

Species Conservation Strategy for Tarzan chameleon (*Calumma tarzan*) 2022 - 2026



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Cover photo

Calumma tarzan (male shot by Alain J.V. Rakotondrina), Amboatrotroka village, Antanandehibe Commune, Antanambao-Manampontsy District, Atsinanana Region © Madagasikara Voakajy (2020)

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FOREWORD

Madagascar is remarkable for its unique and diverse biodiversity. Currently, the island is home to 97 species of chameleons which are all endemic. The chameleon of genus *Calumma* contains more than 34 species which are all endemic to Madagascar. The assessment of the conservation status of species in the IUCN Red List of Threatened Species shows that: two species including *Calumma tarzan* and *C. hafahafa* are Critically Endangered, eight Endangered (*C. andringitraense*, *C. furcifer*, *C. gallus*, *C. glawi*, *C. globifer*, *C. hilleniusi*, *C. vencesi*, and *C. vohibola*), seven Vulnerables (*C. capuroni*, *C. cucullatum*, *C. jevy*, *C. oshaughnessyi*, *C. peyrierasi*, *C. tsaratananense*, and *C. tsycorne*), six Near-Threatened, eight Least Concern and two species with Data Deficient. The threats to these species are mainly habitat loss and fragmentation. For *C. tarzan*, the main threat is habitat loss due to logging.

This Conservation Strategy for *Calumma tarzan* is developed with all stakeholders to prevent the risk of extinction of this species in the wild. This document shows firstly the status review of the species and secondly the strategy which includes the vision, goals, objectives and actions to be achieved over the next five years (2022 - 2026). Therefore, this document will serve as basic information on the activities to be implemented by different actors for long-term conservation of *C. tarzan* in the wild in order to contribute to the local, regional development of Madagascar.

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- District of Anosibe An'Ala and Antanambao-Manampontsy, the Mayors: Anosibe An'Ala, Ankorabe, Ambodimerana, Ampandroantraka, Tratramarina, Antanandehibe, Antanambao-Manampontsy, Mahela and Saivaza, the Head of village and decision-makers: Fihaonana PK 53, Vohitromby, Tratramarina, Fenoarivo, Ambonihiboka, Ankorabe, Ampasimaneva, Bevanana, Ambinanindrano, Beanana, Amboatrotroka, Tsaravinany, Ambohimiadana, Ambodihassina and Betoko II;
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ACRONYMS

AGR	Income Generating Activities
CBD	Convention on Biological Diversity
CEEF	Cantonnement de l'Environnement des Eaux et Forêts
CITES	Convention on International Trade in Endangered Species
CIREEF	Circonscription Régionale de l'Environnement et des Forêts
CISCO	Circonscription Scolaire
COBA	Local Community Based Association
CSG	Chameleon Specialist Group
DAPRNE	Direction des Aires Protégées, des Ressources Naturelles Renouvelables et des Ecosystèmes
DINA	Local regulations
DGGE	Direction Générale de la Gouvernance Environnementale
DREDD	Direction Régionale de l'Environnement et du Développement Durable
EOO	Extent of occurrence
GIS	Geographic Information System
GPS	Global Positioning System
IEC	Information Education Communication
MEDD	Ministry of the Environment and Sustainable Development
MV	Madagasikara Voakajy
MZBA	Mention Zoologie et Biodiversité Animale
NPA	New Protected Area
OG	CITES Management authority
NGO	Non-governmental Organization
PA	Protected Area
SAPM	Système des Aires Protégées Madagascar
SCS	Species Conservation Strategy
SVL	Snout-Vent Length
TGRN	Natural Resource Management Transfer
DTS	Decentralized Technical Services
IUCN	International Union for Conservation of Nature
VOI	Community Based Association

INTRODUCTION

Madagascar is known for its unique fauna and flora (Goodman and Benstead, 2003) and for its high proportion of microendemism (Wilmé et al., 2006). The island has currently 373 amphibian species (Frost, 2021) and 420 reptile species (Glaw and Raselimanana, 2018). Most of herpetofauna species inhabit restricted range or confined to a particular type of habitat, making them sensitive to changes or disturbance of their habitats.

Currently, Madagascar is currently home to 97 endemic chameleon species (Prötzel et al., 2017a; 2017b; 2020; Glaw et al., 2021), or almost half of the world's known chameleon (Glaw and Vences, 2007), making the island a key biodiversity hotspot for this group. However, many species are threatened by anthropogenic pressures. More than 50% of Malagasy chameleon are threatened (Jenkins et al., 2014) such as *Calumma tarzan*. *C. tarzan* was discovered in 2010 in two humid fragments in the Anosibe An'Ala district (Gehring et al., 2010) and listed as Critically Endangered in the Red List of Threatened Species (Jenkins et al., 2011). The main threat to *C. tarzan* is the continuing degradation of its forest habitat due to ongoing clearance. The present conservation strategy was established following Madagascar's national objective set out from the Convention on Biological Diversity: « By 2025, effective measures are in place to effectively reduce biodiversity loss, to ensure the provision of ecosystem services and to share equitable benefits of biodiversity » (CBD Madagascar, 2019).

This conservation strategy for *Calumma tarzan* was developed following the IUCN guideline: 'Strategic Planning for Species Conservation: A Handbook The Species Conservation Planning Task Force Species Survival Commission, IUCN Version 1.0 (IUCN/SSC, 2008)'. It was led by Madagasikara Voakajy and developed by the participation of a wide range of stakeholders. With the participation of local and regional stakeholders, two regional workshops were held in Anosibe An'Ala from 8th to 9th of December, 2021 and in Antanambao-Manampontsy from 14th to 15th December, 2021. Also, a national workshop was held in Nanisana-Antananarivo on the 8th of February 2022.



Some photos during the workshop for designing the conservation strategy (Source: Madagasikara Voakajy).

The conservation strategy presented here comes from the result of various workshops and represents the first conservation strategy for *Calumma tarzan*. This five-year 2022-2026 conservation strategy has the following components:

- Status review;
- Vision ;
- Four (4) goals for long term conservation;
- Eight (8) objectives ;
- Details of actions (61) to be undertaken to achieve the objectives within the framework of this five-year conservation strategy.

A. STATUS REVIEW

I. Description

I.1. Systematic

Scientific name	<i>Calumma tarzan</i> (Gehring et al., 2010)	
Classification	Kingdom	: Animalia
	Phylum	: Chordata
	Class	: Reptilia
	Order	: Squamata
	Family	: Chamaeleonidae
	Sub-Family	: Chamaeleoninae
	Genus	: Calumma
	Species	: tarzan
Common name	English	: Tarzan chameleon
	French	: Caméléon de Tarzan

I.2. Photograph of the species

Calumma tarzan is a medium-sized green chameleon reaching a total length of 119-150 mm (Gehring et al., 2010). It is characterized by the head without rostral appendage, but with a unique 'spade-like' rostral profile in dorsal view, the two rostral crests uniting anteriorly into a thickened ridge, forming together a rectangular ridge that slightly projects beyond the snout tip (Figure 1, Figure 2).



Figure 1. Photo of *Calumma tarzan* showing rostral rectangular profile (Source: Gehring et al., 2010).



Figure 2. Photo of *Calumma tarzan* (male in the left, female in the right; source: Madagasikara Voakajy).

1.3. Description of the species

Group	Gehring et al. (2010) assigned <i>Calumma tarzan</i> to the <i>C. furcifer</i> group following combination of characters: the small to moderate adult body size, the absence of occipital lobes, a very low casque, absence of gular and ventral crests, and a more or less uniformly green colouration usually with dark line running through the eyelids, and a broad brownish mid-ventral band that is bordered by a narrower white band on each side.
Morphology	A medium-sized green chameleon (snout-vent length 61-72 mm, total length 119-150 mm) with a characteristic rostral profile, consisting of the rostral crests which are fused anteriorly to form a spade-like ridge that slightly projects beyond the snout tip (less than 1 mm), and a distinct colour pattern in life, consisting of a green to bright yellow ground colouration (with dark transversal bands when stressed) and a brown to blackish casque and neck in males.
Characteristics	Male : Head without rostral appendage, but with a unique ‘spade-like’ rostral profile, the two rostral crests uniting anteriorly into a thickened ridge, forming together a rectangular ridge in dorsal view that slightly (clearly less than 1 mm) projects beyond the snout tip ; rostral crests almost parallel, but slightly diverging posteriorly (distance between anterior tips 3.5 mm); parietal crest entirely absent ; supra-orbital crest rounded in lateral view and formed by a single, rather smooth row of tubercules; lateral crest moderately distinct, smooth in lateral view; temporal crest indistinct, both crests fusing posteriorly; parietal crest absent; no traces of occipital lobes; no traces of gular and ventral crests; dorsal crest absent. Body laterally compressed with fine homogeneous scalation, except in the vicinity of the cranial crests and neck region where scales are slightly

larger; axillary pits distinct, deeply recessed; limbs and tail with homogeneous scalation, tail without dorsal crest, feet without tarsal spines; tail base moderately swollen.

Female : Head without rostral appendage, but with a characteristic ‘spade-like rostral profile, less pronounced than in the male ; the two rostral crests unite anteriorly on the snout into a thickened ridge, forming together a rectangular ridge in dorsal view that very slightly projects beyond the snout tip ; rostral crests almost parallel, but slightly divergent posteriorly (distance between anterior tips 1,9 mm); parietal crest entirely absent; supra-orbital crest rather indistinct; lateral crest distinct, smooth in lateral view; temporal crest indistinct, both crests fuse posteriorly; parietal crest absent; no traces of occipital lobes; no traces of gular and ventral crests; dorsal crest absent. Body laterally compressed with fine homogeneous scalation except on the head, which is covered with slightly larger scales; axillary pits distinct; limbs and tail with homogeneous scalation, tail without dorsal crest, feet without tarsal spines; tail base not swollen.

1.4. Conservation status

IUCN Red List of Threatened Species

During the global assessment of Madagascar’s reptile in January 2011, *Calumma tarzan* is listed as Critically Endangered in the IUCN Red List of Threatened Species (B1ab(iii)+2ab(iii)) based on an estimated area of occupancy of less than 10 km² and an extent of occurrence probably not much greater. The population occurs as a severely fragmented and there is a continuing decline of its forest habitat due to slash-and-burn agriculture and logging.

1.5. Biology and ecology

The breeding season for *Calumma tarzan* is poorly known. The species is apparently active during the wet season. In November and December, most of encountered females were gravid, which probably indicates the start of breeding season for the species (study carried out by Madagasikara Voakajy in 2012, 2015, 2020). Juveniles were relatively abundant in March and April.

Calumma tarzan is a forest dependent species and prefers less disturbed habitat (Andriantsimanarilafy et al., 2020). This species roosts in forest vegetation at night, 0,1- 4 m above ground (Rakotondrina et al., in prep).

2. Value of the species and Function

2.1. General use and trade

General use	<i>Calumma tarzan</i> is a unique biodiversity as endemic species of Madagascar. It is one of the target species for both Ambatofotsy and Ankorabe Protected Areas and set as flagship species for Anosibe An'Ala District.
CITES (Convention International on Trade of Endangered Species)	Since its description, <i>Calumma tarzan</i> was automatically listed in Appendix II of the CITES by the fact that Madagascar has decided to include the <i>Calumma</i> species in this appendix since 1995, thus zero quota fixed so far.

2.2. Ecosystem services

Calumma tarzan feeds invertebrates including insects (locusts, flies, etc.). Its absence can lead to the proliferation of insects and the lack of prey for some predators such as snakes and birds.

3. Historical distribution

Calumma tarzan has been discovered in 2010 in a rainforest fragment very close to the village formerly known as Tarzanville (since recently called Andasimeloka, meaning 'place of the curve'), Anosibe An'Ala District, Alaotra-Mangoro Region (Gehring et al., 2010). The authors dedicated the species to the fictional forest man 'Tarzan' in the hope that this famous name will promote awareness and conservation activities for this apparently highly threatened species and its habitats, in the mid-altitude rainforest (Gehring et al., 2010). In 2010, Gehring and his collaborators have also recorded individuals in the Ambatofotsy forest located in the east to the rural municipality of Tratramarina, in Anosibe An'Ala District.

In 2012, *Calumma tarzan* has been recorded in Ankorabe (situated to 29.3 km) southwest of Anosibe An'Ala District, Alaotra-Mangoro Region (Randrianatoandro, 2012).

During the same expedition as that of Tarzanville, several areas around the known distribution range of *Calumma tarzan* were surveyed but did not reveal additional localities for the species. These areas are: the forests around Niagarakely, situated north of Tarzanville (at higher altitude); the forest remnants between the Manambolo and Mangoro river valleys; the Tsinjoarivo forest located west of the Mangoro river, the forest fragments of littoral forests in an area between Vatomandry, Mahanoro, the estuary of the Mangoro River and the forest fragment close to Marolambo.

All known localities for *Calumma tarzan* are within an altitudinal range of 800-910 m above sea level (Gehring et al., 2010), but this altitudinal range can reach up to 1000 m according to surveys in Ambatofotsy and Ankorabe protected areas (Andriantsimanarilafy et al., 2020).

4. Current distribution, population and forest status

4.1. Current distribution

Information on the distribution of *Calumma tarzan* is limited. According to Gehring et al. (2010), the distribution of this species could go beyond the fragments initially described. Therefore, recent studies have been carried out to understand the distribution range of the species. In November 2020, as part of a biodiversity inventory for the prospective creation of a new protected area, a rapid herpetofauna inventory was carried out at Efatsy Manombo forest, located in the Ankarana Miraihina municipality, Farafangana District, Atsimo-Atsinanana Region (Figure 4) and revealed the presence of *C. tarzan* in Sahamahitsy site (Randrianantoandro, unpublished report).

In 2020 and 2021, additional researches were conducted by Madagasikara Voakajy, *Calumma tarzan* was confirmed in 14 new forest fragments belonging to five sites: Tsiazombazaha, Ranomafana, Beanana, Ambalavato and Ambavala, Anosibe An'Ala and Antanambao-Manampontsy District, Alaotra-Mangoro and Atsinanana Region, eastern Madagascar Madagascar (Figure 3).

Currently, all known distribution ranges for *Calumma tarzan* are Tarzanville, Ambatofotsy, Ankorabe, Tsiazombazaha, Ranomafana, Beanana, Ambalavato, Ambavala, and Sahamahitsy, (Table I).

Calumma tarzan was recorded within an altitude range of 21-79 m above sea level (a.s.l.) in Manombo forest, 651-1051 m a.s.l. for forest fragments within Anosibe An'Ala District and 695-802 m a.s.l. for forest fragments within Antanambao-Manampontsy District.

Tableau I. Current distribution of *Calumma tarzan*, fragment size was computed using QGIS software.

Site	Nombre de fragment	Superficie (ha)	Altitude (m)	Village	Commune	District	Région
Tarzanville	1	10	760-970	Tarzanville	Anosibe An'Ala	AAA	AMG
Ambatofotsy	1	1775	844-934	Tratramarina, Ambonihiboka	Tratramarina	AAA	AMG
Ankorabe	1	96	709-790	Antandrokomby	Antandrokomby	AAA	AMG
Tsiazombazaha	4	34-38	861-1051	Ampasimaneva, Bevanana	Ampandroantraka	AAA	AMG
Ranomafana	2	9-11	651-735	Androrangavola	Tratramarina	AAA	ATN
Beanana	6	13-29	746-917	Beanana	Antanandehibe	AMT	ATN
Ambalavato	1	521	695-802	Amboatrotroka	Antanandehibe et Saivaza	AMT	ATN
Ambavala	1	324	603-730	Betoko II	Mahela	AMT	ATN
Sahamahitsy	1	-	21-79	-	Ankarana Miraihina	FRG	AAT

AAA: Anosibe An'Ala; AAT : Atsimo Atsinanana ; AMG: Alaotra-Mangoro; AMT: Antanambao-Manampontsy, ATN: Atsinanana ; FRG : Farafangana

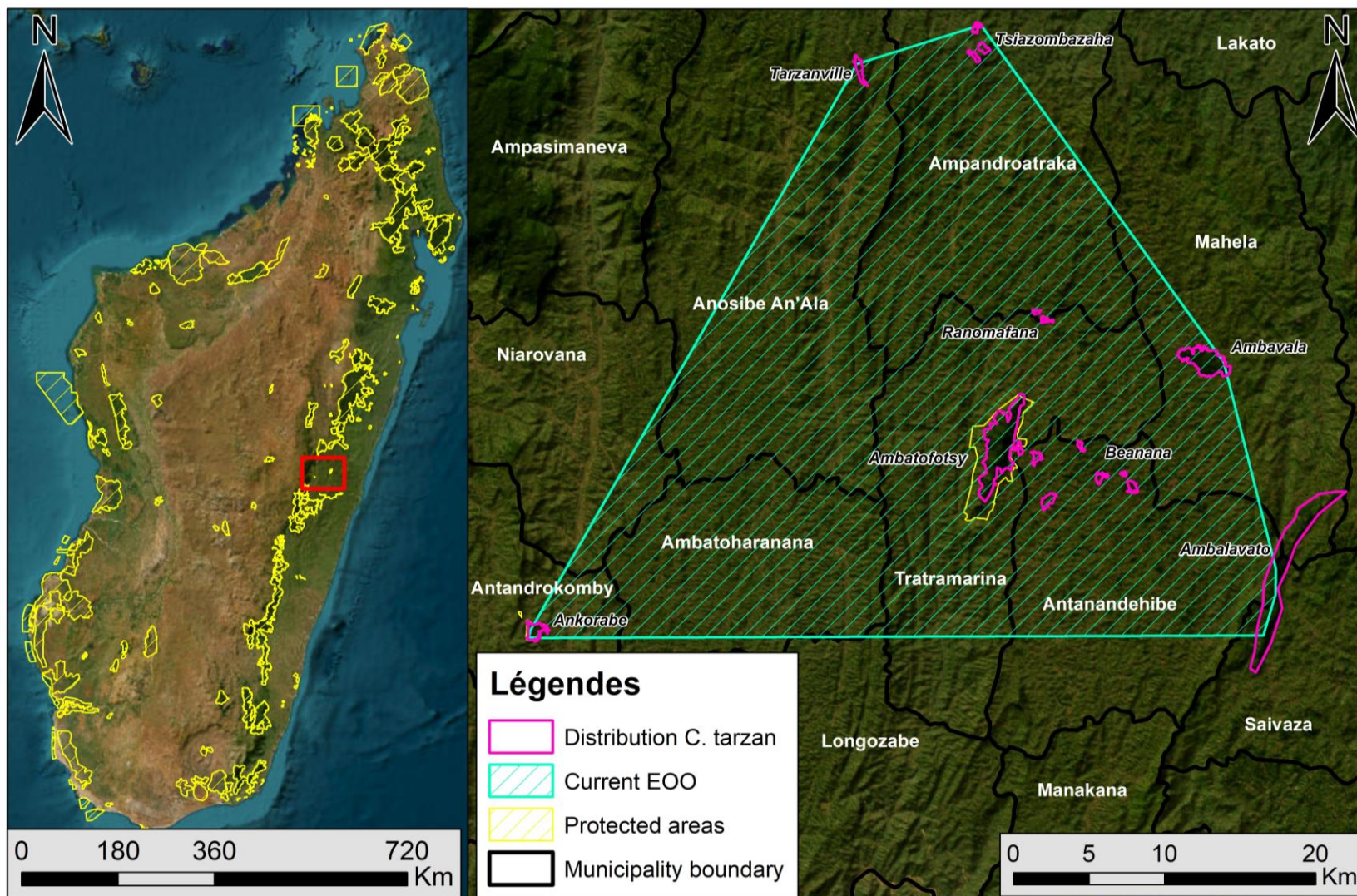


Figure 3. Distribution of *Calumma tarzan* in Anosibe An'Ala and Antanambao-Manampontsy District (Source: Madagasikara Voakajy).



Figure 4. Distribution of *Calumma tarzan* in Farafangana District (Source: Randrianantoandro, unpublished report).

4.2. Population and forest status

The population of *Calumma tarzan* is currently composed by nine highly fragmented populations. The sex ratio (proportion between male and female) is 0.27 (Rakotondrina et al., in prep). Population density varies according to the forest size and disturbance occurring in the forest (Table 2).

Most of sites for *Calumma tarzan* are forest fragments that have no formal protection and therefore faces ongoing threats due to slash-and-burn agriculture (Tableau 2).

Tableau 2. Site status and population density of *Calumma tarzan* (Ind: Individu).

Site	Formal protection status	Density (ind/ha)
Tarzanville	None	98
Ambatofotsy	Protected Area (Category V)	34
Ankorabe	Protected Area (Category V)	110
Tsiazombazaha	None	52
Ranomafana	None	78
Beanana	None	38
Ambalavato	None	25
Ambavala	None	-
Sahamahitsy	Classified Forest	-

5. Habitat and resources

Calumma tarzan is a species restricted to primary and secondary humid forest (Gehring et al., 2010). It is a forest dependent species and prefers less disturbed habitat (Andriantsimanarilafy et al., 2020). According to recent study (Rakotondrina et al., in prep), *C. tarzan* prefers microhabitat within important canopy cover (75-90%), litter cover (70-95%) and dense lower vegetation (up to 2.5 m).

6. Threats analyses

The main threat to *Calumma tarzan* is the continuing decline of its forest habitat due to slash-and-burn agriculture and logging. Other threats were identified from the research conducted in 2020. The threat analysis allows to categorize the severity of threats.

6.1. Slash-and-burn agriculture

Slash-and-burn agriculture or ‘Tavy’ is a traditional farming technique widely practiced by farmers in the east of Madagascar. In fact, farmers practiced this technique by converting a forest area into a crop field (Figure 5).



Figure 5. Slash-and-burn agriculture (Source: Madagasikara voakajy).

6.2. Logging

All localities of *Calumma tarzan* are threatened by logging which lead to habitat degradation and fragmentation.

6.3. Gold mining

For some sites, the habitats of *Calumma tarzan* are threatened by illegal artisanal gold mining (Figure 6), inside or at the forest edge. The gold mining leads to the destruction and reduction of favourable habitat for *C. tarzan*.



Figure 6. Gold mining in the forest edge at Tsiazombazaha site (Source: Madagasikara Voakajy).

6.4. Use of the biological resource

Information on the illicit trade for *Calumma tarzan* is poorly known. *C. tarzan* could be exported accidentally or intentionally due to failure of monitoring of national regulations on species trade. The large similarity between *C. tarzan* and *C. gastrotaenia*, the sympatric species sharing the same habitat with *C. tarzan* in both Ambatofotsy and Ankorabe Protected Areas, could favour the intentional trade of *C. tarzan*.

In some places within Antanambao-Manampontsy District, some people use chameleons as pets because they believe that chameleons could be used to protect against witchcraft. The impacts of this collect on the populations are not exactly known but it is obvious that the collect could have negative impacts on the survival of *Calumma tarzan* if it is combined with the destruction of its habitat.

6.5. Climate change

The impact of climate change on biodiversity covers at least five strategic axes such as: changes in the structure of population, changes in the distribution area, changes in biological rhythm, proliferation of invasive species and changes in structure of surrounding environment. For *Calumma tarzan*, a preliminary modelling of its distribution using bioclimatic variables for 2050 indicates a decrease of the area with high probability of harbouring the species but also a displacement of the area likely to be viable for the species. The effect of climate change can be more severe with high rate of degradation of the surrounding environment.

The diagram (Figure 7) shows the threats to *Calumma tarzan* and its habitat. These threats act directly or indirectly according to their degree of severity and lead to the disappearance of the species (Figure 8).



Figure 7. Threats and their degrees of severity on *Calumma tarzan* and its habitat.

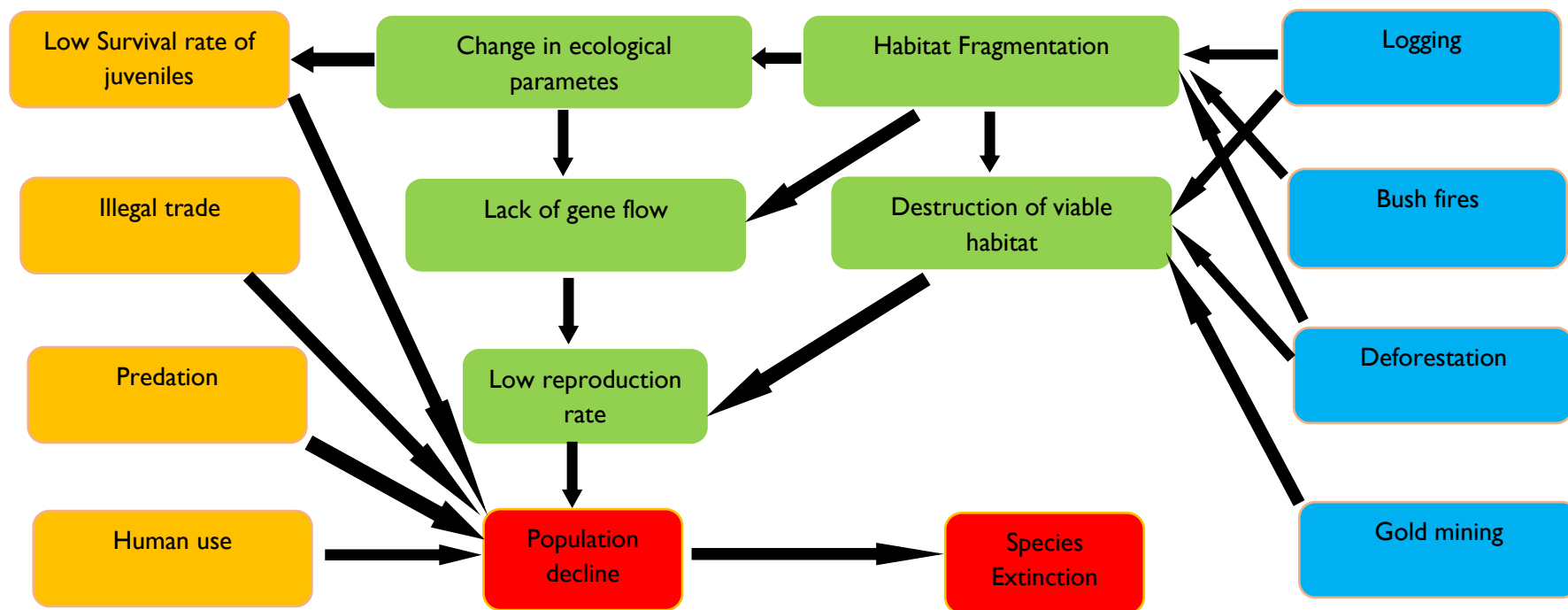


Figure 8. Threats analysis for *Calumma tarzan*.

B. DECLARATION OF VISION

The vision for *Calumma tarzan* is that the population and its natural habitats are conserved for the maintenance of ecosystem services through the participation of all stakeholders.

C. GOALS

To make this vision operational, four goals are identified in this conservation strategy of *Calumma tarzan* :

- 1 Conservation and improvement of habitats in the known distribution of *Calumma tarzan*
- 2 Implementation of research to update scientific data on *Calumma tarzan* and to guide conservation decisions
- 3 Contribution of local people in the conservation of *Calumma tarzan* and its habitat
- 4 Awareness, communication and coordination to ensure sharing efficient information



Figure 9. Forest fragment in Beanana site, one of the natural habitats of *Calumma tarzan* (Source: Madagasikara Voakajy).

D. CONSTRAINTS

The constraints likely to compromise the achievement of these goals are:

Unawareness of populations and authorities towards the importance of biodiversity

In Madagascar, populations and local authorities are often not aware of the importance of biodiversity due to poverty, which encourages local residents to irrationally exploit natural resources, considering them as the only and immediate source of income. Moreover, the texts and laws on the use of natural resources are not disclosed and applied.

Difficulty of access

The difficulty of access favours illegal activities such as logging, collection of wood for daily use or trade and collect of animals for trade.

Insecurity

The insecurity remains a big problem in Madagascar's rural place. The implementation of research or conservation activities is difficult because of the terror caused by this problem.

Climate change

The effects of climate change are felt and are manifested by the increase in temperature or global warming, the scarcity of precipitation and the increase in climatic hazards such as cyclones and floods. All these complications make agriculture more and more difficult by no longer making it possible to meet the needs of households.

Lack of collaboration and coordination of activities among stakeholders

The lack of collaboration between stakeholders or coordination of activities is an obstacle to achieving the objectives set out.

Inadequate financial, logistical and human resources

The financial, material and human resources are useful for carrying out the work. The lack of any of these three pillars will not achieve the objectives.

E. GOALS, OBJECTIVES, ACTIVITIES

Goal 1: Conservation and improvement of habitats in the known distribution of *Calumma tarzan*

Objective 1: Conserve habitats of *Calumma tarzan* inside Protected Area

Specific objectives	Activities	Indicator	Responsible	Time frame
I.1-Protect habitats at the current state	I.1.1-Strengthen law enforcement and monitor the application of laws and convention related to the use of natural resources (laws on PA, conservation, etc.)	Number of monitoring	MV, Local community, DTS	Year 1-5 (2022 - 2026)
	I.1.2-Renew contract of COBA on the TGRN	Number of contract renewed	MV, Local community, DTS	Year 1 (2022)
	I.1.3-Build capacity of patrollers and DINA committee members	Number of capacity building, number of patrollers and DINA committee members	MV, Local community, DTS	Year 1 (2022)
	I.1.4-Enforce the application of local regulations (DINA)	Number of infractions reported/ people arrested	MV, Local community, DTS	Five years (2022 - 2026)
I.2-Strengthen strategies to monitor and control activities within PA	I.2.1-Monitor and control activities in the sustainable use zone	Monitoring report	MV, Local community, DTS	Five years (2022 - 2026)
	I.2.2- Strengthen awareness campaigns on fire fighting	Number of awareness campaign,	MV, Local community, DTS	Five years (2022 - 2026)
	I.2.3- Improve the physical delimitation of PA (Maintenance and renewal of paintings/signs)	Number of signs/paintings renewed	MV, Local community, DTS	Five years (2022 - 2026)
	I.2.4-Maintain annually the firewalls in place	Length (km) of firewalls maintained	MV, Local community, DTS	Year 1, 3 and 5
	I.2.5-Install biological firewalls at the forest edges (green belt)	Length of biological firewalls in place	MV, Local community, DTS	Year 1, 3 and 5
	I.2.6-Monitor changes of forest cover	Map on Tree cover loss (GFW)	MV	Year 1, 3 and 5

Objective 2: Improve the habitats of *Calumma tarzan* within Protected Area

Specific objectives	Activities	Indicator	Responsible	Time frame
2.1-Restore degraded habitats within PA	2.1.1-Locate habitats to be restored for each PA	Habitats (ha) to be restored	MV, COBA	Year 1 (2022)
	2.1.2-Develop a restoration plan for each PA	Restoration Plan	MV, CIREEF, CEEF	Year 1-2 (2022 - 2023)
	2.1.3-Restore habitats with native plants (characteristics of <i>C. tarzan</i> habitats)	Habitat restored in ha	MV, COBA	Year 2-4 (2023 - 2025)
	2.1.4-Monitor restored habitats	Seedling survival/mortality rate	MV, COBA	Year 3-4 (2024 - 2025)
	2.1.5-Report restoration activities	Evaluation report	MV, COBA	Year 5 (2026)

Objective 3: Implement a management and protection system for all unprotected sites

Specific objectives	Activities	Indicator	Responsible	Time frame
3.1-Promote the protection for unprotected sites	3.1.1-Identify an adequate status for each site (public consultation)	Protection status identified for each site	Promoters, DREDD, CIREEF, CEEF, Local community	Year 1-2 (2022 - 2023)
	3.1.2-Create COBA/NPA	COBA/NAP created	Promoters, DREDD, CIREEF, CEEF, DTS, Local community	Year 1-2 (2022 - 2023)
	3.1.3-Develop a management plan and management tool for each site	Management Plan and Management tool developed for each site	Promoters, DREDD, CIREEF, CEEF, DTS, Local community	Year 1-3 (2022 - 2024)
	3.1.4-Create a local regulation (DINA) and approve it locally	Local regulation created and approved by local people	Promoters, DTS, Tribunal, Local community	Year 1-3 (2022 - 2024)
	3.1.5-Create and implement DINA committee members	Number of committee created	Promoters, CIREEF, CEEF, Local community	Year 2-3 (2023 - 2024)
	3.1.6-Train DINA committee members	Number of trainings, number of committees trained	Promoters, DREDD, CIREEF, CEEF, DTS, Local community	Year 3 (2024)
	3.1.7-Monitor DINA committee members	Number of monitoring	Promoters, CIREEF, CEEF, DTS, Local community	Year 3-5 (2024 - 2026)

3.2-Publicize the new status of each site and materialize	3.2.1-Publicize the existence of new protected sites	Number of media campaigns	Promoters	Year 3-5 (2024 - 2026)
	3.2.2-Set up signs and paintings in the new protected sites	number of signs/paintings in place	Promoters	Year 3-5 (2024 - 2026)
3.3-Restore disturbed sites	3.3.1- Develop a restoration plan for each site	Restoration Plan	Promoters, DTS, Local community	Year 1-2 (2022 - 2023)
	3.3.2- Restore sites with native plants (characteristics of <i>C. tarzan</i> habitats)	Area restored in ha	Promoters, DTS, Local community	Year 3 (2024)
	3.3.3- Monitor restored area	Seedling survival/mortality rate	Promoters, DTS, Local community	Year 4-5 (2025 - 2026)

Goal 2 : Implementation of research to update scientific data on *Calumma tarzan* to guide conservation decisions

Objective 4: Determine the extent distribution of *Calumma tarzan*

Specific objectives	Activities	Indicator	Responsible	Time frame
4.1- Locate new sites for <i>Calumma tarzan</i>	4.1.1-Identify potential new sites	List and map of potential sites	CSG, Research Institution	Year 1-5 (2022 - 2026)
	4.1.2-Confirm in the field the Presence/Absence of <i>Calumma tarzan</i>	Field report, distribution map updated	CSG, Research Institution	Year 1-5 (2022 - 2026)
	4.1.3- Study population genetics of <i>Calumma tarzan</i> in all known distribution sites	Scientific publication, analysis report	CSG, Research Institution	5 years (2022 - 2026)
	4.1.4-Study the effects of climate change on the distribution of <i>Calumma tarzan</i>	Research report, scientific publication	CSG, Research Institution	Year 4 (2025)

Objective 5: Determine the biological and ecological requirements of *Calumma tarzan*

Specific objectives	Activities	Indicator	Responsible	Time frame
5.1-Study the population dynamics of <i>Calumma tarzan</i>	5.1.1-Estimate population size at each	Research report, scientific publication	CSG, Research Institution	Year 1-5 (2022 - 2026)
	5.1.2-Study the effects of fragmentation on the population size of <i>Calumma tarzan</i>	Research report, scientific publication	CSG, Research Institution	Year 2-5 (2023 - 2026)
	5.1.3- Assess population trend at each site	Research report, scientific publication	CSG, Research Institution	Year 3-5 (2024 - 2026)
	5.1.4-Collect information on the trade of <i>Calumma tarzan</i>	Research report	CSG, Research Institution	Year 1-5 (2022 - 2026)
5.2-Determine the ecological parameters conditioning the presence of <i>Calumma tarzan</i>	5.2.1-Determine habitat preferences of <i>C. tarzan</i> (habitat type, vegetation, soils characteristics, etc.)	Research report	CSG, Research Institution	Year 1-5 (2022 - 2026)
	5.2.2-Collect et analyze ecological parameters (temperature, humidity)	Research report	CSG, Research Institution	Year 1-5 (2022 - 2026)
	5.2.3-Develop a HSI (<i>Habitat Suitability Index</i>) document summarizing the variation of ecological parameters for the species	HSI document (<i>Habitat Suitability Index</i>)	CSG, Research Institution	Year 4 (2025)
5.3-Study the biology of <i>Calumma tarzan</i>	5.3.1-Determine the breeding season (reproduction success, hatch rate/juveniles' survival)	Research report, scientific publication	CSG, Research Institution	Year 1-5 (2022 - 2026)
	5.3.2-Study the behaviour of the species	Research report, scientific publication	CSG, Research Institution	Year 1-5 (2022 – 2026)
	5.3.3-Study the diet of the species	Research report, scientific publication	CSG, Research Institution	Year 1-5 (2022 – 2026)
	5.3.4-Study of biotic factors: predation, diseases, parasitism, inter/intraspecific competition	Research report, scientific publication	CSG, Research Institution	Year 1-5 (2022 – 2026)

Goal 3: Contribution of local people in the conservation of *Calumma tarzan* and its habitat

Objective 6: Support local communities on the importance of *Calumma tarzan* and its conservation

Specific objectives	Activities	Indicator	Responsible	Time frame
6.1- Promote income-generating activities (IGR) and create them according to the needs of local communities	6.1.1-Support youth/women's initiatives to adopt and promote sustainable agricultural and beekeeping techniques in the Ambatofotsy and Ankorabe PA	Number of practiced IGR, number of beneficiaries	MV, COBA, DTS	Year 4-5 (2025 - 2026)
	6.1.2-Identify suitable IGR for each local community	Number of identified IGR for each site	Promoters, DTS	Year 1-2 (2022 - 2023)
	6.1.3-Train local communities on the practice of identified IGR	Number of trainings, number of beneficiaries	Promoters, DTS	Year 2, 3, 5
	6.1.4-Support essential materials to make effective and efficient each implemented project (IGR)	Number of materials delivered, number of beneficiaries	Promoters	Year 2 (2023)
	6.1.5-Monitor and evaluate the completion of each project	Monitoring and evaluation report	Promoters	Year 3-5 (2024 - 2026)

Goal 4: Awareness, communication and coordination tools to ensure information sharing

Objective 7 : Support IEC (Information, Education, Communication) initiatives

Specific objectives	Activities	Indicator	Responsible	Time frame
7.1-Raise awareness on <i>Calumma tarzan</i>	7.1.1-Design awareness tools	Number of designed tools	Promoters	Year 2-4 (2023 - 2025)
	7.1.2-Environmental awareness in primary schools around the sites	Number of awareness campaigns, number of students sensitized	Promoters, CISCO	Année 1-5 (2022 - 2026)
	7.1.3-Sensitize local communities on the importance of <i>Calumma tarzan</i>	Number of awareness campaigns, number of local communities sensitized	Promoters, DTS	5 Years (2022 - 2026)
	7.1.4-Reinforce the capacity of local authorities regarding the law on biodiversity (Mayors, Forest Agent, Gendarme, etc.)	Number of reinforcements, number of local authorities reinforced	Promoters	Year 2-4 (2023 - 2025)
7.2-Share available information on <i>Calumma tarzan</i>	7.2.1-Participate in regional/national celebration days	Number of entries	All stakeholders	Year 2-4 (2023 - 2025)
	7.2.2-Participate in international events	Number of entries	All stakeholders	Year 1-4 (2022 - 2026)
	7.2.3-Publish research results on the species	Number of scientific publications on the species	CSG, Research Institution	Year 1-5 (2022 – 2026)
	7.2.4-Share data on the species at the Communication and Information system Department of MEED	Functional database	CSG, Research Institution, MEDD	Year 1-5 (2022 – 2026)
7.3-Capitalize the required information on <i>Calumma tarzan</i>	7.3.1-Update the conservation status of <i>Calumma tarzan</i> on the IUCN Red List of threatened species	Conservation status updated	CSG, Research Institution, DGGE	Year 1-3 (2022 – 2024)

	7.3.2-Support the listing of <i>Calumma tarzan</i> on the national legislation	National legislation supported	DGGE, CSG, Research Institution	Year 1-3 (2022 – 2024)
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Objective 8 : Ensure close collaboration between stakeholders

Specific objectives	Activities	Indicator	Responsible	Time frame
8.1- Coordinate activities related to the conservation of <i>Calumma tarzan</i> and its habitat	8.1.1-Set up a coordination committee (dissemination of information)	Committee created	All stakeholders	Year 1 (2022)
	8.1.2-Hold a periodic meeting for exchange of information (mid-term valuation for year 3)	Number of conducted meetings	OG, CSG, Promoters, Partners	Year 1-5 (2022 - 2026)
	8.1.3-Reinforce advocacy with potential partners (technical and financials)	Number of meetings established	OG, CSG, Promoters, Partners	Year 1-5 (2022 - 2026)
	8.1.4-Coordinate fundraising at national and international level	Number of application submitted	All stakeholders	Year 1-5 (2022 - 2026)

LIST OF PARTICIPANTS

The following table shows the list of people as well as their respective institutions participating to the workshop for developing the conservation strategy for *Calumma tarzan*.

Institutions	Name
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Ambalanirana Village	ZAFIDO
Vohitromby Village	RABOTO Alphonse
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Antanandehibe Municipality	RAZAFISOLOMANGA Ratsimamary Christiane
Mahela Municipality	ANDRIANARISOA Jean Cadi
Saivaza Municipality	LEZOMA Clement
Betoko II Village	RAKOTONANDRASANA Chant-Tonie RAKOTOMALALA Joseph
Ambohimiadana Village	FAHAROY Barnabe

Ambohimiadana Village	EFA Adolphe
Tsaravinany Village	JUSTIN EFADAHY RAZAFINDRAMANANA Prosper
Amboatrotroka Village	ROALAHY Fabien André Emile RABEMASOANDRO
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