves
	<i>Albizia lebbeck</i>	Treatment of Wounds, boils, diarrhea (Tea therapy or dermal application)	Leaves
	<i>Antidesma petiolare</i>	Treatment of Baby's fountainhead (Dermal application)	Roots
		Treatment of Fever on baby (Inhalation)	Leaves
	<i>Cedrelopsis grevei</i>	Treatment of Diarrhea (Tea therapy)	Bark, Leaves
		Treatment of Tiredness (Tea therapy or bath)	Bark, Leaves
		Treatment of Arterial pressure problem (Tea therapy)	Bark
		Treatment of Bleeding in women during birthing (Bath)	Bark

Categories	Species	Utilities	Part used
	<i>Dalbergia humbertii</i>	Treatment of Wounds (Dermal application or bath)	Leaves
		Treatment of Diarrhea (Infusion)	Leaves
	<i>Diospyros perrieri</i>	Treatment of Cold (Fumigation)	Stem
		Treatment of Stomach ache (Tea therapy)	Leaves
	<i>Grewia lavanalensis</i>	Treatment of Tiredness (Fumigation)	Leaves
		Treatment of Diarrhea (Tea therapy)	Leaves
		Treatment of Fever (Tea therapy)	Leaves
	<i>Mangifera indica</i>	Stomach ache and headache (Tea therapy)	Leaves
	<i>Ouratea deltoidea</i>	Tiredness (Tea therapy)	Leaves
	<i>Phyllanthus pervilleanus</i>	Treatment of Skin wounds and boils (Tea therapy)	Leaves
	<i>Stereospermum euphorioides</i>	Treatment of Asthma (Tea therapy)	Leaves
		Treatment of Fever (Tea therapy)	Bark, Leaves
		Treatment of Jaundice (Tea therapy)	Bark
		Treatment of Stomach ache (Tea therapy)	Bark
Treatment of Internal bleeding in women during birthing (Bath)		Leaves	
<i>Tamarindus indica</i>	Treatment of Diarrhea, stomach ache (Tea therapy)	Leaves	
Tsivakimbaratsy	Treatment of Tiredness (Tea therapy or bath)	Leaves	
Handicraft use	<i>Bismarckia nobilis</i>	Making Baskets, Hats and Mats	Leaves, Leaf bud
Food use	<i>Anacardium occidentale</i>		Fruit
	<i>Bismarckia nobilis</i>	"Kabija", "Hovaky"	Stele/Heart of palm
	<i>Mangifera indica</i>		Fruit
	<i>Tamarindus indica</i>		Fruit
Cultural use	<i>Dalbergia humbertii</i>	Ancestors during <i>Misoloho</i>	Plant
	<i>Tamarindus indica</i>	"Kilimasy"	Plant
	<i>Cedrelopsis grevei</i>	"Valamena"	Trunk