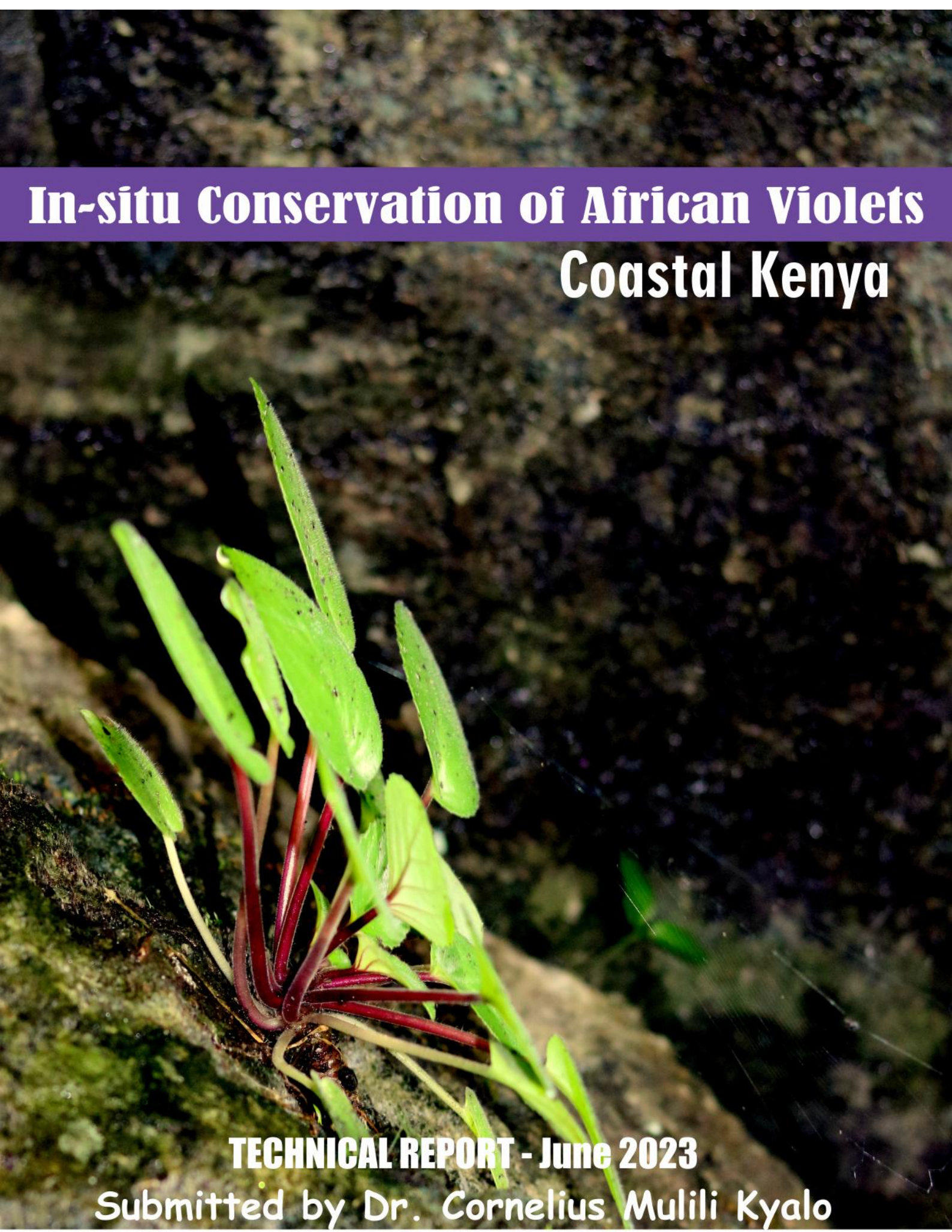
In-situ Conservation of African Violets

Coastal Kenya



TECHNICAL REPORT - June 2023

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Report Submitted to: The Rufford Foundation www.rufford.org @ruffordgrants

NatureKenya THE EAST AFRICA NATURAL HISTORY SOCIETY

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Acknowledgement

This work was funded by the Rufford Foundation Small grants program. On behalf of the entire project team, I take this opportunity to greatly thank the grants' committee for seeing it fit to fund my research/conservation proposal. Additionally, I take pleasure to recognize the commitment of Rufford Foundation's Director Josh Cole for his good will to environmental conservation matters and ensuring grassroots efforts are supported. Indeed, this funding has expanded our efforts towards rescuing the African violets from extinction risk in coastal Kenya. It is my sincere hope that we continue partnering together and build a solid conservation foundation for this species. Through this project, we were able to achieve the following; 1) establish a rescue/propagation center where massive propagation of African violets is being conducted, 2) establish two tree nurseries, 3) studied the recruitment vs survival rates of African violet seedlings, and 4) established two *in-situ* rescue sites. From the support of Rufford Foundation, we have laid a conservation journey that saves not only the African violets but other threatened plant species in the coastal forests of Kenya. We would be glad to extent our partnership with the Rufford Foundation and eventually exhibit sustainable results worth the work. We also appreciate the local communities for their support and dedication to conserve forest fragments in their neighborhoods. Finally, we wish to appreciate the entire project team members for being dedicated towards the project's activities, the local community members/guides for sacrificing their time, and the government authorities for facilitating our access to different areas.

Executive Summary

African violets are perhaps the most spectacular plant species on earth yet extremely threatened in nature due to increasing habitat loss. During the 1st round of funding, we concentrated on understanding the population status (size, number of individuals), species/habitat threats, testing propagation techniques, and raised community awareness. Here (2nd round of funding), we focused on mitigating observed threats, conducting massive propagation of African violets, and initiating habitat restoration. To achieve the targeted goals, we constructed a propagation center for African violets and conducted leaf propagation in both water and soil media. We resorted to use leaves since the production of seeds in the wild is now extremely low (fruiting has been affected by extreme weather conditions), thus, its ecologically-sound to allow the few fruiting individuals to support natural recruitment. In conjunction, we established two tree nurseries where we are propagating indigenous plant seedlings (locally-adapted species) for use in habitat restoration (restoring suitability of the habitats for African violets - *shading, wetness, pollinators*). Positively, we have propagated over 1200 African violets seedlings in the propagation center, propagated approx. 3000 indigenous tree seedlings, and studied the survival of newly-recruited African violet seedlings in the wild. However, although we could not translocate the African violets seedlings back into their respective populations due to the poor ecological state (the African violet seedlings are delicate/sensitive to dry conditions), we established a trial *in-situ* recovery site and transplanted 100 individuals for monitoring. Additionally, during the May - July rains, we transplanted 1160 indigenous tree seedlings in the largest population (Cha Simba). In conclusion, the local communities are now actively engaged in indigenous seedlings production, threats are now reducing (due to environmental training sessions), we have propagated a substantial number of African violets seedlings (good stock for translocation), and have initiated habitat restoration plan for strengthening once further funding is available. Therefore, we plan to expand this work and establish more *in-situ* recovery sites, expand restoration efforts focusing more on other endangered plant species (the target habitats host a number of threatened, endemic, and rare plant species), map degraded patches within the target sites (for prioritization of restoration initiatives), and promote/establish alternative and nature-based sources of livelihoods (to reduce pressure on natural forests).

1. Introduction

1.1 Background Information

Streptocarpus Lindley (Gesneriaceae), also known as the cape primroses, are herbaceous plant species that exhibit either annual or perennial lifeforms. The genus hosts approximately 176 species (Möller & Cronk, 2001, Puglisi *et al*., 2016), distributed in Madagascar, Comoro islands and some regions of Africa, with the regions sharing no single species. Majority of the species are of great horticultural importance due to their showy flowers and contribute a large percentage to the world's flower industry (Moller & Cronk, 1997). Specifically, *Streptocarpus* section *Saintpaulia* are widely cultivated as house plants and thus of great horticultural importance. Most of the hybrids available in the market in America and Europe are cultivars derived from the parent wild species *Streptocarpus ionanthus,* popularly known as the African violets. For instance, the constituent taxa within *S. ionanthus* complex have been crossed, improved and used for production of extensive flower colors (Afkhami-Sarvestani *et al*., 2012).

The monophyletic section *Saintpaulia* is endemic to the Eastern Arc Mountains and the remnant lowland forests of Tanzania and Kenya (Kolehmainen *et al*., 2009), and comprises tropical forest understory plants that never occur outside forests in nature, with the exception of *S. ionanthus* which frequently occurs in rather exposed habitats in coastal remnant forests of Kenya and Tanzania (Dimitrov *et al*., 2012). Species of sect. *Saintpaulia* are habitat-specific, mostly flourishing well in shaded dense forest areas, or on wet rocks or cliffs and sometimes near rivers, streams and waterfalls. Further, *Saintpaulia* are long-lived perennial herbs which mainly grow as lithophytes (Fig. 1), though sometimes grow on forest floor, as epiphytes on living trees' bases and sometimes on decomposing logs.

However, due to habitat intrusion and fragmentation in most parts of the section's range (Hughes *et al.*, 2004), forest cover has continued to diminish, leading to desiccation and this has tremendously reduced the range of most species and subspecies (Eastwood *et al*., 1998), with some like *S. teitensis* and *S. ionanthus* subsp. *rupicola* being restricted to one and three small populations, respectively. The lowland populations mostly occur on the limestone outcrops in the forests and on the steep gorges alongside the streams. Generally, African violets species are habitat-dependent (prefer constant shade, and wet conditions) (Kolehmainen &

Korpelainen, 2008), thus, vegetation disturbance may lead to extinction. For example, limestone mining activities in Mwache forest have indirectly led to the eventual loss of a resident *S. ionanthus* subsp. *rupicola* population (through habitat destruction, exposing the species to direct sunlight and dry conditions). Unfortunately, a similar trend seems to follow Cha Simba population where a mining company was cleared to conduct limestone mining within Cha Simba.

Fig. 1: Germinating seedlings and mature African violets on rock crevices in coastal Kenya.

1.2 Conservation status of Saintpaulia in the wild

Global plant biodiversity in the tropical forests are facing a major threat due to habitat fragmentation (Kolehmainen & Mutikainen, 2006). The IUCN Red List of Threatened Species database assess majority of *Saintpaulia* taxa as threatened, informed by a number of field assessments done over the previous years, perceived threats, and distribution.

In Kenya, two taxa, *S. teitensis* and *S. ionanthus* subsp. *rupicola* are of great concern due to their critically endangered status, the loss of their populations and reduction of population sizes. *S. teitensis* has only one extant population in Mbololo

hill (Taita hills), while *S. ionanthus* subsp. *rupicola* is survived by only three populations in the Kenyan coastal forest patches.

The two species share similar habitat conditions being principally lithophytic and occurring in well shaded areas. However, they have different altitude preferences, with *S. teitensis* growing between 1500m and 1800m above sea level (a.s.l) while *S. ionanthus* subsp. *rupicola* exist in the coastal lowlands 0 - 200m a.s.l. The extent of both species and their populations has vividly condensed of late, with the remaining existence range being extremely encroached and fragmented. For instance, *S. ionanthus* subsp. *rupicola* has recently lost Mwache forest population due to continued quarry activities ongoing in the forest. Thus, conservation strategies are crucial to save the remaining populations.

1.3 Project Justification

The coastal forests of East Africa are part of the world's biologically-rich areas, supporting many endangered flora and fauna diversity, thus a priority for conservation efforts. However, more than 30 million people also inhabit this region, increasing pressure on the natural resources.

The African violets are a success in the horticulture industry in Europe and America, as crosses between the constituent taxa of *S. ionanthus* complex have produced beautiful hybrids. This has attracted interest from enthusiasts who have ventured in the propagation for their homes and offices. Unfortunately, the wild species have been pushed to the brink of extinction by both the current climate change effects and human encroachment in their natural habitats. Further, the species are habitat-dependent, require constant shading, wet conditions and less disturbance. Therefore, the present vegetation disturbance have contributed to evident population loss, reduction and exposes the taxa to the danger of extinction. This underscores the urgency to protect and conserve the remnant populations. Although poor taxonomic understanding of the African violets (section *Saintpaulia*) was termed a key hindrance to conservation, things have not changed much despite the group receiving great taxonomy progress. The species continue to lose populations in Kenya and Tanzania, majorly due to lack of conservation programs, little or no funding, and little action.

This project will benefit global African violets enthusiasts as the propagation and domestication of the hybrids borrow greatly from the wild in terms of habitat

conditions and growth patterns. Scientifically, the wild species have been used to conduct taxonomic and identification studies, resulting in correct naming of the hybrids. For instance, in some cases of controversial naming of hybrids, the source has to be checked, including collection location of the wild relative. Further, some enthusiasts report poor propagation results, partly due to lack of information on the propagation requirements of the species with reference to the wild setting. It is therefore important to highlight the plight of the wild species of perhaps one of the most propagated species globally, as a result provide crucial information that can benefit enthusiasts. The conservation of wild species acts as a preservation of genotypes which will be beneficial in the future of this industry. Therefore, addressing this problem serves to inform, educate and raise the awareness of African violets enthusiasts, possibly resulting in positive actions.

1.4 Project Objectives

In realization of the urgency to save the African violets, we aimed to enhance their conservation in Kenya through;

(1) Monitoring of recruitment/survival rates and pollination activities in African violets.

(2) Initiating the species recovery process.

(3) Initiating habitat restoration in the species distribution.

1.5 Study Sites

This project was conducted in Kilifi (coastal Kenya) and Taita Taveta Counties, encompassing all Kenya's four populations of the African violets namely; Cha Simba, Kachororoni, Mwarakaya, and Mbololo hill. However, although all four populations were incorporated in this study, much efforts were concentrated on the three populations of *S. ionanthus* subsp. *rupicola* since they occur in private/community land unlike Mbololo that is officially protected by the government (Kenya Forest Service). Apart from hosting the critically endangered African violets, the sites are highly important for biodiversity conservation. For instance, the fragmented habitats house endemic and critically endangered plant species (among them, *Premna discolor, Cola octoloboides, Cola porphyrantha,* among others). The biodiversity potential of the habitats could be attributed to 'special' habitat conditions that offer refuge to rare species of narrow ecological niche. For instance, all sites are rocky in nature

(remnants of limestone mining in the past), making them inaccessible or of no agricultural importance to the locals.

Fig. 2: Some threatened plant species housed in Cha Simba habitat.

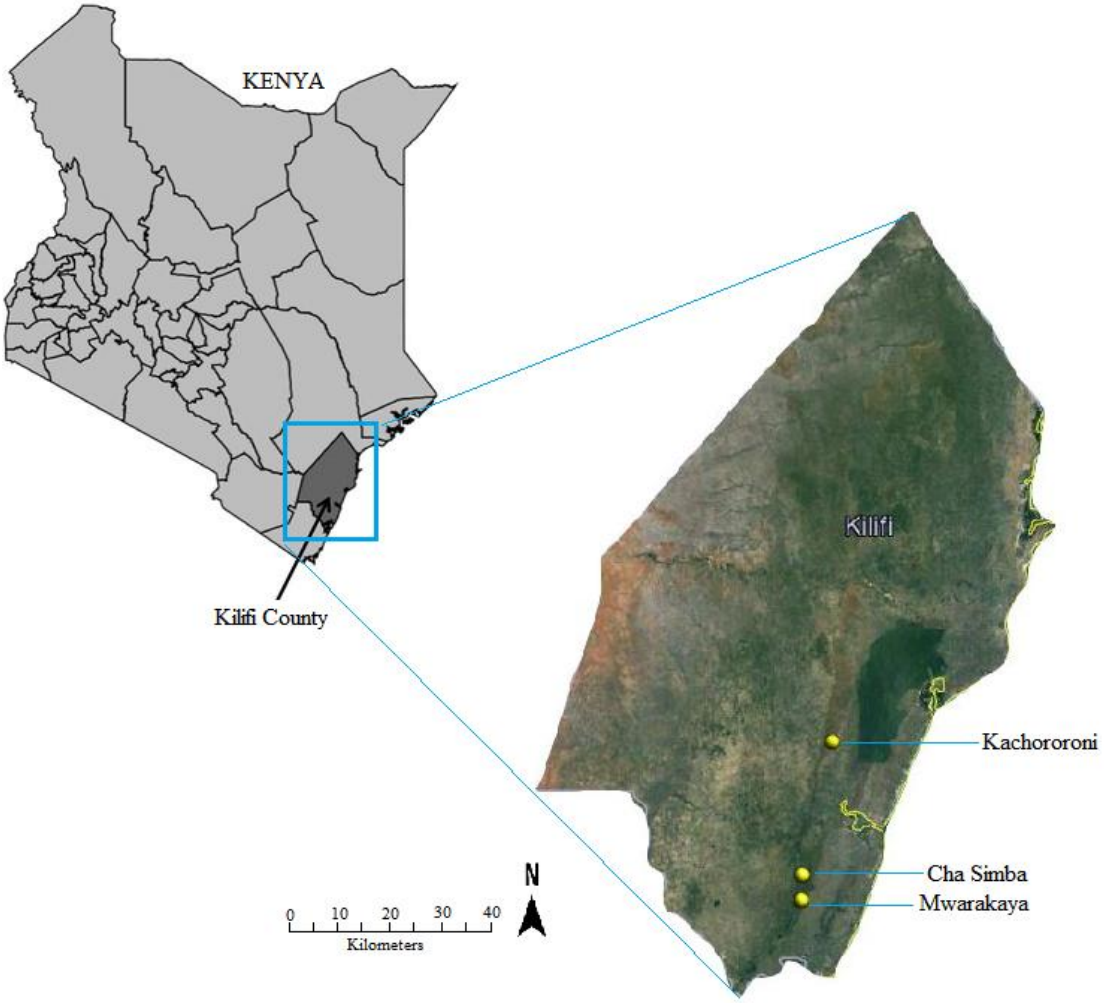


Fig. 3: Map showing the distribution of *Streptocarpus ionanthus* subsp. *rupicola* in Kenya. The map was extracted from Google Earth.

2. Conservation Approaches & Impacts

2.1 Project Inception

To ensure a smooth implementation of our project, we first met members of the local communities, briefly introduced our project focus, and made a working timeline with the project team (since the team was trained in the previous round of funding). However, this round, our briefing touched on the biodiversity potential of the area (highlight on the endemic and threatened species, species of conservation concern, rare species, etc), emerging threats facing the habitats (including human-induced threats, majorly expanded maize farms and limestone mining), and introduced the need for Community Forest Associations (CFAs) (for future implementation of conservation activities). It is during such briefing sessions that we selected sites for nursery establishment (locals donated small parcels for nurseries).

Fig. 4: Awareness creation/project briefing activity in Kachororoni

2.2 Mass Propagation

African violets have a narrow ecological niche, comprising specific ecological requirements; shaded areas (with indirect light), and wet rock crevices. Thus, we designed a propagation room (Fig. 5) with regulated conditions (controlled light, humidity, etc), using locally-available material (e.g iron sheets, wood, ply wood). This room is (and will be) used to nurture rescued seedlings (from unfavourable localities in the wild such as footpaths, exposed areas, etc), propagate collected seeds,

propagate harvested leaves, and conduct further research on African violets. To avoid mix up of different populations, we constructed partitioned shelves.

Fig. 5: Establishment of a propagation center. *A - Carpenter cutting wood pieces into required sizes, B - the project leader confirming the height measurements for the propagation shelves, C - Propagation shelves fitted into the propagation room, and D - Propagation shelves fitted with ply wood partitions and clear polythene for light regulation.*

The growth and propagation of African violets has been reported a challenge in the continued survival and conservation initiatives. During the 1st round of funding, we tested different methods of propagation (using both seeds and leaves) where leaf propagation was found to be more ideal, considering the threatened status of the African violets. The leaves were prepared (Fig. 6), and put in plastic cups (with soil or water), and placed on the shelves (Fig. 7), avoiding direct sunlight. While using the leaves, two methods were used to propagate; soil and water media. When using soil, each leaf was solely propagated inside a plastic cup with soil. Whereas, when using water method, a plastic dish (clear) was used to propagate approx. 30 leaves, after which the individual leaves were transferred into single plastic cups after rooting and producing first 3 leaves.

Although both seed and leaf propagation trials exhibited success, seed propagation was observed to be the most successful approach, as leaf propagation is delicate, and took longer time (2-5 months depending on the maturity of the leaf used) to re-sprout. However, leaf propagation using water medium was faster than soil as roots would appear in two to three weeks.

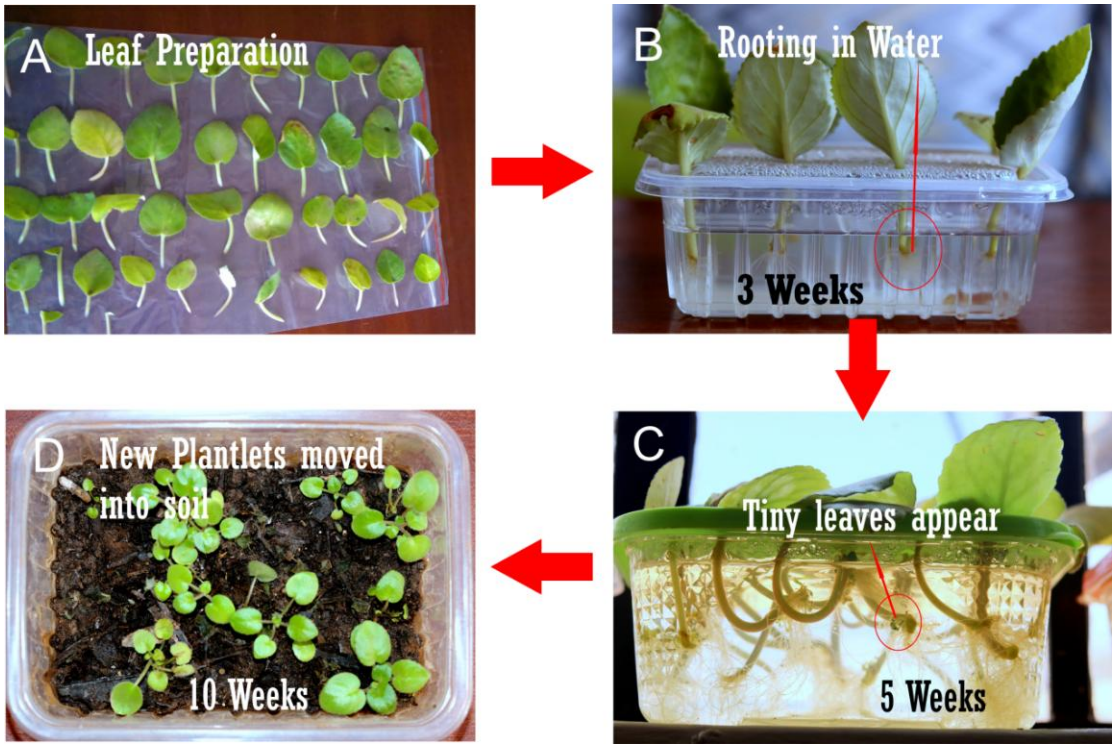


Fig. 6: Leaf propagation under water medium. *A, Leaf preparation, B - Rooting under water, C - Re-sprouting of leaves, and D - New plantlets moved into soil awaiting individual re-potting.*

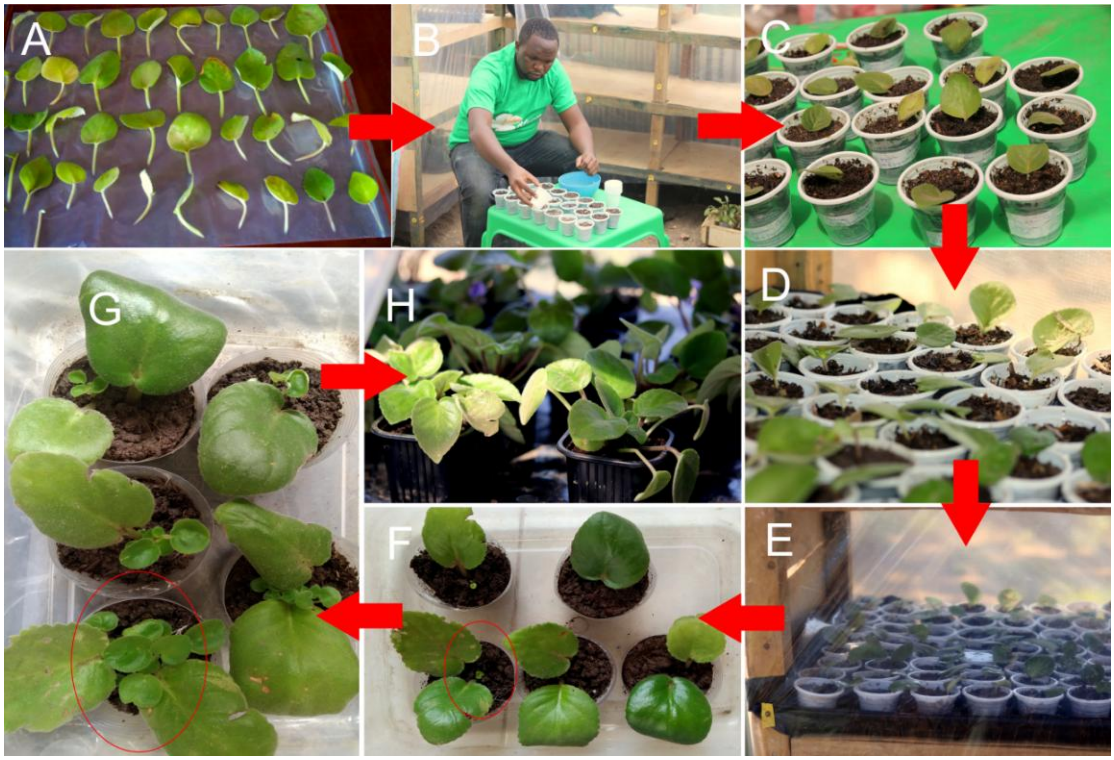


Fig. 7: Leaf propagation under soil medium. *A - Leaves prepared for propagation, B -Project leader preparing propagation cups (soiling and watering), C - Leaves propagated in plastic cups, D & E - Propagated leaves placed inside the shelves, F & G - Resprouting of first leaves, and H - Plantlets transferred into seedling pots and arranged in the shelves.*

During the field investigations, we also collected new recruits of African violets (Fig. 8) (individual seedlings growing in unfavorable conditions such as; exposed to sunlight, on soil media in the forest, re-sprouts in dense clusters (to ease competition), on footpaths, etc) and transferred them for nurturing in the propagation center. It is expected that upon improvement of habitat conditions, we will take them back into the wild after attaining a size able to withstand wild conditions.

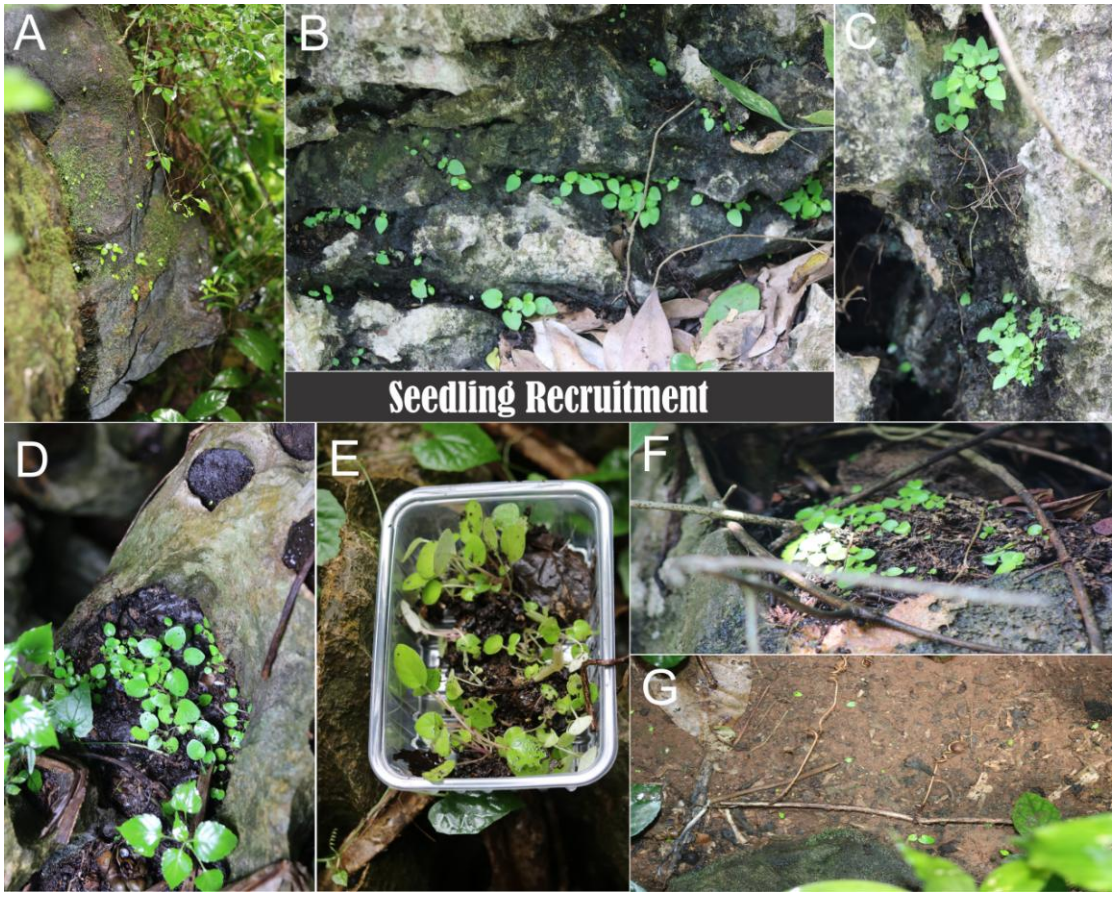
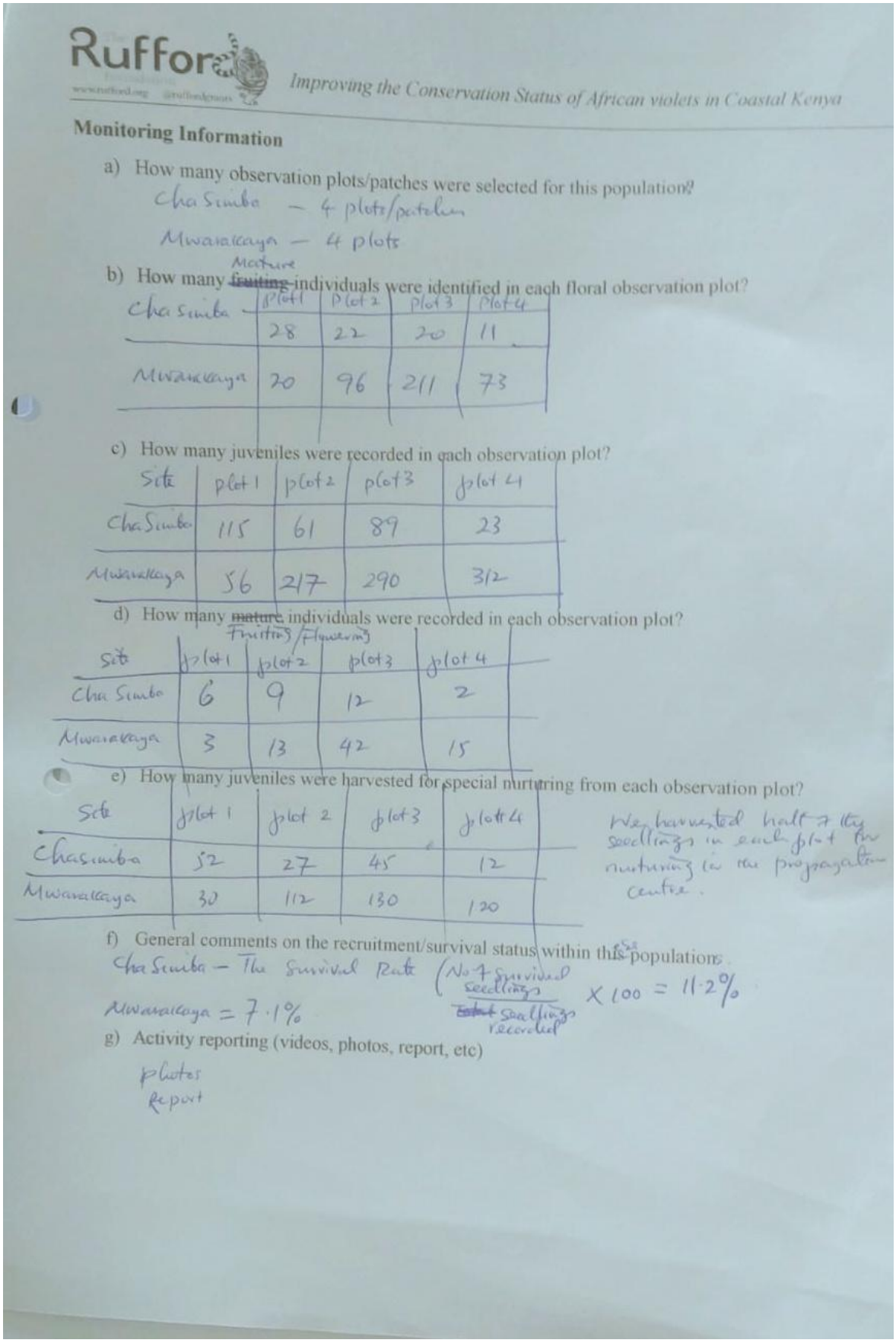


Fig. 8: Recruitment of African violets seedlings in the wild. *A, B, C, D & F - New recruits on rock crevices in different populations, E - Rescued seedlings for nurturing, and G - New recruits on soil along footpaths.*

2.3 Species Recruitment/Survival monitoring

From the observations made during the 1st round of funding, African violets in the wild exhibit massive sprouting of seedlings during the wet seasons, but low maturity rate (very few of these seedlings grow to maturity). Thus, it was prudent to monitor the recruitment vs survival rates in key populations/ patches. Here, we identified four plots/patches in each of three populations; Cha Simba, Mwarakaya and Mbololo (in Kachororoni, we could not spot any African violet plant, thus, we decided to omit that population in the analysis). We visited the populations during the wet season (May - July 2022), recorded the number of mature individuals in each plot, flowering/fruiting individuals, and new recruits (Fig. 9).



Improving the Conservation Status of African violets in Coastal Kenya

Monitoring Information

a) How many observation plots/patches were selected for this population?

Cha Simba – 4 plots/patches

Mwarakaya – 4 plots

b) How many ~~fruiting~~ Mature individuals were identified in each floral observation plot?

	Plot 1	Plot 2	Plot 3	Plot 4
Cha Simba	28	22	20	11
Mwarakaya	20	96	211	73

c) How many juveniles were recorded in each observation plot?

Site	plot 1	plot 2	plot 3	plot 4
Cha Simba	115	61	89	23
Mwarakaya	56	217	290	312

d) How many ~~mature~~ Fruiting/Flowering individuals were recorded in each observation plot?

Site	plot 1	plot 2	plot 3	plot 4
Cha Simba	6	9	12	2
Mwarakaya	3	13	42	15

e) How many juveniles were harvested for special nurturing from each observation plot?

Site	plot 1	plot 2	plot 3	plot 4
Chasimba	52	27	45	12
Mwarakaya	30	112	130	120

We harvested half of the seedlings in each plot for nurturing in the propagation centre.

f) General comments on the recruitment/survival status within this populations.

Cha Simba – The Survival Rate (No of survived seedlings / ~~Total~~ seedlings recorded) X 100 = 11.2%

Mwarakaya = 7.1%

g) Activity reporting (videos, photos, report, etc)

photos

Report

Fig. 9: Representative data sheet recording recruitment information for Cha Simba & Mwarakaya populations.

Although the populations are experiencing a severe decline, the recruitment was relatively high; Cha Simba (Plot 1 - 115; Plot 2 - 61; Plot 3 - 89, & Plot 4 - 23), Mwarakaya (Plot 1 - 56; Plot 2 - 217; Plot 3 - 290; & Plot 4 - 312) and Mbololo (Plot 1 - 216; Plot 2 - 426; Plot 3 - 204, & Plot 4 - 639). During the wet season, we harvested half of the new recruits in each plot (for nurturing in the propagation centre) and left the other half for subsequent monitoring.

We conducted the second monitoring during the short dry season (February - March 2023) to see the progress/status of the recruits recorded in July 2022. Unfortunately, of the total 152 recruits left at Cha Simba in July 2022, only 17 survived and were recorded in Feb 2023 (survival rate = 11.2%). In Mwarakaya, 33 individual recruits survived of the total 471 (Survival rate = 7.1%). However, Mbololo population had the highest survival rate (68.3%), possibly since the population is well protected and is found deep in the forest. Therefore, it is clear the survival rate in the two populations is low. Positively, of the harvested total of 1228 seedlings across the three populations, a total of 864 are surviving till date (Survival rate = 70.4%). Thus, rescue of new recruits is a potential approach to reduce seedlings mortality and should be now incorporated into the conservation of the African violets.

Fig. 10: Some field team members during the field investigations. *A - Project leader together with young locals during a demo activity, B - Project leader onlooking*

inaccessible African violet patches on cliffs, C - Project assistant with a neighbor/partial owner of Cha Simba habitat during a survey, D & E - Project assistant collecting new recruits (those growing in exposed and unsuitable localities) into plastic dishes (for nurturing in the propagation center)

2.4 Indigenous Seedlings Propagation & Habitat Restoration

African violets have been reported to survive under narrow ecological requirements; wet and shaded conditions. However, the present distribution is characterized by fragmented, dry habitats and intense human encroachment. For instance, during the dry seasons (the area has not received substantial rainfall between 2015-2022), the populations lose a larger percentage of its natural vegetation (Fig. 11), exposing African violets to direct sunlight and dry conditions (Fig. 12**)**.

In the last decade, vegetation cover in all populations has greatly degraded due to various factors; drought, crop farming (extension of farmlands), creation of grazing fields, and charcoal burning. Although the threats facing these habitats are manageable, land ownership status makes it a challenge to save the habitats. For instance, all habitats are owned by the community, fueling competition by locals to maximumly use the resources (resulting in the tragedy of commons).

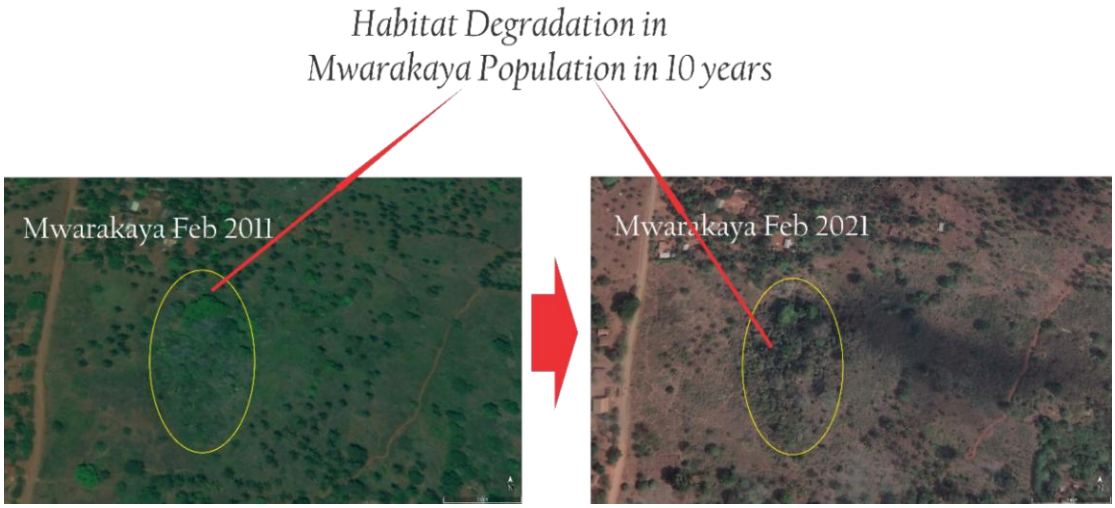


Fig. 11: Habitat degradation in one African violets habitat (Mwarakaya) in the last decade. *The maps were derived from Google Earth satellite database.*

For example, although Kachororoni is considered the largest habitat in which the African violets occur in Kenya, the population is quickly becoming unsuitable for the African violets. This is because the area has attracted unsustainable human activities;

cattle grazing (creates paths and destroys vegetation cover), and charcoal burning. This has led to reduced area under constant shade and wetness, and not funny that it is hard to spot an African violet individual. Contrary to normal observations, during our recent visit, no single juvenile was spotted, bringing to doubt the recruitment rate of this population.

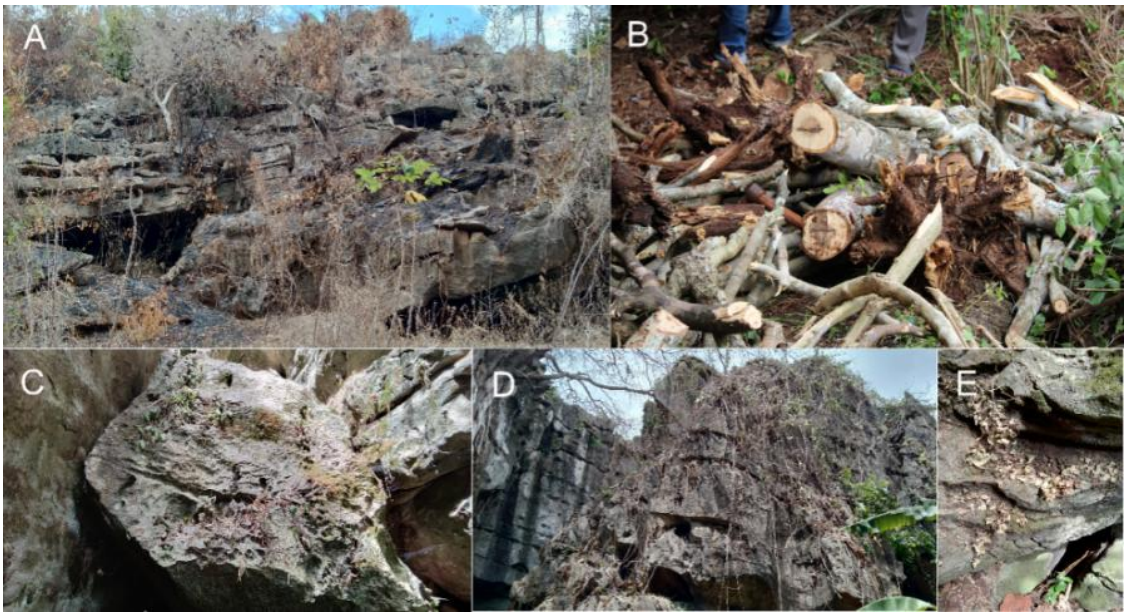


Fig. 12: The status of African violets populations during the dry season. *A - a burned rocky habitat in Cha Simba population (to expand farmlands), B - tree felling for charcoal burning, C, D & E - scorched African violet plants.*

Therefore, community-based restoration of the habitats will make them suitable for African violets. In line with this understanding, we established two tree nurseries to propagate indigenous tree seedlings that will be the foundation for long-term restoration of the sites (Fig. 13 & 14). The nurseries propagate purely locally-adapted indigenous plant species (especially endangered, rare, useful tree species) since they are adapted to the local environment, are useful and returning them may re-build the wild habitats for long-term conservation. To achieve local support and involvement, we involved the communities in the process of seed collection, propagation and nursery establishment. Some of the collected/propagated species include; *Milicia excelsa* (drought-resistant and rare timber species), *Melia volkensii* (a fast-growing drought-resistant tree indigenous to East Africa drylands), *Gyrocarpus americanus* (fast growing and good for forest litter/mulch), *Afzelia quanzensis, Adansonia digitata* (threatened by international trafficking), *Erythrina sacleuxii*, *Grewia holstii, Sterculia appendiculata, Vitex payos,* among others (Fig. 15).

Fig. 13: Nursery establishment and indigenous seedlings propagation. *A - Project leader and community members measuring size of nursery, B - Constructed nursery with initial seedlings, C - Raised sowing bed with plastic liner and river sand, D - Some collected seeds preserved in zip lock bags, E - Youth participation in seed collection, and F - Project leader identifying a seed in the field.*

Fig. 14: Propagation of indigenous tree seedlings. *A - Collection of seeds, B,C,D - Collected seeds being dried, E,F - Seedlings potted in tubes, and G - Team members arranging seedlings in the nursery.*

Since most of our seedlings could not be sown and transplanted within the same year (project duration), we purchased majority of our seedlings from individual nurseries within the local communities. Further, our restoration plan was affected by lack of rains in Kachororoni habitat and hence our tree planting sessions were largely in Cha Simba and Mwarakaya. In total, we transplanted 1160 indigenous tree seedlings in two rain seasons (Nov-Dec 2022, and May 2023). Since restoration is a continuous process and this was the initiation, we transplanted the seedlings around the rocky habitats to create a 'green wall' or boundary (to limit human activities) (Fig. 16). During the end of our project, we mapped degraded patches within the sites where more seedlings will be transplanted subject to availability of more funding. This will

involve filling the degraded gaps and doing enrichment planting within the existing fragments.

Fig. 15: Indigenous tree seedlings being prepared/selected for transplanting in the wild.

Fig. 16: Tree planting activity. *A - Degradation from maize farming, B - Seedlings prepared for transplanting, C - Project leader selecting seedlings for transplanting, D - Local carrying a seedling, E - Project leader digging a hole in Cha Simba, F & G - Local planting a seedling.*

2.5 In-situ Translocation & Recovery

As part of the species recovery mechanism, and especially a species affected by climate patterns like the African violets, it is crucial to first nurture seedlings under care (hence the need for a rescue centre) and translocate them back into the wild once they are big enough to withstand weather changes. Therefore, our long-term plan is to translocate the seedlings back into the wild in phases as our project continues. During the present project, we have initiated habitat restoration efforts to improve the habitats and revert their suitability for the African violets. However, the conditions have not become so ideal for us to translocate the seedlings back. Thus, as we continue to plant indigenous trees and lobby for protection of the original sites, we have resolved to translocate the seedlings in other suitable and secure *in-situ* sites/habitats in Kenya, sites we are referring to them as '*in-situ* recovery sites'.

Positively, towards the end of last year during the short rains, we established the first *in-situ* recovery site and transplanted 100 African violet seedlings (Fig. 17) from the propagation center. Eight (8) months down the line, all plants (except a few) are doing well and getting acclimatized to the new environment. Although the site is housed on private land, we selected it since its well secured (no more logging), has relatively ideal conditions for African violets (shade and rocky habitat under a giant *Ficus glumosa* tree), and the owner is willing to take care and nurture the plants for the long-term (we plan to fence the habitat once funds are available). Further, plans are underway to transplant the second batch of 300 seedlings in another recovery site in Pangani karsts where all arrangements have been made with the owner. Historically, Pangani rocks had records of African violets presence, however, they have since disappeared (largely due to agricultural activities).

We believe that securing this critical species in several recovery sites (that are suitable) will act as refuge, especially when the present populations are facing extinction from limestone mining and expansion of agricultural activities.

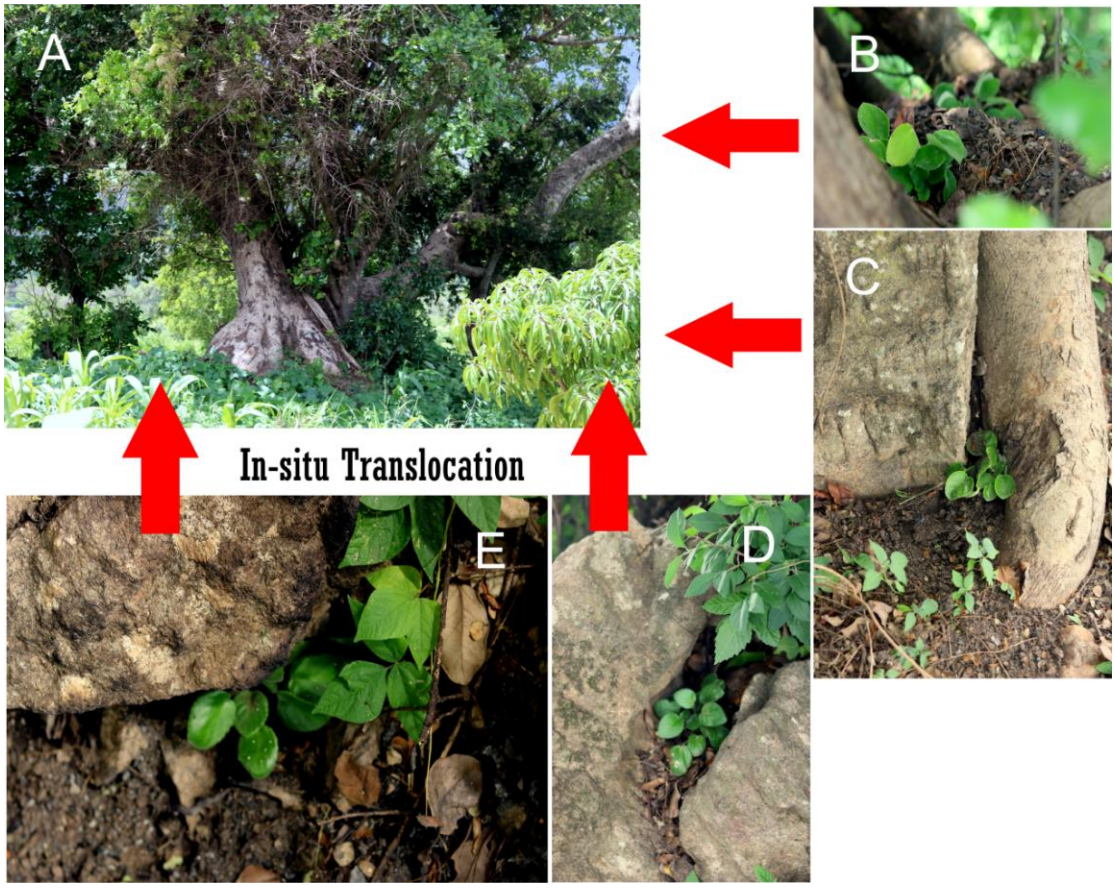


Fig. 17: The first *in-situ* recovery site for African violets. *A - The rocky habitat, B, C, D, & E - sample individuals transplanted in different corners of the habitat.*

3. Lessons & Challenges

Environmental awareness campaigns should be conducted for the long-term in order to achieve effective conservation of biodiversity. This is because technology, development, and human encroachment is expanding on a daily basis. First, our work was challenged by drought conditions. Since the African violets prefer wet conditions, the prevailing dry conditions could not allow us transplant propagated individuals back into the wild. However, we took this opportunity to create community awareness, and massively propagate African violets in the propagation centre. Additionally, we concentrated on raising more indigenous seedlings, campaigning for habitat protection, and restoration (we were lucky that two of the sites received good rains this year May - June and we capitalized on that and planted over 1000 indigenous tree seedlings). We hope with this trend, the sites might get ideal for African violets in few years.

Another challenge that came up was threat of population loss. Early last year (2022), an investor proposed to mine limestone in Cha Simba rocks, a vital refuge for African violets and more than five other endangered plant species. Unfortunately, the proposed project did not do thorough Environmental Impact Assessment to understand the area, or rather ignored the biodiversity aspect. As a result, we came across the proposal and launched an objection campaign (led by conservation NGOs such as Nature Kenya, Cave Exploration Group of East Africa, National Museums of Kenya, among others).

Having worked for years in saving the African violets, I could not sit back and watch a sudden loss of a species I have dedicated my efforts towards its survival. Therefore, I joined other conservationists and made my comments/contributions on that course and we managed to halt the proposed project (although the campaign is still on). Below are some of the contributions I made to the campaign published in different media networks in Kenya;

Links

1. https://www.the-star.co.ke/news/2022-05-05-limestone-mining-threatens-african-violet-plant--nature-kenya/

2. https://naturekenya.org/2022/06/02/rare-plant-in-kilifi-is-under-threat-from-limestone-mining/

3. https://www.thefreelibrary.com/Limestone+mining+threatens+African+violet+plant+--+Nature+Kenya.-a0702631622

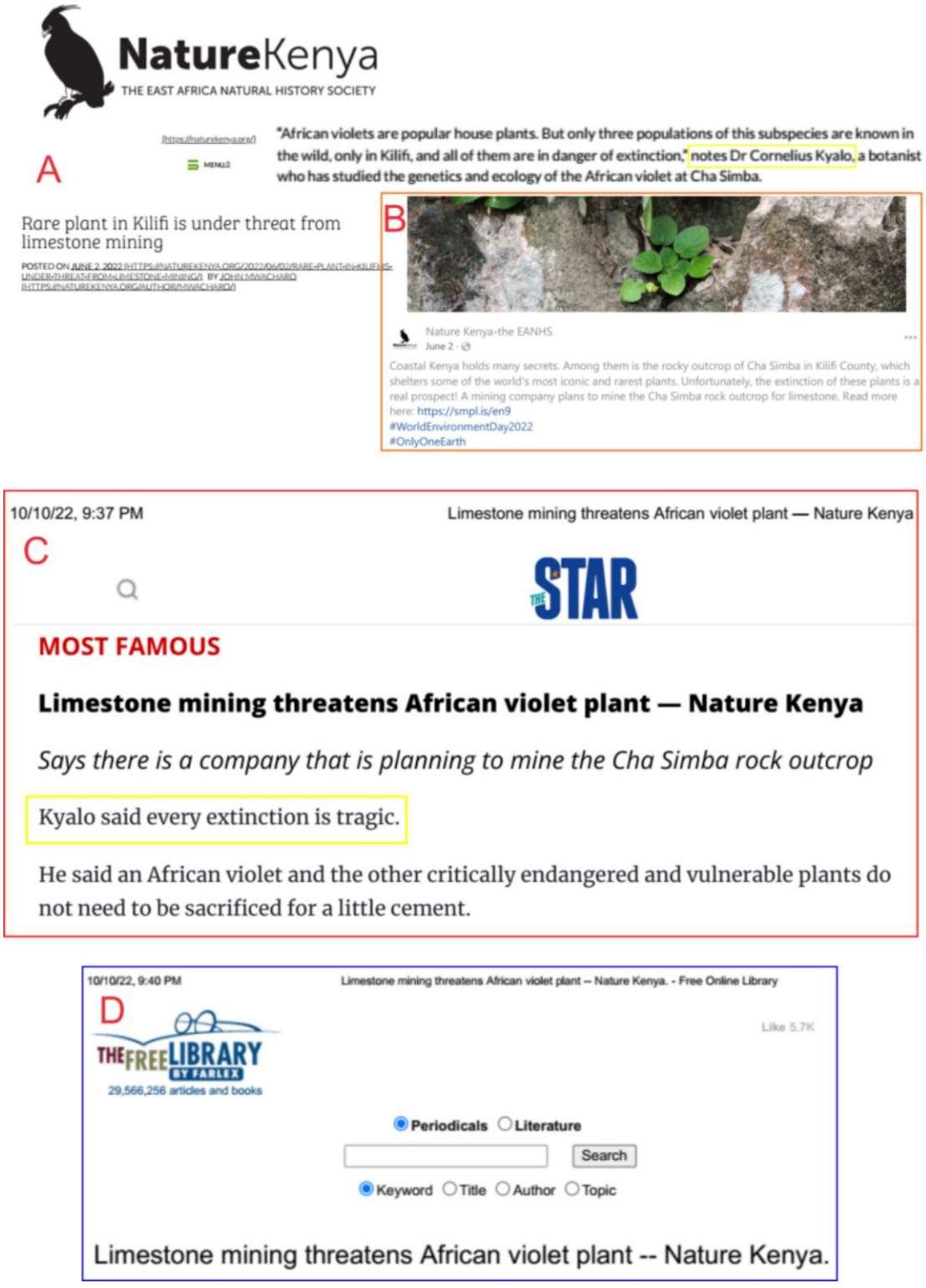


Fig. 18: Media campaign comments published in diverse media outlets. *A - Published in Nature Kenya website, B - Published in Nature Kenya Facebook page, C - Published by the STAR Newspaper, and D - Publication in an online repository.*

4. Conclusion, Prospects & Partnerships

4.1 Conclusion

Here (2nd round of funding), we focused on mitigating observed threats (through environmental training sessions), conducting massive propagation of African violets (we constructed a propagation centre to nurture African violet seedlings where we have propagated over 1200 seedlings), and initiating habitat restoration (we have so far propagated approx. 3000 indigenous tree seedlings in the two nurseries and planted 1160 seedlings in the respective habitats). Although we could not translocate the African violets seedlings back into their respective populations due to the poor ecological state (the African violet seedlings are sensitive to dry conditions that dominate the habitats), we established a trial *in-situ* recovery site and transplanted 100 individuals for monitoring (since November 2022, the seedlings have survived the short dry season and are doing well). In conclusion, this project has managed to achieve substantial milestones including; mobilizing the local communities to participate fully/own the initiative of indigenous seedlings production, halting common threats (we have managed to make the locals environmental stewards who are now defending the forest fragments, thanks to the numerous training sessions), setting up the first ever community nurseries, and identified other threatened plant species that need to be included for full conservation of the respective habitats. Further, we have mapped patches within the habitats that will be targeted for tree planting and rehabilitation in the next conservation plan. Therefore, the foundation laid during this project has exposed other gaps worth the attention and we plan to expand this work in partnership with the Rufford Foundation. and establish more *in-situ* recovery sites, expand restoration efforts focusing more on other endangered plant species (the target habitats host a number of threatened, endemic, and rare plant species), map degraded patches within the target sites (for prioritization of restoration initiatives), and promote/establish alternative and nature-based sources of livelihoods (to reduce pressure on natural forests).

4.2 Prospects

In line with the gaps exposed during this 2nd round of Rufford Small grants, there is an evident need to continue with this work focusing on the following; establishment of more *in-situ* recovery sites for the African violets in suitable habitats (the natural habitats are still highly threatened by mining interests, thus the need to preserve the

species in diverse safer areas), expand and intensify restoration efforts focusing more on other endangered plant species (the target habitats host a number of threatened, endemic, and rare plant species that need to be prioritized for conservation), and promote/establish alternative and nature-based sources of livelihoods (to reduce pressure on natural forests). Further, future projects, ought to take into consideration the aspect of African violets seedlings recruitment (how to ensure they are rescued and nurtured under protection to be able to withstand wild conditions), and protection /management of the target sites (establishment of Community Forest Associations - CFAs). Thus, there is an urgent need to upscale our efforts on several key angles;

a) *Developing a multi-stakeholder protection/management plan for the target sites* - although we have held numerous consultations with the local communities during this project, we need more engagements to ensure the sites are protected, especially Cha Simba and Mwarakaya as the sites are targeted for limestone mining activities. This involves intensive training of locals inhabiting those sites, especially on matters pertaining forest protection (establishment of Community Forest Associations - CFAs), alternative sources of livelihoods (ways of reducing pressure on forest products), and rehabilitation mechanisms.
b) *Establish more in-situ recovery sites for the African violets* - since two of the populations are endangered by limestone mining interests over the past few years, and another one threatened by prolonged drought, there is an urgent need to spread the gene pools in other suitable areas. Positively, our first recovery site (trial) was a success, there is hope for the species to survive in other ecologically-suitable habitats.
c) *Develop a rescue protocol for African violet seedlings during recruitment* - based on our observations and analysis, the mortality rate of new recruits in the wild is estimated to 80% on average across the habitats (could be 95% for Kachororoni population). Further, the survival in the propagation centre (of wild seedlings brought in the centre for nurturing) was observed to be high (over 75% of the seedlings survived). Thus, there is a need to factor in the aspect of collecting new recruits (especially during harsh conditions, and from unsuitable areas such as footpaths or exposed areas), nurturing them in the propagation centre and translocating them *in-situ.*

4.3 Partnerships

Notably, since the 1st round of funding all through to the 2nd round, our project has and activities have attracted the attention of various stakeholders and partners in the conservation world. First, we are partnering with the local community through Mazingira ni Uhai CBO (a community-based organization that was registered during our 1st round of funding and is conducting environmental activities in Kilifi) and Cha Simba Caves Association (registered to advance eco-tourism in Cha Simba, thanks to the beautiful historic sites in the area). The members of these two community groups have been instrumental in conducting restoration activities, creating awareness among land owners in the area, and actively participating in field surveys. The members donated a parcel of land to host the tree nurseries, and are taking care of the nurseries.

Further, during the anti-mining campaigns for Cha Simba rocks, we have interacted with several partners, including; Nature Kenya (a conservation NGO and our host for this project), National Museums of Kenya (interested in restoration of some sites in the coast), Little Environmental Action Foundation (LEAF), and Cave Exploration Group of East Africa (CEGEA). Although the partners have no direct interest on African violets, there is common interest on conserving the Cha Simba habitat and other coastal fragments due to their biodiversity and cultural heritage values. We expect to work together in future opportunities as a joint partnership could bring massive impacts and sustainably ensure the African violets survive for long-term.

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Appendices

Appendix 1. Selected project photos

Photo: African violet juveniles growing on rock crevices/basins in Cha Simba and Mwarakaya habitats.

Photo: Maize plantation surrounding Cha Simba habitat.

Photo by Cornelius M. Kyalo

Photo: African violet plants growing on rock crevices in Mwarakaya population.

Photo by Cornelius M. Kyalo