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A Technical Report for the

ALA PROGRAMME: PHASE III

Fifth Assessment Report of Faunal and Floral Biodiversity in Sainte Luce's Forest Corridors and Littoral Forest

August 2025

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# Summary

Madagascar's littoral forests face a variety of threats, including unsustainable logging, increased reliance on natural resources, and climate change. The Sainte Luce littoral forest in the Anosy region of southeastern Madagascar is no exception. The Sainte Luce littoral forest (SLLF) supports disconnected populations of four endangered lemur species, a rich diversity of floral and invertebrate species and numerous amphibian and reptilian species, including nationally endemic and micro-endemic species.

Initiated in 2019, SEED Madagascar's (SEED's) Ala Programme is a ten-year littoral forest conservation strategy. To increase habitat connectivity, the Ala Programme, has planted five forest corridors to connect littoral forest remnants with a larger protected forest fragment, fragment eight (S8 North). Since 2019, SEED's Conservation Research Programme (SCRP) has been conducting ecological monitoring of the forest corridors and littoral forest remnants. Lemur, amphibian, reptile, and invertebrate populations within the corridors and littoral forest remnants have been monitored to gain a detailed understanding of species richness, diversity, and the distribution of spatially disconnected populations. This research was complemented by floral research to monitor Programme progress holistically.

Between October 2022 and July 2025 camera traps were deployed in Littoral Forest Corridors 1 to 4, for a total of 1,625 trapping nights to monitor lemur movement through the corridors. Monitoring methods were adapted during this period to increase the efficiency and efficacy of camera trap use. As of July 2025, there have been two images of *Cheirogaleus thomasi* recorded, one in 2023 on the edge of Corridor 3 and another in April of 2025 on the edge of Corridor 2. A *Microcebus tanosi* was recorded in May of 2025 on the edge of Corridor 1 and images of *Eulemur collaris* were captured in Corridors 1, 3, and 4. Additionally, there have been small, non-native mammals and native birds observed in the corridors on the reviewed footage thus far.

Between July 2019 and July 2025, 197 herpetofauna visual encounter surveys were completed in the corridors, with 410 observations of 18 identified species. The most frequently observed species were *Trachylepis elegans* (132) followed by *Heterixalus boettgeri* (68), and *Trachylepis gravenhorstii* (52). Additional herpetofauna species continue to be observed within the corridors. As such, it is important that monitoring continues.

Between August 2019 and July 2025, 442 invertebrate catch-and-release surveys were conducted, with a total of 7,247 invertebrates observed from 19 known phylogenetic orders made across the corridors, forest remnants, and external quadrats. The most frequently observed orders in the corridor quadrats were *Hymenoptera* (n = 1,875) followed by *Orthoptera* (n = 1,124), and *Arachnida* (n = 436). In the forest quadrats the most observed orders were *Hymenoptera* (n = 957) followed by *Blattodea* (n = 705), and *Arachnida* (n = 659). In the external quadrats the most common orders were *Hymenoptera* (n = 59) followed by *Orthoptera* (n = 26) followed by *Arachnida* (n = 5), and *Coleoptera* (n = 5).

Survival and growth of planted flora have been monitored quarterly in four of the Ala Programme's Forest corridors. Additional survival and growth surveys have been conducted monthly in quadrats in all five of the forest corridors. In July 2025, the average height of native seedlings across all five corridors was 15.6 cm. Fires have set back progress in both survival and growth for trees in all corridors, with 87.7% of native seedlings being lost between December and January this technical year. Despite this, as forest corridors recover, become more established and average native tree height, circumference, and canopy cover increase, it is expected that faunal biodiversity within the corridors will increase. *Acacia* continues to grow in all the forest corridors and while they increasingly provide shade and structure for the native seedlings in Corridors 1 to 5, they are also acting as competition and may be hindering seedling growth and survival. As a

result, selective ringbarking is being implemented to remove some of these trees and Acacia has not been planted in the extension to Corridor 5. Instead, the planting of native seedlings on open ground is currently being trialled in the Corridor 5 extension.

1 Introduction

1.1 Background

Madagascar is one of the world's highest conservation priorities (Myers et al., 2000). As a megadiverse country (Convention on Biological Diversity, n.d.), Madagascar supports around five percent of global biodiversity (Ministry of Environment and Forests Madagascar, 2014) and has some of the highest levels of endemism worldwide (Helmstetter et al., 2021). Forest loss, however, continues to threaten Madagascar's unique flora and fauna, with 4.62 million hectares of forest cover lost through deforestation between 2001 and 2021 (Global Forest Watch, 2023). As a result, lemurs have been categorised as one of the world's most threatened mammal groups (IUCN, 2020), with habitat loss and fragmentation threatening populations across the country (Schwitzer et al., 2013).

1.2 Littoral Forests

Littoral forest ecosystems are one of the most threatened ecosystems in Madagascar (Watson et al., 2010) and are considered a national conservation priority (Ganzhorn et al., 2001). Habitat fragmentation and degradation continue to endanger this ecosystem and the myriad of genetically diverse species it supports (Consiglio et al., 2006; Krishnan et al., 2013). The Anosy region in southeast Madagascar contains some of the few remaining viable littoral forests, including the Sainte Luce littoral forest (SLLF). Littoral forests support unusually rich and diverse ecological communities (Bollen & Donati, 2006), including 13% of the country's native flora (Consiglio et al., 2006). The SLLF is one of three larger littoral forests left in the region, comprising 17 fragments, and supporting a large variety of plant species, 83% of which are endemic to Madagascar (Rabenantoandro et al., 2007). Additionally, the SLLF is home to populations of various Threatened species, such as four Endangered lemur species: the Red-collared brown lemur (*Eulemur collaris*), the Southern woolly lemur (*Avahi meridionalis*), the Anosy mouse lemur (*Microcebus tanosi*), and the Thomas' dwarf lemur (*Cheirogaleus thomasi*) (Donati et al., 2020a; Donati et al., 2020b; Donati et al., 2020c; J. Ganzhorn et al., 2020).

The SLLF supports a growing community (SEED Madagascar, 2021) who depend on the forests for natural resources (Bollen & Donati, 2006) however, the SLLF is threatened by a variety of factors. Irregular rainfall and frequent droughts have depleted groundwater sources (Ashraf et al., 2021), exacerbating edge effects[1] and increasing vulnerability to fire (Cochrane & Laurance, 2002). The SLLF fragments are especially vulnerable because they have dry, fire-prone edges which are predominantly adjoined to grasslands that are often burned as part of a traditional land management technique called *tavy*[2] (Cochrane & Laurance, 2002; Schwitzer et al., 2013). In addition to community use, proposed mining operations by QIT Madagascar Minerals (QMM) threaten to remove 661.80ha of the SLLF, increasing the risk of extinction of locally endemic species (Bollen & Donati, 2006; Temple et al., 2012; Watson et al., 2010).

1.3 The Ala Programme

As a response to the threats facing the SLLF, SEED Madagascar (SEED) initiated the Ala Programme (*ala* meaning forest in Malagasy), a ten-year littoral forest conservation strategy. The Programme aims to improve habitat connectivity and species dispersal between SLLF Fragment 8 (S8) and nearby forest

[1] Edge effect involves microclimatic variations (light, temperature, and humidity) in the forest edge that become unsuitable for organisms adapted to forest interior conditions (Aragón et al., 2015).

[2] *Tavy* is a swidden agricultural practice which involves setting intentional fires to clear land for agriculture.

remnants (R1, R2, R3, R4) through the creation of five forest corridors (C1, C2, C3, C4, C5). In Phase I (2019-2021), SEED planted four forest corridors with *Acacia mangium* (*Acacia*) and native seedlings, totalling 1.64ha. In Phase II (2021-2024), available habitat was increased by expanding the original corridors and establishing a fifth forest corridor, creating a total corridor area of 3.72ha and connecting 111ha of littoral forest. Phase II aimed to understand and meet community forest resource needs, build sustainable, locally led forest management structures, and contribute to the body of international conservation knowledge regarding forest corridors as a conservation strategy.

Phase III began in August 2024 and builds on the progress of Phases I and II to conserve endangered lemur species by improving habitat connectivity in SLLF fragment S8 through the establishment of forest corridors. Additionally, Phase III will disseminate learnings on community forest usage patterns to advocate for community needs, engage with local forest management structures to improve communication, and increase available knowledge on littoral forest biodiversity.

Forest corridors facilitate the movement of forest-dependent species between patches of otherwise disconnected habitat. This has been found to increase habitat connectivity and permeability (Andriamandimbiarisoa et al., 2015; Caro et al., 2009; Christie & Knowles, 2015) and mitigate the effects of habitat fragmentation (Christie & Knowles, 2015). Forest corridors can increase gene flow between previously disconnected habitats, supporting larger population sizes (Caro et al., 2009; Pardini et al., 2005; Wan et al., 2018).

Through the establishment of forest corridors, the Ala Programme aims to increase and improve habitat connectivity for the conservation of three Endangered nocturnal lemur species (*Avahi meridionalis*, *Cheirogaleus thomasi*, and *Microcebus tanosi*) which cannot traverse the open land created by fragmentation. The Programme will also conserve and study many invertebrate and herpetofauna species in the SLLF, including the Critically Endangered *Guibemantis diphonus* (frog) (IUCN SSC Amphibian Specialist Group, 2020) and the Critically Endangered *Phelsuma antanosy* (gecko) (Jenkins et al., 2011a).

A large proportion of the S8 and surrounding forest remnants one to four (R1, R2, R3, R4) were designated as a community protected area as part of QMM's mining offset zone (Temple et al., 2012). These areas are part of Madagascar's National Protected Areas network, classified as conservation zones under IUCN Category V Protected Areas regime, and provide crucial lemur habitat. *Avahi meridionalis* have been recorded in the forest remnants surrounding S8, making it imperative to connect R1-R4 to S8 to reduce the risk of inbreeding and other detrimental consequences of isolation. Increasing forest remnant habitat availability may also be crucial for the protection of *Eulemur collaris,* by providing additional suitable habitat. Moreover, an increase in local lemur populations will increase native seed dispersal, which will in turn improve chances of long-term survival for the forest itself.

1.4 Drought, Fire and Cyclone Damage to the Corridors

In 2024 eastern Madagascar saw the driest October through December period on record (SADC Agromet update 2025). This resulted in drought conditions that negatively impacted all plant life in the area including the Ala corridors. In addition, the prolonged dry weather conditions set the stage for massive fires between December 2024 and January 2025 which caused extensive damage to the forest areas in St. Luce, including the S8 forest remnants and the corridors connecting them. All five Ala programme corridors were affected by the fire, with 87.7% of native seedlings destroyed altogether.

In March 2025, Tropical Storm Jude hit Madagascar, travelling through the Taolagnaro District on the 16th of March, causing severe destruction. The storm brought severe winds, with gusts of up to 100kmph (Southern Africa: Tropical Cyclone Jude Flash Update No. 1 as of 11 March (2025)). Jude impacted the Ala corridors, knocking down 13% of the remaining Acacia trees, with the impact most felt in Corridor 3 where 274 trees were felled. Corridor 3 lies along the crest of a hill and has the tallest Acacia, as a result, this corridor was more susceptible to the storm's extreme winds. The damage to Corridor 3 has significantly reduced the viability of this corridor for lemur traversal.

2 Methodology

Data collected since the beginning of the Ala Programme in April 2019 have yielded a variety of interesting and important observations. From March 2020, in-situ capacity was reduced due to the COVID-19 pandemic, as a result, not all lemur, herpetofauna, and invertebrate surveys were completed as scheduled. Data collection resumed at a normal frequency from January 2022.

2.1 Study Site

The Ala Programme conducts research in five forest corridors between forest fragments in the rural community of Sainte Luce, southeast Madagascar (24° 46' S, 47° 10' E) (Figure 1). The five corridors cover 3.72ha and connect a total area of 111ha of littoral forest. Data collection is led by SEED's Conservation Research Programme (SCRP) and began in May 2019, following the planting of C1 to C4. C5 was planted in April 2022, aiming to increase the total corridor coverage and habitat connectivity; floral monitoring is ongoing here, and faunal monitoring will start once the corridor vegetation is more established.

2.2 Data Collection

Three methodologies have been used for assessing faunal biodiversity within C1 to C4, Visual Encounter Sampling (VES), catch-and-release sampling, and camera trapping. Additionally, survival and growth quadrat surveys have been conducted in all corridors to assess floral biodiversity. This report summarises the findings of data collected by the Ala Programme over the last five years, from May 2019 until July 2025, with particular focus on the last technical year (August 2024 to July 2025).

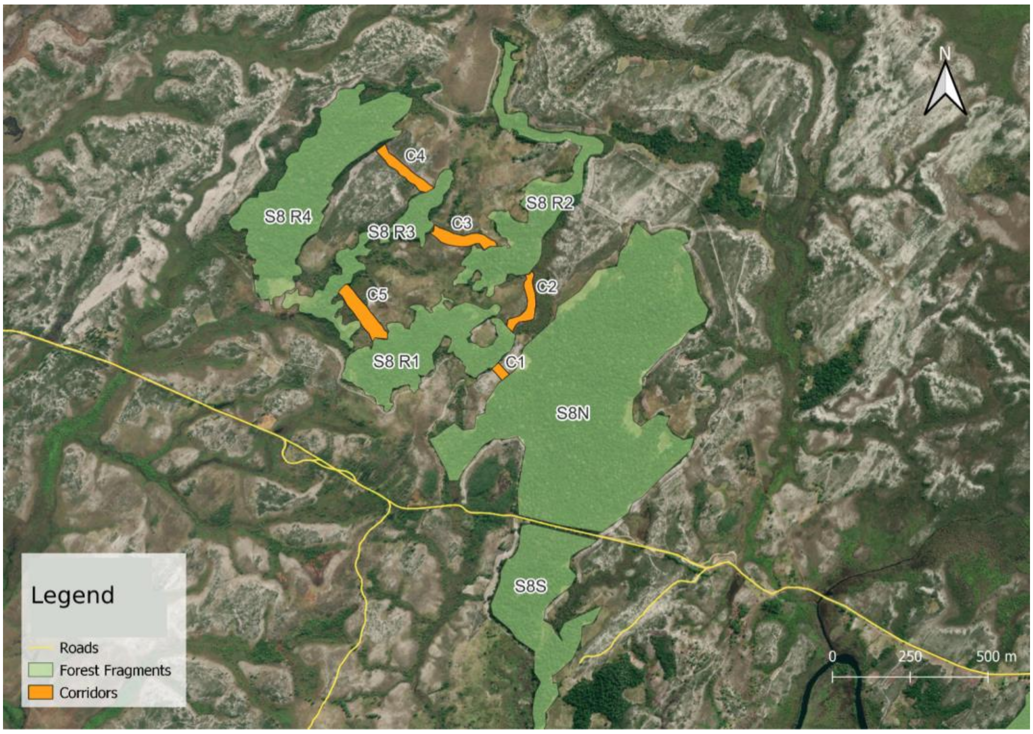


Figure 1: The Ala Programme study site.

2.2.1 Lemurs

A total of 119 Lemur Visual Encounter Surveys (VES) were carried out in the corridors between May 2019 and October 2022. From this point onwards, lemur populations have been surveyed using camera traps. The methodology for lemur VES can be found in the Ala Programme: Phase II Technical Report – 2023.

2.2.1.1 Camera Trapping

Pilot camera trapping trials were conducted between October 2022 and January 2023. The results from this trial can be found in the Ala Programme: Phase II Technical Report 2023. From April 2023, two cameras were placed in C1 to C4, one in the middle and one near the remnant edge. This was done after obtaining permission from the corridor landowners. This strategic placement aimed to detect whether lemurs and other species were actively using the corridors to disperse between forest fragments, capturing both potential edge activity and interior movement.

In October 2023, a third camera was installed in corridors 1 to 4 at the edge that did not already have a camera, bringing the total number of camera traps deployed to 12. Camera trapping coverage will increase in Phase III with the installation of additional camera traps in C5 beginning in January 2026. The aim of adding additional cameras was to capture any potential lemur interaction with corridor edges from the forest remnants or S8 fragment while maintaining capacity for identifying lemurs travelling through the corridors. Each camera takes three-photo bursts, which, compared to other settings, reduces the blur of an animal moving across the frame, and allows for the images to be more easily reviewed by researchers. Camera traps were situated to face either the north or the south to reduce the direct glare of the rising or setting sun and reduce the likelihood of the infrared detector being triggered by the sun reflecting off leaves. The cameras were placed on the trees at an angle that captures as much of the upper reaches of the trees as possible since the target nocturnal lemurs are arboreal and would move through the dense leafy canopy. Care was taken to attach the cameras to trees with sparse branch cover around the camera and to remove any overhanging branches surrounding the camera to reduce the likelihood of non-target trigger events.

Camera batteries and SD cards were checked roughly every ten days and changed if necessary. When the batteries or SD cards were changed, there would be a period of one to two days where the cameras were not operational. Once the footage was downloaded, it was reviewed by research staff and volunteers. Images containing no meaningful information were deleted (i.e. no wildlife).

2.2.2 Herpetofauna Visual Encounter Sampling

Under the Ala Programme, SCRP recorded all observations of herpetofauna species along a set transect (Hutchens & Deperno, 2009). Transects were established through the centre of the corridor in C1 to C4. Surveys took place in each corridor once every three months, with one survey conducted during the day for diurnal species and one at night for nocturnal species. In Phase III, SEED will add a transect to C5 and begin surveys here by January 2026.

VES are a way of systematically monitoring an area with standardised effort that is often used to estimate population densities from long-term datasets (Flint & Harris, 2005; Furnas et al., 2019). Herpetofauna diurnal and nocturnal VES were conducted at the appropriate times of day by at least one experienced SCRP staff member and a local expert guide, who moved along each transect at a slow speed (~1km/hr). Torches were used to aid detection during nocturnal surveys. Prior to each survey, contextual data were recorded. When an observation was made, environmental and biological variables were recorded, including time of sighting, species sighted, life stage (juvenile, sub-adult, or adult), GPS coordinates of sighting location, distance from transect (m), height of individual, microhabitat (such as in the leaf litter, under a dead branch, on a tree trunk), and any additional information of interest. If the perch (e.g. tree) was too tall to be measured using a measuring tape, a visual estimate was made and agreed on by the researchers present.

2.2.3 Invertebrate Catch-and-Release Surveys

Starting in August of 2019, invertebrate catch-and-release surveys were conducted in 20, 10mx10m longitudinal quadrats situated in C1 to C4, R1 to R4, and S8. Five quadrats were created, one in the centre and two at the edges of each corridor and then two in the adjoining forest remnants. The quadrats within the forest remnants serve as ecological baselines that corridor invertebrate biodiversity could be compared to.

Beginning in August of 2024, an external quadrat was added to each corridor, bringing the total number of quadrats up to 24. The external quadrat was added in order to better quantify the difference between the corridor ecosystem and an area in which no planting had occurred. Similar to the forest quadrats, this will serve as an ecological baseline to which invertebrate biodiversity in the corridors can be compared to.

Each quadrat was surveyed for ten minutes to monitor invertebrate presence and abundance. Three to five SCRP data collectors conducted each survey. Contextual data were recorded prior to the survey, including date, start and finish time, number of observers (staff and volunteers), weather, and percentage cloud cover. Oftentimes, species could only be identified to order, as many species in the SLLF are undescribed. The orders Lepidoptera, Diptera, and Odonata were not collected or recorded as most species in these orders are highly mobile and difficult to catch. A photographic guide sheet of the different species previously observed by SCRP was used to aid identification, standardise observations, and identify potential new species. A morphological species (morpho-species) code was assigned to each species in the identification guide (e.g., ARACH3). The code was recorded on the datasheet with a tally made for every time an individual of that species was caught. If a species was absent from the identification guide, it was recorded as a new species and identified to order level. New species were photographed with scale and described so that they could be identified and added to the guide (e.g. size, distinct features, antennae length). Once identification was complete, every individual was released outside the quadrat to prevent repeated sampling. Handling time was kept to a minimum to reduce stress for the captured individual.

2.2.4 Additional Opportunistic Sightings

Opportunistic sightings of species are recorded outside of scheduled surveys or specific data collection periods if the species is not seen frequently in the corridors. In such incidents, the species name, number of individuals, sex (if identifiable), location, and date are recorded. Such sightings are particularly helpful in identifying individuals that are not observed by camera traps or within herpetofauna or invertebrate surveys. Opportunistic observations are not included in data analysis but are noted in this report as they contribute to the understanding of species diversity within the corridors.

2.2.5 Survival and Growth

2.2.5.1 Quarterly Monitoring

Survival and growth data of *Acacia* and native species were recorded for seedlings within monitoring quadrats. Since the Ala Programme's corridors were planted at different times, the date of the first data collection within quadrats differed for each forest corridor (Annex 1). Survival and growth data were collected for SCRP-monitored seedlings within fixed quadrats in C1 to C4. There are two quadrats per corridor, one at the edge and one in the middle, all measuring 10mx10m. All quadrats were visited during daylight hours, with data for survival and growth collected at the same time. General data were recorded, such as quadrat code, seedling identification number, species, and other abiotic factors such as weather and rainfall. Seedling survival was monitored using their condition, which was rated from 1 to 4 (Annex 2) and was recorded through visual cues, such as if the seedlings were alive or dead, wilting, or had lost leaves. Mean seedling growth over time was calculated by measuring height from the root collar to the apex with a tape measure.

Native seedling survival and growth measurements were collected at initial planting, and at months one, three, six, nine and 12 after planting. Following this, survival and growth data continued to be collected every three months.

Acacia seedling survival and growth measurements were collected at initial planting, and at months one, three, six, and 12 after planting, following this they were monitored once a year. Additionally, growth for *Acacia* was calculated using the height and Diameter at Breast Height (DBH). The DBH was measured at the middle of the trunk for seedlings <1.30m and at breast height for seedlings ≥1.30m in height (Batcheler, 1985). If the *Acacia* became too tall to be measured using the tape measure, their height was visually estimated. The *Acacia* are now deemed well-established, and as such, *Acacia* monitoring was concluded at the end of 2023.

2.2.5.2 Monthly Monitoring

Additional fixed monitoring quadrats for native seedlings were set up in C1 to C4 in July 2023. A fifth monitoring quadrat was established in C5 in March 2024, after native seedlings were planted in February 2024 (Annex 1). Monitoring quadrats, measuring 9m x 9m were established after corridors had been planted, and as such, the number of seedlings monitored in each quadrat varies depending on the corridor. Quadrat locations were randomly chosen, however, there was selection bias for areas with a high number of living seedlings. Survival and growth data was recorded monthly from quadrat establishment.

All quadrats were visited during daylight hours, with data for survival and growth collected at the same time. Seedling condition was rated from 1 to 4 (Annex 2) and was recorded through visual cues, such as, if the seedlings were alive or dead, wilting, or had lost leaves.

2.2.6 Botanical Survey

In August 2024 six, 2m x 2m quadrats were set up in Corridors 1 to 4 to survey the abiotic and biotic ground cover as well as conduct a vegetation survey. These quadrats are surveyed quarterly.

2.2.6.1 Biotic and Abiotic Ground Cover Assessment

The purpose of the biotic and abiotic assessment is to evaluate the ground cover of the quadrats and to get a better insight into how the entire ecosystem is changing over time.

The biotic and abiotic ground cover assessment is a visual assessment of the amount of rock, bare ground, leaf litter, non-vascular (mosses, lichens, and liverworts) and vascular plants (all plants which have leaves, including grasses, trees, and herbs), which are present in the quadrat. Each of the categories has a percentage score rounded to the nearest 5%.

2.2.6.2 Vegetation Survey

The vegetation survey is specifically designed to measure and understand vegetation dynamics in the corridors. There are two parts to the vegetation survey, a ground cover survey and a vertical assessment of plant diversity.

All the species found within the quadrat are recorded with the common Malagasy names in field, and then later in excel with scientific names. Plants planted during an Ala planting scheme are measured in the same way, but a note is made that they were artificially planted.

Once all plant species have been identified and recorded, each is given a ground cover score between 1 and 5 (Table 1). The cover scores are birds-eye view from 1.35m (breast height) above the ground, while standing on the edge of the quadrat. If there is overlapping foliage within a species during the birds-eye cover estimate, the area which overlaps is simply regarded as the same area covered, therefore does not alter the overall cover.

Table 1 (Left): Ground cover scores given to vascular plants during the botanical vegetation survey. Table 2 (Right): Vertical height tiers for assessing the vertical height structure of the vascular plants in botanical vegetation survey.

Cover score	Ground cover
1	<1%
2	1% - 25%
3	26% - 50%
4	51% - 75%
5	76% - 100%

Vertical Height tiers	Heights (cm)
1	0-30
2	31 - 60
3	60 - 90
4	90 - 120
5	>120

To account for differences in vertical foliage distribution the plot will be broken into height tiers (*Table 2*). For each species, a percentage will be given as to how much of the foliage, which is present within the quadrat, is present within that height tier. Both the overall cover and the height tier foliage are repeated for all vegetative species present within each quadrat.

3 Results

3.1 Lemurs and other Mammals

3.1.1 Lemurs

In November 2022, a camera trap at the edge of C3 captured an image of a *C. thomasi* in the adjoining forest remnant. After the pilot study, camera traps were deployed for monitoring. Since full deployment in January 2023, a total of 1,629 nights of footage have been collected. Footage captured throughout 2024 has been reviewed, no further lemur sightings have been made in the footage analysed during this time. Camera trap footage from 2025 has resulted in 5 sightings of 3 different species of lemur. In April 2025, *a Cheirogaleus thomasi* was sighted on the edge of Corridor 2, and in May 2025, images of a *Microcebus tanosi* were captured from the edge of Corridor 4 (Figure 2). On four different occasions, Collared Brown Lemurs (*Eulemur collaris*) were also recorded in or near the corridors. In February, a group of three Collared brown lemurs were photographed crossing Corridor 3 on the ground (Figure 3). They were also photographed twice in Corridor 1 and once in Corridor 4.

Figure 2: Left – Thomas' Dwarf Lemur (Cheirogaleus thomasi) on the edge of C2, right – Antanosy Mouse Lemur (Microcebus tanosi) on the edge of C1. The orange boxes highlight the two lemurs.

Figure 3: A group of 3 Collared Brown Lemurs (Eulemur collaris) crossing Corridor 3

3.1.2 Other Mammals

Since August 2024, there have been four observations of non-lemur mammals in the corridors on the camera traps, three of *Rattus rattus* (black rat) in Corridor 4, and one of a *Viverricula indica* (small Indian civet) in Corridor 3 (Figure 4).

*Figure 4: Left – black rat (*Rattus rattus*) in C3, right – Indian civet (*Viverricula indica*) in C4. The orange boxes highlight the two mammals.*

3.2 Herpetofauna

Between July 2019 and July 2025, 197 herpetofauna biodiversity surveys were completed in the forest corridors (109 Day and 88 Night surveys). There were 78 surveys conducted during this time where no herpetofauna were observed. There have been 410 observations of 18 identified species across the four monitored corridors. The highest number of herpetofauna observations occurred in C4 (105), followed by C3 (102), then C2 (97), and C1 (27). The most frequently observed species in the corridors were *Trachylepis elegans* (132) followed by *Heterixalus boettgeri* (68), and *Trachylepis gravenhorstii* (52). The species richness (S) was highest in C3 (12 species) and lowest in C1 and C2 (7 species each). To date, *Plethodontohyla bipunctata*, and *Aglyptodactylus inguinalis* have only been observed in C1, *Dromicodryas bernieri*, and *Acrantophis dumerili* have only been observed in C2, *Phelsuma modesta*, *Phelsuma lineata*, *Calumma sp. aff. nasutum*, *Ithycyphus oursi,* and *Ebevania sp. aff. inunguis* have only been observed in C3, and *Mimophis mahfalensis*, and *Ptychadena mascareniensis* have only been observed in C4 (Figure 5).

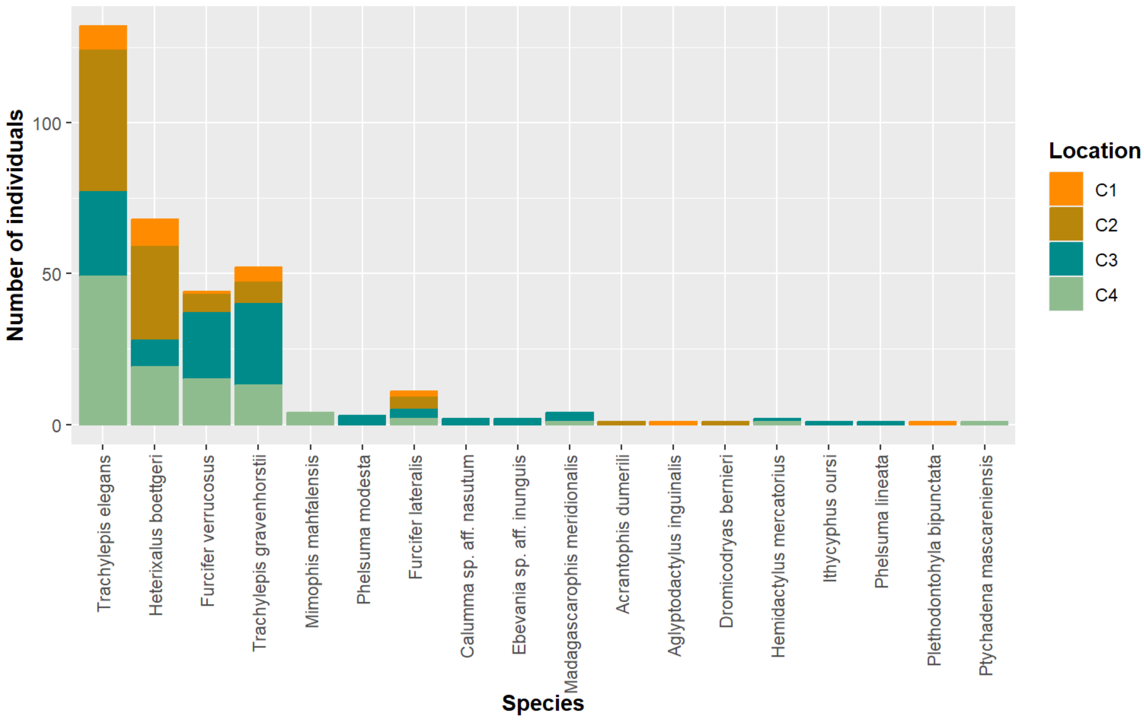


Figure 5: Number of individuals observed from each herpetofauna species within the corridors from July 2019 to present

SEED is able to predict the number of herpetofauna species in each of the corridors using species accumulation curves, which plot the cumulative number of species discovered in an area as a function of survey effort (Figure 6). Overall, the corridor with the highest species richness to date is C3 (12). The corridor with the lowest species richness to date is C1 (7) and C2 (7). This technical year, SEED observed the highest number of species in C3 (10) and the lowest number of species in C1 (6). In total 271 observations of 15 species were observed in the corridors during the last technical year (August 2024 to July 2025), compared to 290 observations of 14 species in the previous technical year (June 2023 to May 2024). During the last technical year, three herpetofauna species were found in the corridors for the first time (*Ebevania sp. aff. inunguis, Hemidactylus mercatorius, and Aglyptodactylus inguinalis*).

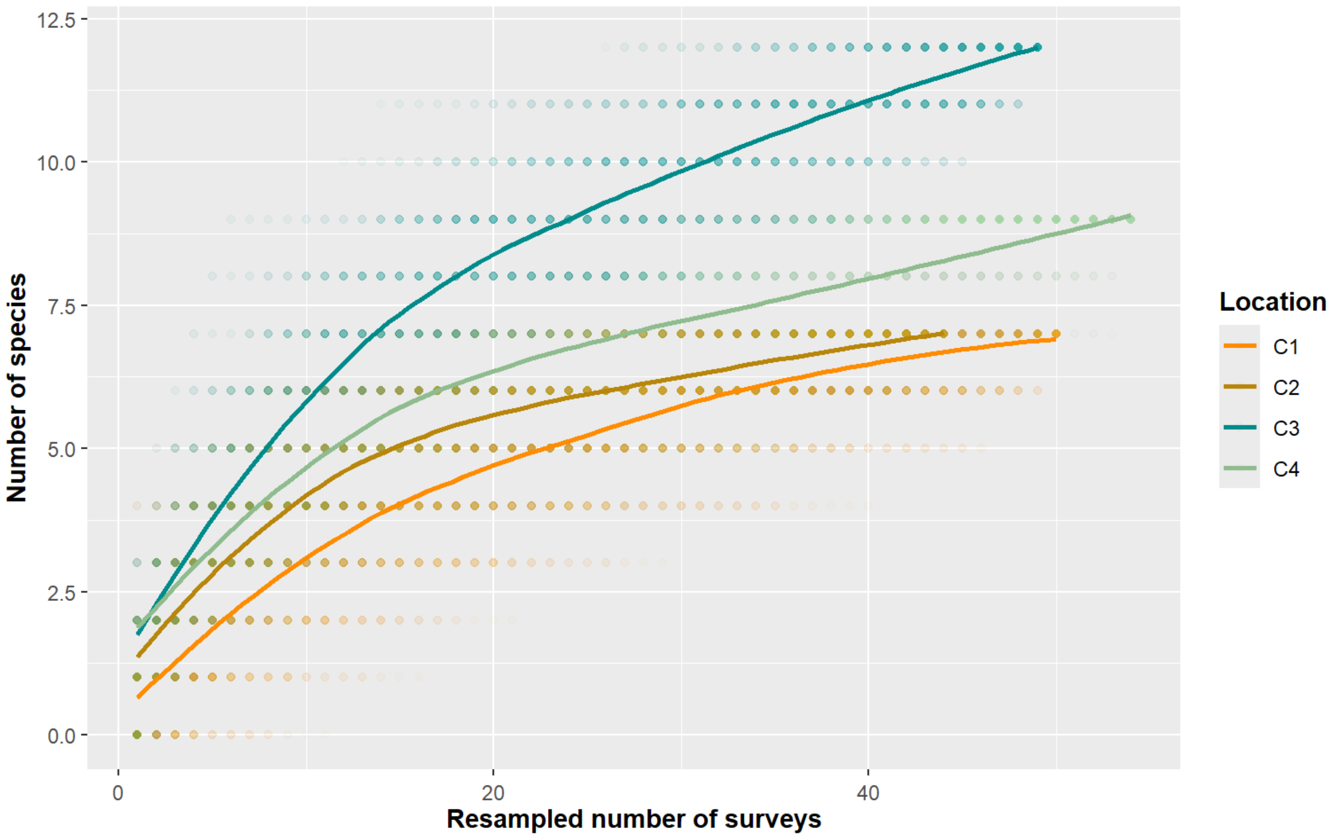


Figure 6: Species Accumulation Curves for the number of additional species recorded in each corridor with each survey, this was calculated using a random addition of each survey. The points show the accumulated number of species observed in each Corridor as they occurred over time.

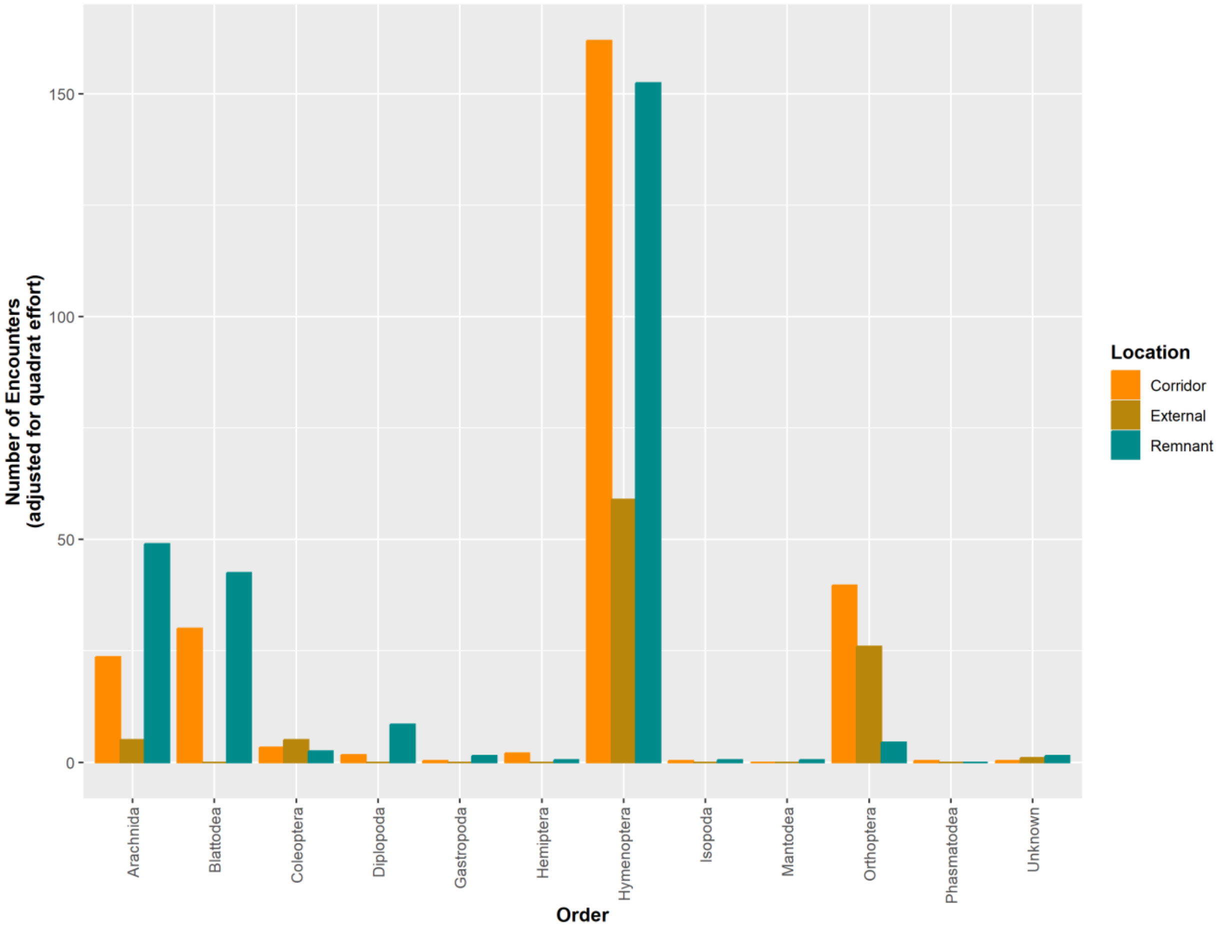
A suite of habitat data was also collected for each observation. On average, observations were made 127 cm from the transect in the corridors and 39.68 cm above the ground. All observations of herpetofauna in the forest corridors occurred in the corridor, in dry forest, or on open ground. Overall, herpetofauna were observed in 16 different microhabitats including leaf litter, dead wood, in water, and on trees, such as *Ravinala*, *Pandanus*, and *Acacia*.

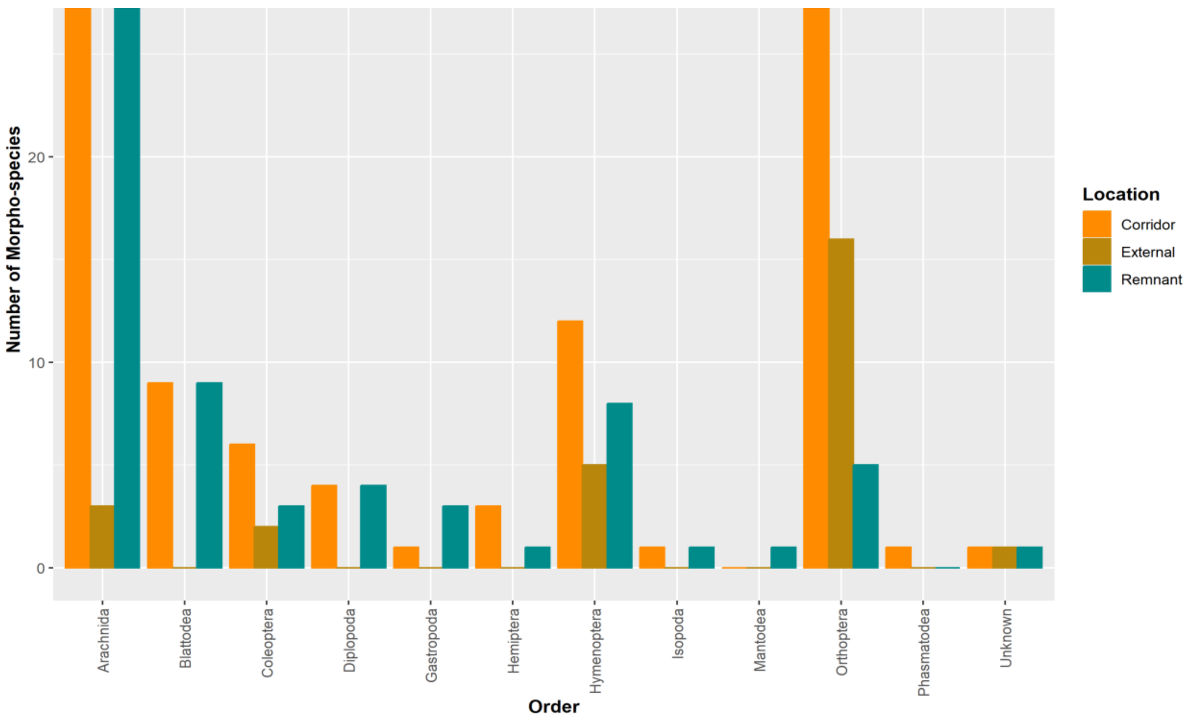
3.3 Invertebrates

Between August 2019 and July 2025, 442 invertebrate biodiversity surveys were conducted in S8, divided into four zones. Each zone included one corridor (C1-C4), the forest or remnants adjoining this corridor (R1-R4, S8N) and an external area near the corridor where trees have not been planted. Three quadrats were placed within each corridor, one was placed in the forest or remnant on each side of the corridor, and one outside of the planting or forest area, resulting in six quadrats per zone. Across all study locations a total of 7,247 invertebrates belonging to 19 known orders have been observed. The highest number of invertebrates was observed in Zone 1 with 2,512, with the fewest observations made in Zone 2 with 1,438. An encounter is when a specific morpho-species is observed in a quadrat during a single survey. The most frequently encountered orders within the corridor quadrats were Hymenoptera (n = 1,875) followed by Orthoptera (n =

1,124), and Arachnida (n = 436). The most frequently encountered orders in the forest quadrats were Hymenoptera (n = 957) followed by Blattodea (n = 705), and Arachnida (n = 659). Finally, the most frequently encountered orders in the external areas were Hymenoptera (n = 59) followed by Orthoptera (n = 26) followed by Arachnida (n = 5), and Coleoptera (n = 5) (Figure 7).

Figure 7: Number of encounters from each invertebrate order from August 2019 to present. Colour denotes location (Corridor, Remnant, External). Abundance is adjusted for quadrat effort (individuals/quadrat samples in location) and Figure 8: Number of morpho-species of each order observed per quadrat between August 2019 and technical year end, separated by Corridor, External, or Remnant/Forest location.





Within the Ala Programme's Forest corridors, 4,020 invertebrates of 18 orders were observed, 3,131 invertebrates of 18 orders were observed within the forest remnants, and 96 invertebrates of five orders were observed in the external areas. Of these observations, 184 morpho-species were identified. The most species-rich orders overall were Arachnida (66) followed by Orthoptera (46), and Coleoptera (21). In the corridors, the most species-rich orders were Arachnida (52) followed by Orthoptera (44), and Coleoptera (17). (Figure 8).

For invertebrate orders with enough data (more than 7 datapoints when divided into Order, Location, and Year), morphospecies abundance (number of encounters per order) (Figure 9) and richness (number of morphospecies per order) (Figure 10) were plotted over time for corridor, external, and remnant locations. This will show if species abundance and distribution is trending towards becoming more similar between corridors and forest remnants within specific orders.

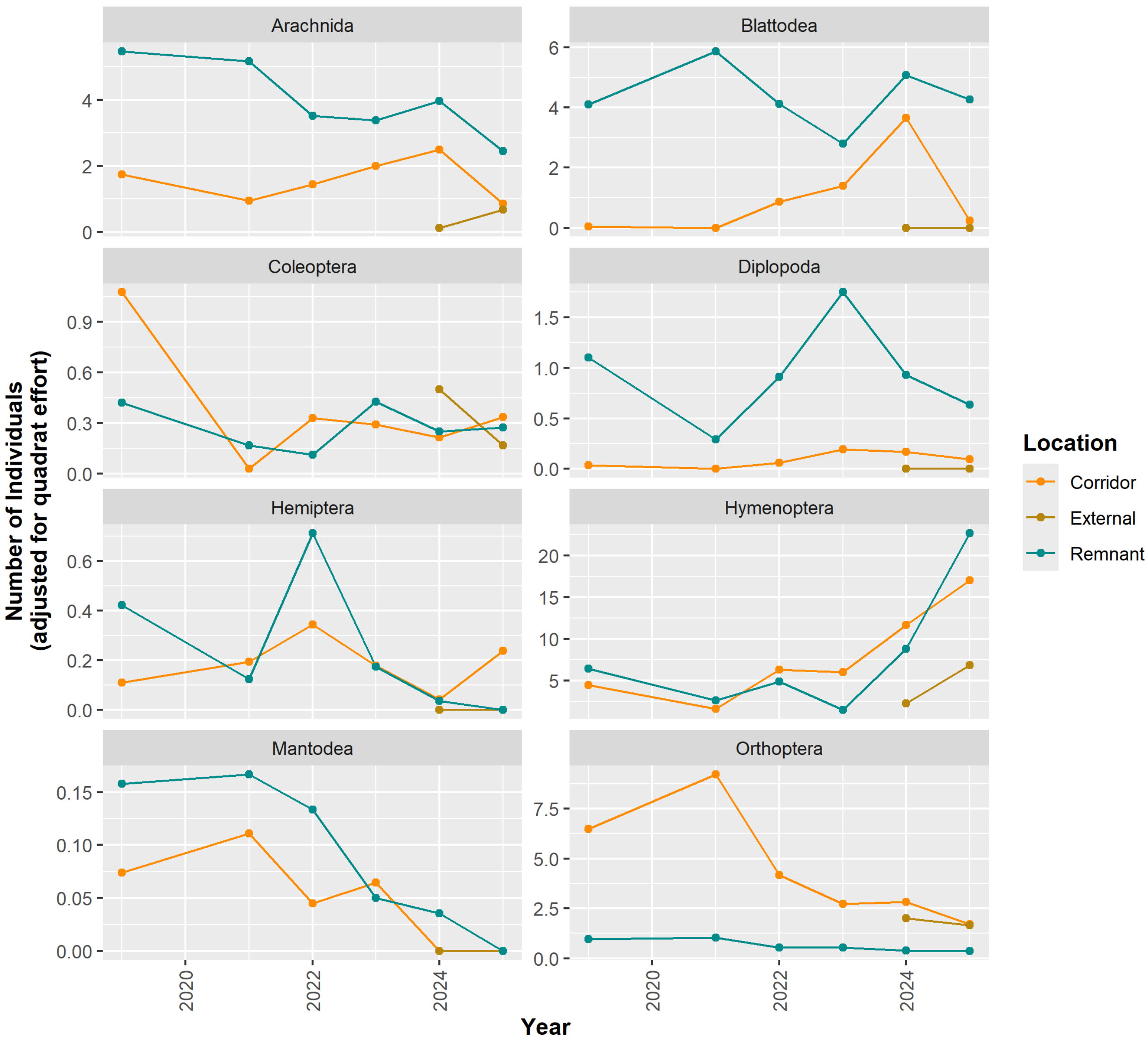


Figure 9: Invertebrate abundance by order by year. Colour denotes location (Corridor, Remnant, External).

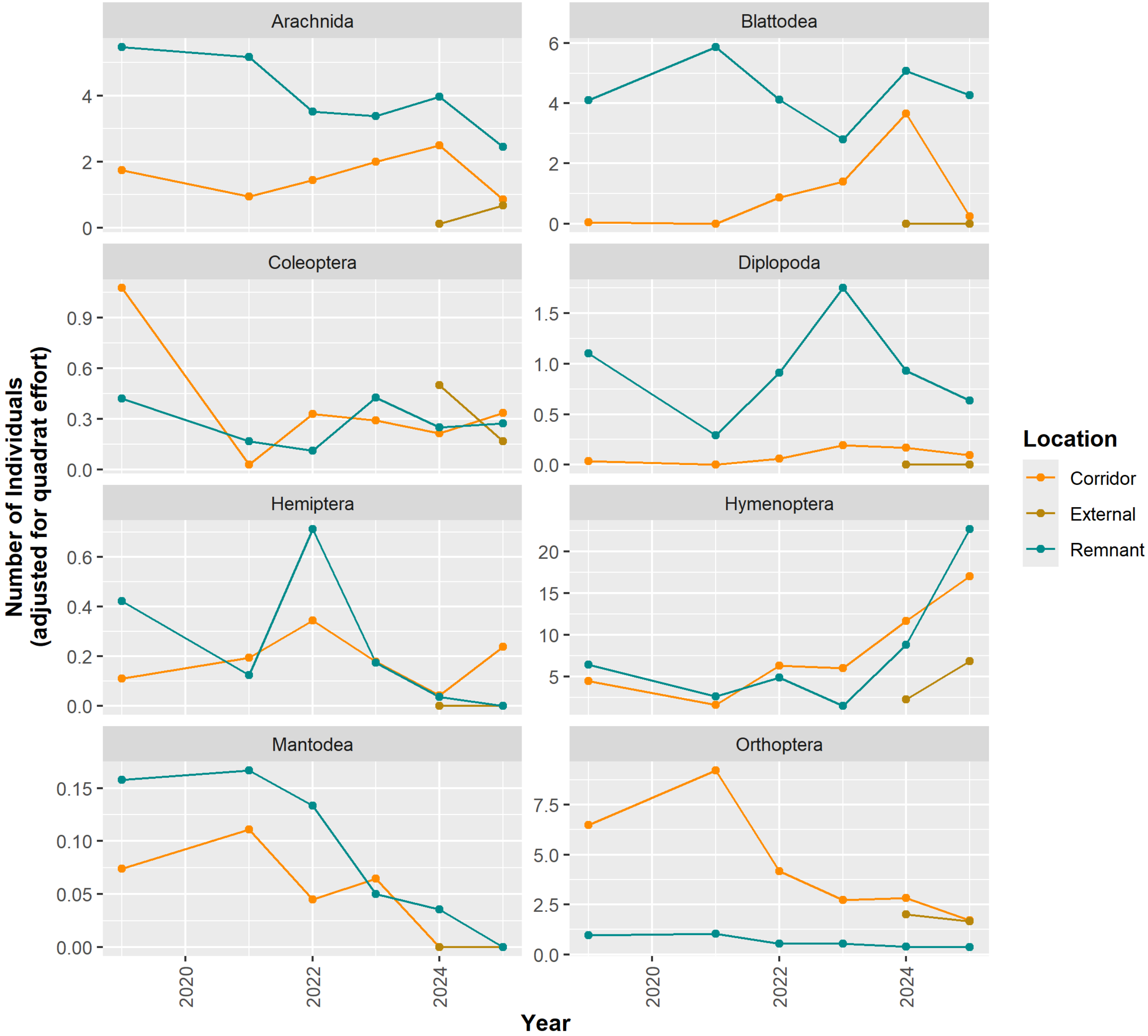


Figure 10: Invertebrate abundance by order by year. Colour denotes location (Corridor, Remnant, External).

A principal components analysis (PCA) was run on the species richness and abundance data using the 'logisticPCA' package in R. Two principal components were constructed which explained 28.72 % of the variation in the data. The first principal component was characterised primarily by overall species richness. The second principal component was characterised primarily by community composition. Community Type 1 is dominated by Orthoptera and Hymenoptera, while Community Type 2 is characterised by the presence of Gastropoda, Diplopoda, and Isopoda species. SEED plotted these principal components for each zone (1-4) and location (Corridor, External, Remnant) over time (Figure 11).

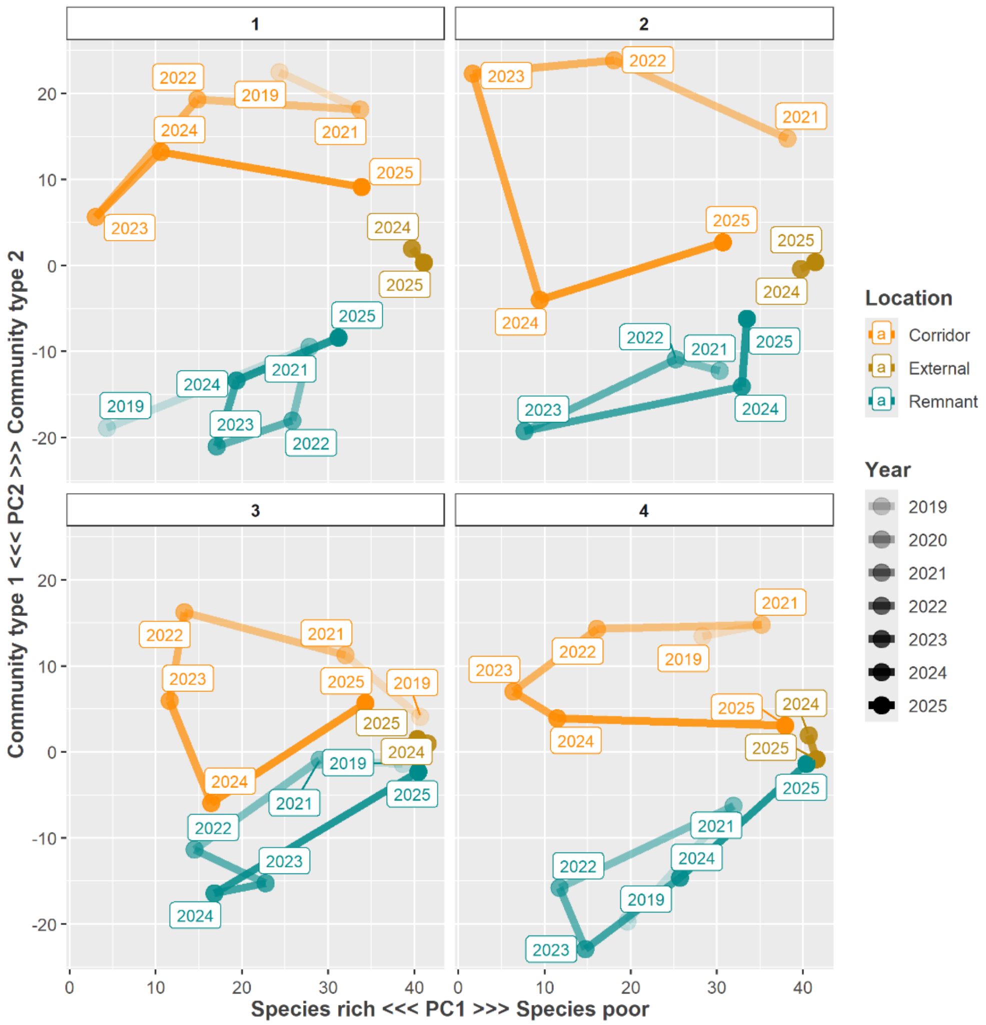


Figure 11: Figure 10: PCA plot showing the invertebrate species richness and abundance in corridor, remnant, and external quadrats plotted onto two principal components over time. PC1 (left to right) is characterised by species richness. PC2 (high to low) is characterised by community composition. Community Type 1 (higher) is characterised by a high number of Orthoptera and Hymenoptera, while Community Type 2 (lower) is characterised by the presence of Gastropoda, Diplopoda, and Isopoda.

A Jaccard Similarity Test, run using the 'vegan' package in R, assessed the similarity in invertebrate species richness and abundance between quadrats in the corridors, the connected forest remnants, and the external areas. This technical year, the highest similarity in morpho-species between the corridors and forest remnants was in Zone 2 with 0.204 Jaccard Similarity Index (JSI) value, while the lowest similarity between corridors and forest remnants was in Zone 4 with 0.163. The highest similarity between corridors and external areas was Zone 1 with 0.109 and the lowest similarity between corridors and external areas was Zone 4 with 0 (Figure 12). Overall, quadrats in corridors and forest remnants tended to have a higher JSI value than either one had to external, which indicates that the biodiversity in the corridors is more similar to the forest remnants than to the external zones. This suggests that SEED's work to reforest the corridors is having the desired effect on invertebrate biodiversity in the area, making the corridors more similar to the forest remnants they are connecting.

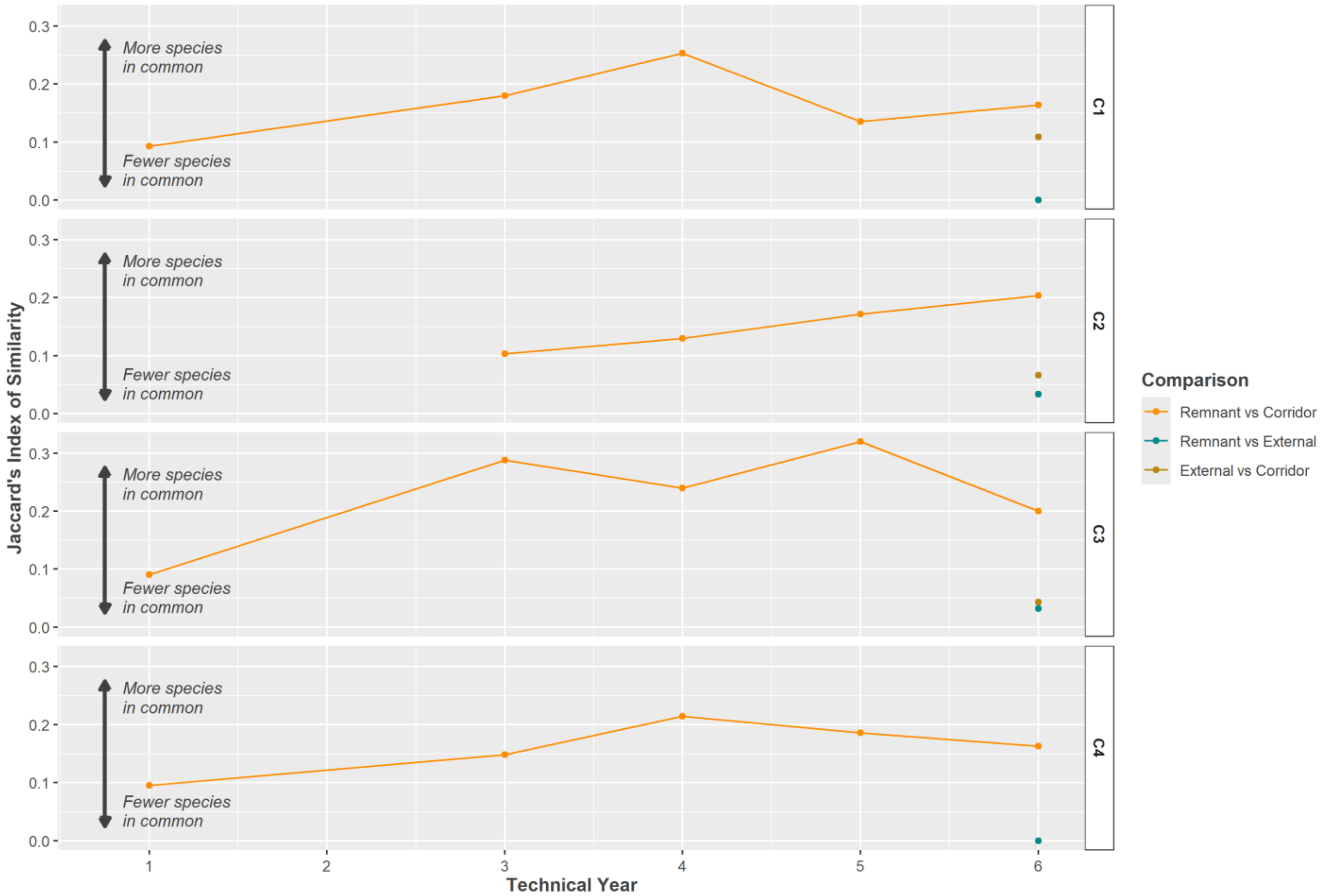


Figure 12: Level of similarity in invertebrate species richness and abundance between the forest corridors, forest remnants, and external areas and how this changed over time in each of the Zones. A Jaccard Similarity Test was used to assess the similarity between the invertebrate communities.

New morpho-species of invertebrate continue to be observed in each of the four corridors, with additional morpho-species categorised and added to the Invertebrate Guide that is used to identify the different morpho-species. This technical year, four morpho-species were categorised and added to the Invertebrate Guide.

3.4 Birds

Between August 2024 and July 2025, there was one unknown bird and an unidentifiable owl captured on footage in C1, an unknown bird in C4, and four instances of a Madagascar Nightjar (*Caprimulgus madagascariensis*) in C4 (Figure 13).

Figure 13: Left – Madagascar Nightjar (Caprimulgus madagascariensis) in C4. Right – unknown owl in C1

3.5 Botanical Biodiversity

3.5.1 *Acacia* Survival and Growth

At the most recent point of data collection, in July and August 2023, the Acacia were tallest in C3, both at the edge of the corridor and in the middle (Figure 14). The Acacia in C2 were the shortest both at the edge and in the middle of the corridor, however, they were planted most recently, in July 2020 (Annex 1).

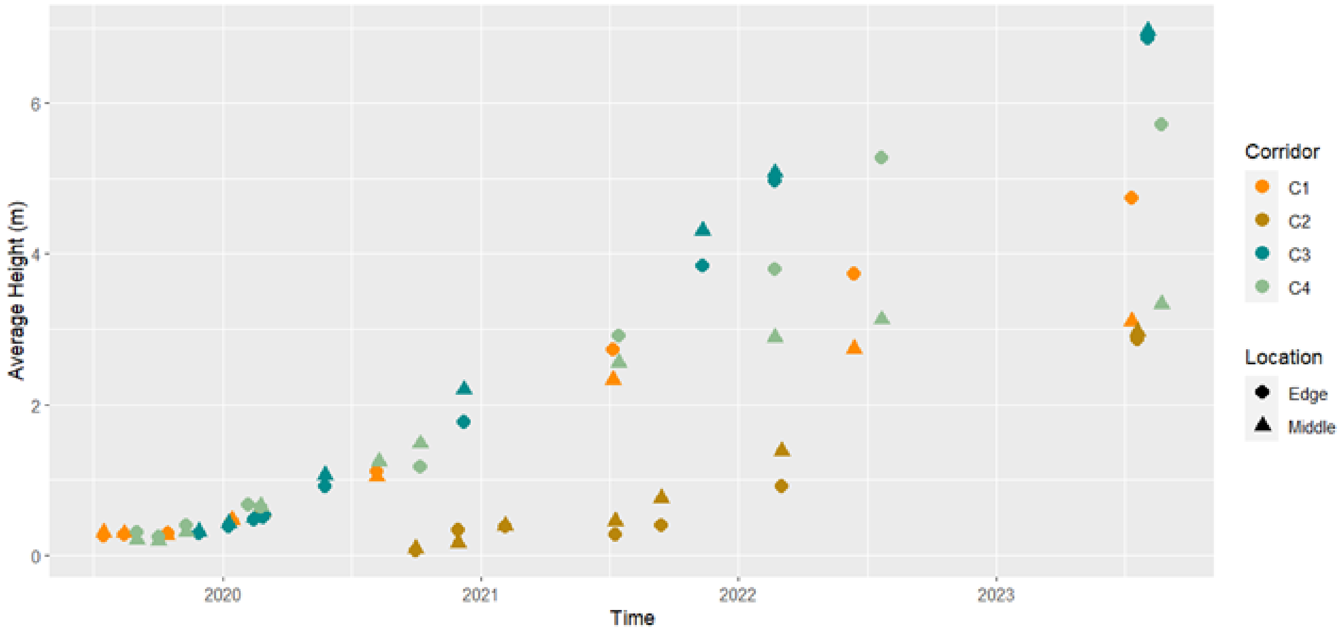


Figure 14: Average height of Acacia in Corridor's 1 to 4 and how they differ on the edge or in the middle of the corridor.

3.5.2 Native Seedling Survival and Growth

From the data collected quarterly, the average height of alive native seedlings in C1 to C5 was 15.6 cm as of July 2025. The height distribution of alive native seedlings differs between the corridors (Figure 15) and has shifted throughout the last three years (Figure 16).

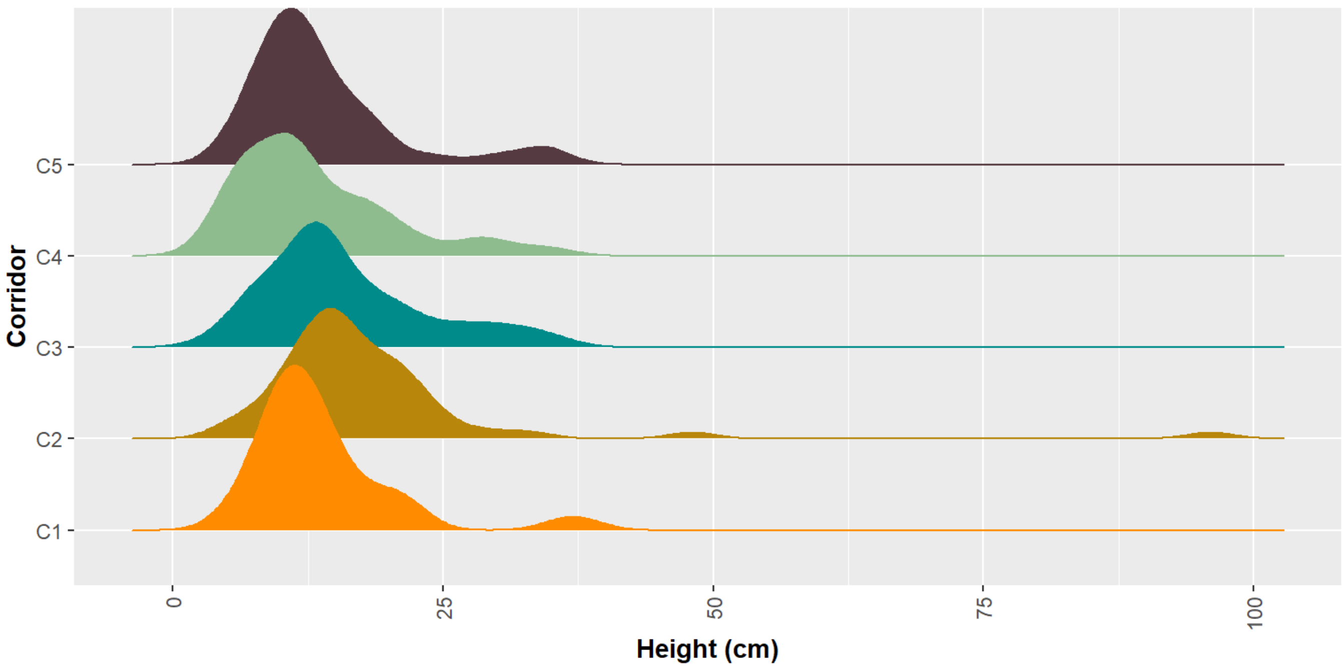


Figure 15: Height distribution of alive native seedlings based on most recent measurement in each corridor.

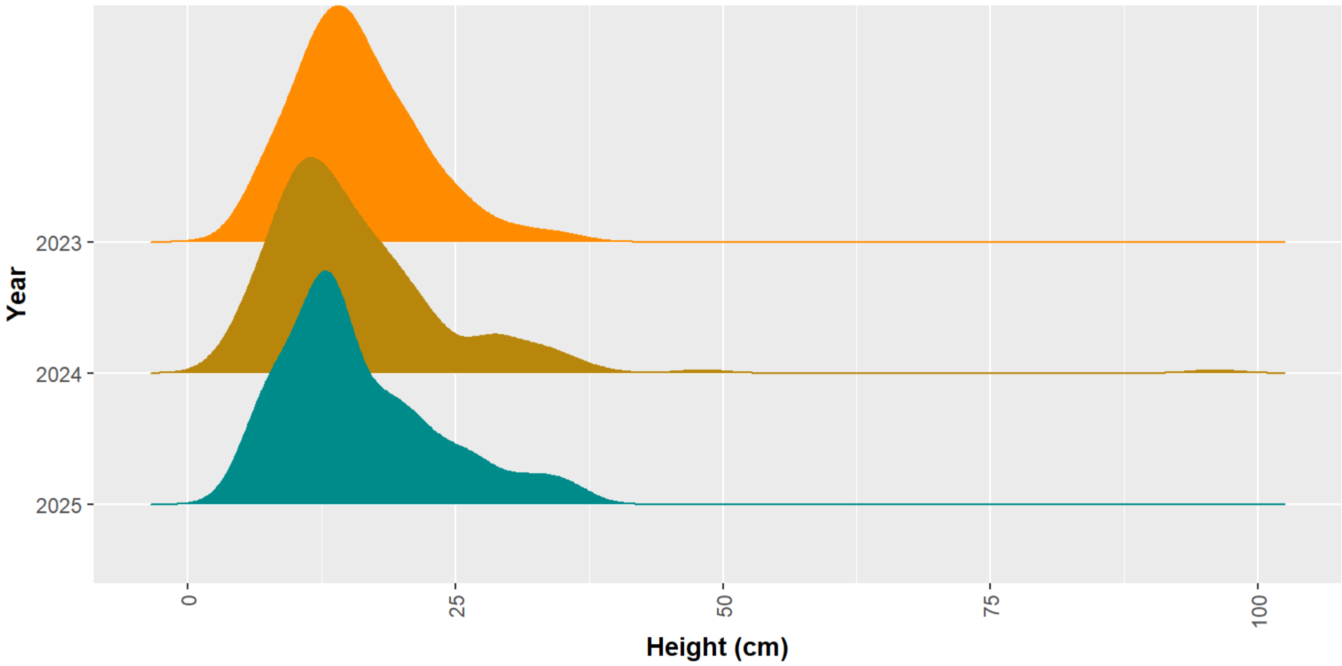


Figure 16: Height distribution of alive native seedlings based on most recent measurement by year.

The average height and growth rate of alive native seedlings has changed over time as well (Figure 17). The corridor with the highest growth rate of alive native seedlings was C2 with 0.31 cm/month, while the corridor with the lowest growth rate was C5 with 0.07 cm/month (Table 3).

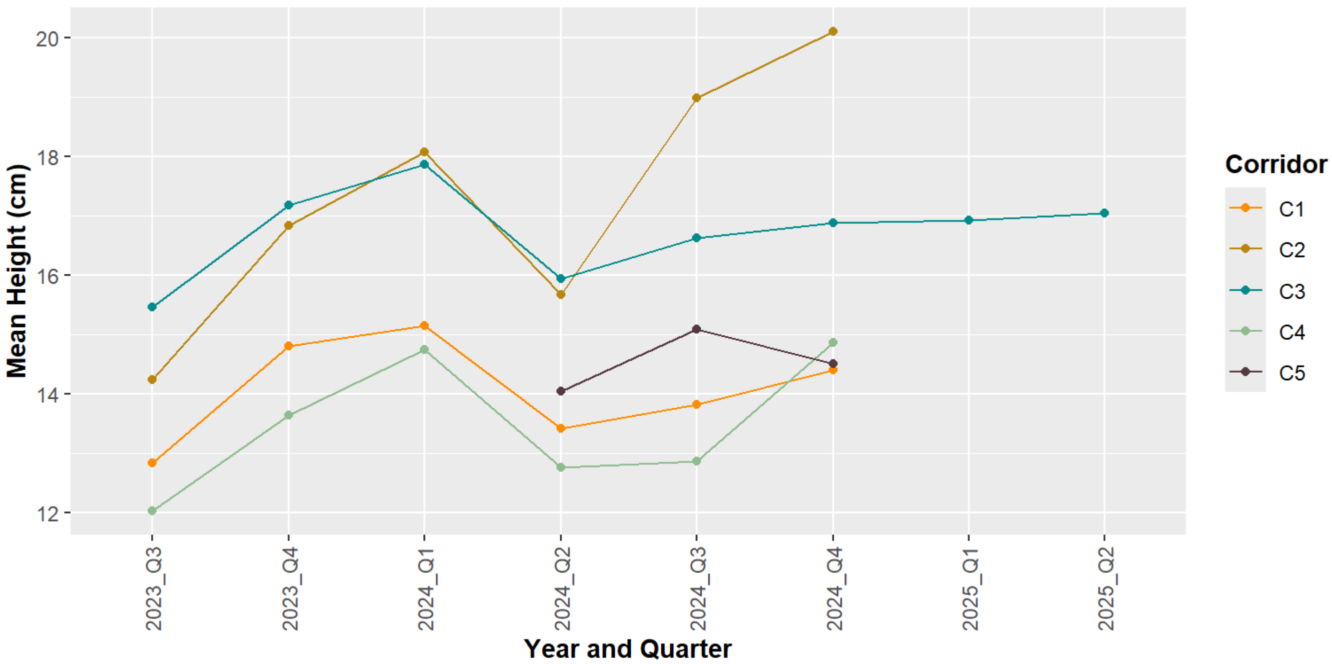


Figure 17: The average height of alive native seedlings in each corridor over time. The years are split into three-month quarters which correspond to SEED's survey and planting schemes.

Table 3: Average growth rate of alive native seedlings in Corridor's 1 to 4 during the last technical year.

Corridor	Average Growth Rate (cm/month)
C1	0.148
C2	0.310
C3	0.108
C4	0.105
C5	0.069

Seedlings planted in February of 2024 had a survival rate of approximately 54.8%[3] in April 2024. More seedlings were planted in May of 2024. Survival rate of all seedlings between May 2024 and December 2024 was approximately 55.2%[3]. In January 2025 there was a fire which destroyed a large portion of the planted trees in the corridors. Survival rate post fire was 12.3% overall, with C2 and C5 being the most affected, losing 100% of alive native seedlings. C1 lost 86.8% of alive native trees, C3 lost 92.3% and C4 lost 75.2%. In March and April of 2025 new seedlings were planted in all corridors except C2, but their survival is yet to be assessed (Figure 18).

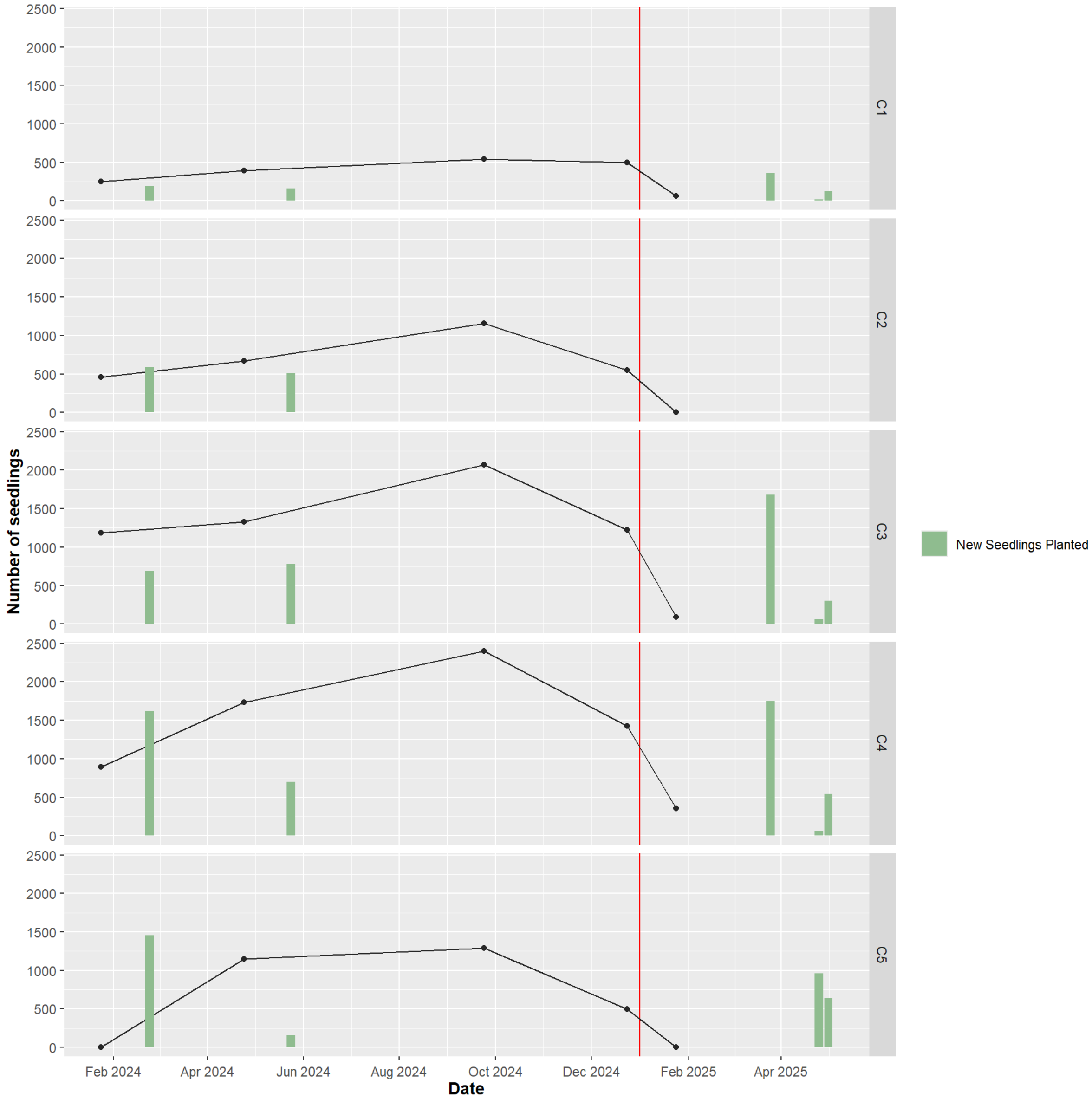


Figure 18: The total number of surviving native seedlings across all corridors over time. The green bars indicate when seedlings were planted and how many. The red line indicates the time of the fire

3.5.3 Botanical Survey

Since botanical surveying began in the corridors in August of 2024, six surveys have been conducted in each corridor for a total of 24 surveys overall. The corridor with the highest species diversity was C2 with 19

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[3] Counts are not fully accurate as the total number of surviving trees was not counted at the time of planting. SEED is using counts from one month before as an approximation for number of existing trees that were still alive at the time new trees were planted.

species, followed by C1 with 17 species, C4 with 15 species, and C3 with 13 species. Grasses were the most common growth type in C1 (19) and C3 (10) while trees were the most common growth type in C2 (17) and C4 (11). The most common species in C1 were Ahipoly and Tsitokotoko with five instances each. In C2 it was Tegny with five instances, in C3 the most common species were Ahipoly, Saritolongo, and Tegny with three instances each, and in C4 the most common species were Anjavidy and Saritolongo with four instances. The tallest plant was in C2 and was an Acacia species. Trees were consistently the tallest species in the corridors followed by ferns and grasses (Figure 19).

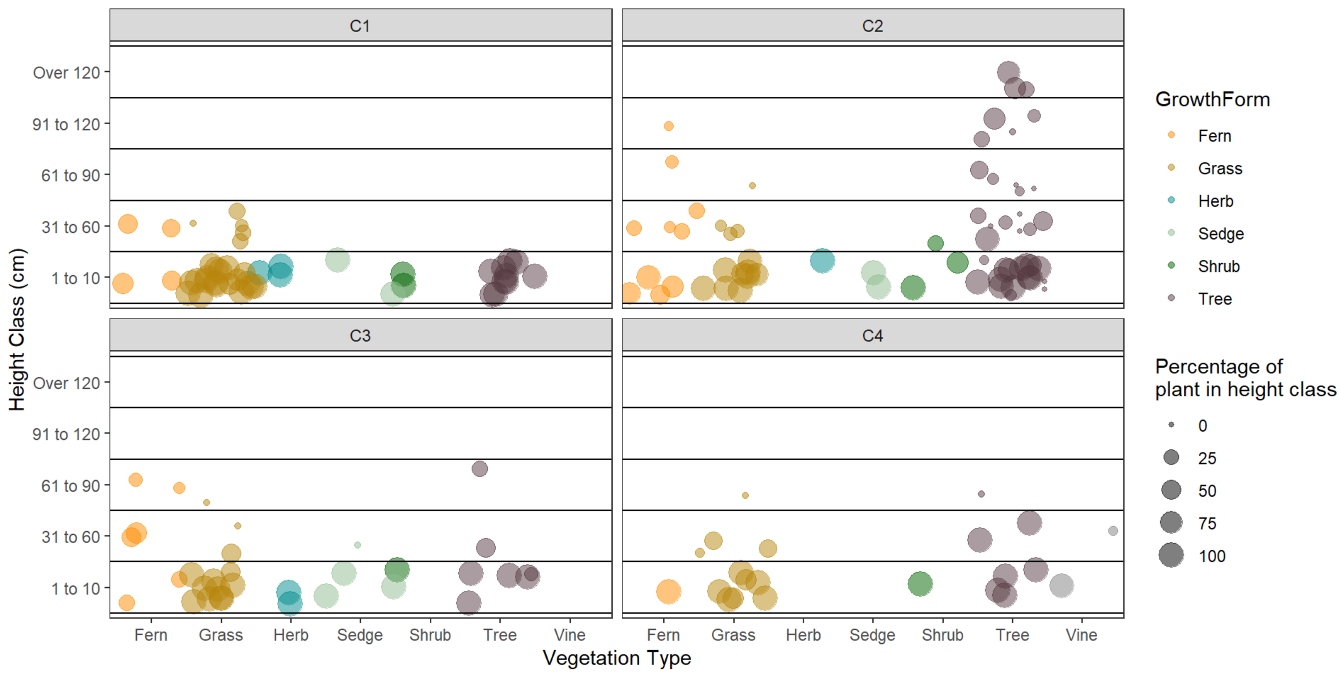

Figure 19: Growth form, height class, and vegetation type in each of the corridors

4 Discussion

4.1 Lemurs and other Mammals

Camera traps can be used to identify arboreal primates in the canopy, such as *Prolemur simus* (Olson et al., 2012) and study detailed behaviour of large primates (Whitworth et al., 2019). Footage of one solitary *C. thomasi* captured in November 2022 in C3 proved the concept that the camera traps can successfully record lemurs in the corridors. In addition, arboreal camera trap studies have successfully captured images of mouse lemurs (*Microcebus jollyae*) (Chen, 2020). As such, if *M. tanosi* were to move within the detection range of the cameras, it is expected that they would be recorded in the corridors.

The most commonly observed mammalian species in the forest corridors this technical year were *Eulemur collaris*, with six individuals spotted across three transects. *E. collaris* are mainly frugivorous but complement their diet with leaves and flowers. Frugivorous species require larger home ranges to provide enough food resources for the population (Campera et al., 2014). They also travel on the ground as well as arboreally. As such, *E. collaris* would be expected to start using the corridors before other species of lemurs due to their larger home range size and more flexible mobility. The increased presence of *E. collaris* in the corridors could be a result of the changing floral diversity. Increased tree cover could create a greater sense of safety, encouraging the lemurs to use the corridors to travel between forest transects via the corridors even on the ground.

A. meridonalis are a predominately folivorous species, feeding almost exclusively on leaves, with flowers being consumed occasionally (Norscia, Ramanamanjato & Ganzhorn, 2012). This species has shown a preference for habitats with a high density of large trees that facilitate their movement and provide a plentiful food supply (Adrianasolo et al., 2006). While the size and density of *Acacia* trees within the corridors are within the range that a species of Indriid (*Avahi laniger*) have been found to inhabit (Adrianasolo et al., 2006), it is unlikely that *A. meridonalis* will utilise the corridors for feeding until plentiful sources of native leaves are available.

C. thomasi was synonymised with *Cheirogaleus medius,* as part of a recent revision of the genus *Cheirogaleus* (Lei et al., 2014; Ganzhorn et al., 2020). *C. medius* is an insect and fruit eater (Schwab & Ganzhorn, 2004), relying on habitats that provide tree holes for hibernation, sleep refugia during active months, and offspring safety. While the corridors do not currently provide these ecological functions, the presence of a *C. thomasi* at the edge of C1 is an encouraging sign that these lemurs will likely enter the corridors when the tree species there become large enough. *R. rattus* was the most observed non-native mammalian species in the forest corridors this technical year, with three records, all in C4. This is a decrease from the last technical year, which saw four records of *R. rattus* in C1. *R. rattus* are habitat generalists and can be found in primary forests as well as in exotic tree plantations such as *Acacia* corridors (Ramanamanjato & Ganzhorn, 2001). *R. rattus* presence reduces as tree density and tree size increases (Ganzhorn, 2003), which suggests that as the corridors mature, fewer images of *R. rattus* would be captured. Studies in Madagascar have shown the presence of *R. rattus* does not exclude endemic small mammal species (e.g. *Microcebus murinus*, *Eliurus myoxinus)* from the habitat (Andriatsitohaina et al., 2020; Ganzhorn, 2003).

Research has found that as the DBH decreased there was an increase in the number of observations of some species of mouse lemur (Chen, 2020), and they have been found to use exotic *Acacia* forests or other degraded forest types, including regenerating forests, within as few as five years after planting (Andriamandimbiarisoa et al., 2015). Food availability, however, plays a large part of mouse lemur use of degraded forests (Fish, 2014). *M. tanosi* are omnivorous (Donati et al., 2020a) and currently the planted native seedlings and *Acacia* in the corridors do not provide adequate foraging habitat. *M. tanosi* were seen on the edge of Corridor 1 this year, so with continued surveillance, their entry into the corridors may be observed as the native vegetation matures, becoming a reliable food source and supporting greater invertebrate numbers (Andriamandimbiarisoa et al., 2015).

The corridors presently do not provide adequate food sources or sleeping sites for any of the four local lemur species. The corridors can, however, facilitate the movement of all four lemur species between the fragments through the provision of an intact canopy, which offers protection from aerial predators, and through trees of appropriate size, which facilitate various methods of transport. Thus, expanding home ranges through the Ala Programme, populations are presented with greater opportunities (Bertoncini et al., 2017). SEED has already seen *E. collaris* increasingly using the corridors. It is expected that rates of encounter, via camera trap imagery or opportunistic sightings, are likely to increase over time as habitat quality improves (Andriamandimbiarisoa et al., 2015).

4.2 Birds

This year the bird observations in the corridors were dominated by Madagascar Nightjar (Caprimulgus madagascariensis) in C4. Madagascar nightjars are habitat generalists that can be found primarily in open habitat or degraded forest (Cleere 2020). Two of their major food sources are grasshoppers and beetles, invertebrate orders which make up a large portion of the invertebrate diversity in the corridors. The presence of Madagascar nightjars in C4 is likely a result of the fires in January 2025 creating a more open habitat which is favourable to both the nightjars and their prey. An owl was also observed in C1, though the species could not be determined. A Madagascar long-eared owl (*A. madagascariensis*) was observed in C3 in 2024 and this species is reliant on forest cover (Ellis, 2003). The diet of *A. madagascariensis* in southeastern

Madagascar is dominated by *R. rattus* (Goodman, Langrand & Raxworthy, 1993). The presence of both these species in C3 suggests predator-prey interactions are occurring. The presence of *R. rattus* in C4 suggests additional predator-prey interactions could be occurring in this corridor as well. Guinea fowl (*N. meleagris*) and Souimanga sunbirds (*C. sovimanga*) can be found in both forest and open land (Niekerk, 2002; Ellis, 2003). These were observed last year, however no diurnal bird species were detected this year. This could be a result of the fires reducing much of the forest cover, particularly at the edges of these corridors. As the corridors continue to develop, bird activity is expected to increase over time.

4.3 Herpetofauna

Herpetofauna VES surveys are continuing in C1 to C4 to monitor how herpetofauna species richness and abundance change over time. Following trends in species accumulation to date, it is anticipated that the richness of forest-associated herpetofauna species will increase as the corridors mature. Five species were found in all corridors monitored: *F. lateralis*, *F. verrucosus*, *H. boettgeri, T. elegans*, and *T. gravenhorstii*. A total of 18 species were observed across all corridors.

The skinks (*T. elegans* and *T. gravenhorstii*) and the snakes (*D. bernieri, M. meridionalis,* and *M. mahfalensis*) are all ground-dwelling species that can be found in both arid and humid habitats (Glaw & Vences, 2007; Raxworthy, 2011a; Raxworthy, 2011b; Vences, 2011). Two of the species of chameleon that were observed in the corridors (*F. lateralis* and *F. verrucosus*) favour arid land, however, they require herbaceous vegetation such as low bushes (Jenkins et al., 2011b; Raxworthy, 2014). While species including Boettger's reed frog (*H. boettgeri*) and the Mascarene grass frog (*P. mascariensis*) require reliable water sources for breeding, these species are also generalists and occur in varying habitats (IUCN SSC Amphibian Specialist Group, 2016a). Interestingly, a species of chameleon (*C. nasutum*) was observed in C3 and a species of day gecko (*P. modesta*) in C2, C3, and C4. *C. nasutum* is a widely distributed species that is typically found in humid primary forest, secondary vegetation, and on forest edges, while *P. modesta* is widely distributed in arid parts of southeast Madagascar and typically observed on *Ravenala madagascariensis* (Glaw & Vences, 2007). The broad ecological habitat preferences of all these species explain their occupation of the dry and open current corridor habitat. As expected, species that are strictly native forest associated are not yet occupying the corridors. Observations of strongly arboreal species such as *C. nasutum, F. lateralis, F. verrucosus, I. oursi*, and *P. modesta* indicate the success of the ecological functioning of the planted trees.

The lowest herpetofauna species richness occurred in C1 and C2. The *Acacia* trees in C1 have sparser foliar coverage than those in the other corridors and there is more bare ground in C1, which may be limiting suitable habitat for herpetofauna within the corridor. Foliage in C2 was drastically reduced by the fires in January 2025, and the fire would have destroyed not only the live fauna but the leaf litter on the forest floor as well. In particular, the lack of leaf litter in these corridors could mean that there is no habitat for leaf litter dwelling species, such as *G. leucocephalus* (IUCN SSC Amphibian Specialist Group, 2016c), which were seen in large numbers in the forest remnants, but to date, have not been seen in the forest corridors.

4.4 Invertebrate Biodiversity

Invertebrate assemblages in C1 to C4 are increasingly diverse and abundant. The orders encountered most frequently within the corridors were *Hymenoptera, Orthoptera*, and *Blattodea*. *Orthoptera* were much more commonly found in corridors than in the forest remnants and were more similar in abundance to the external quadrats than the forest ones. *Orthoptera* are mainly found in open matrix ecosystems (INRAE – ephytia, 2022). From 2019 to the current technical year however, a marked decrease in *Orthoptera* abundance in the corridors has been observed. As the corridors continue to grow, more canopy cover and organic matter will result in the invertebrate communities observed in the corridors more closely resembling those observed in the forest remnants.

Orthoptera are large making them easy to detect and record. They are also solitary as they spatially outcompete conspecifics (INRAE – ephytia, 2022). As a result, their encounter rates are high, but the total abundance is low. In comparison, *Hymenoptera* are smaller and more difficult to find and catch, although they are often made up of large colonies of individuals (Robinson, 2005). Therefore, if one is found, it is often recorded alongside many other individuals. This may explain the extremely high *Hymenoptera* abundance in both the Corridors and Remnants.

Invertebrates are sensitive to environmental conditions, making them useful bioindicators to assess restoration efforts (Osborne, 2022; Orabi, 2012). Continued invertebrate surveying in the corridors and forest remnants will allow monitoring of changing invertebrate assemblages and species composition in the corridors as they mature. Invertebrate surveys contribute to the overall biodiversity monitoring of the Ala Programme as well as SCRP's wider understanding of local invertebrate biodiversity.

4.5 Floral Biodiversity

The *Acacia* in C1 to C4 have a mean height of over two metres. These *Acacia* can provide shade for slower-growing and shade-dependent native tree species, fix nitrogen into a nutrient-deficient substrate (Koutika & Richardson, 2019), and facilitate the reconnection of a range of species in fragmented habitat (Andriamandimbiarisoa et al., 2015, Chazdon et al., 2020, Gillies & Cassady St. Clair, 2008, Luckett et al., 2004, Schlaepfer, Sax & Olden, 2011, Singh et al., 2001). As such, it is expected that mature *Acacia* in the corridors will provide the structure, shade, and soil nutrients needed for native seedlings to grow. As the corridor *Acacia* are now deemed sufficient to fit this purpose, future replants will not be conducted.

Despite there being positive seedling growth across most corridors, growth was slow. One contributing factor could be the dense *Acacia* root systems which, when growing amongst other species, may cause below-ground competition (Kadir et al., 1998) and impact native seedling growth. This technical year, the average height of alive native seedlings was greatest in C2 and smallest in C1, although no pattern was detected by corridor. Averaged across all corridors the native seedlings that survive are slowly increasing in height. This measure has a high survivorship bias, as it does not include any native seedlings that die when calculating the growth rate or average height of native seedlings in each of the corridors.

The Tropical Storm, drought, and fire have been severely detrimental to the native seedling survival in the corridors. Survival decreased in all corridors between October and December 2024. Both C2 and C5 lost all native seedlings post fire and there was only a 12.3% survival rate across all corridors. Re-planting began in March 2025 and SEED will continue to monitor the native seedlings as they grow in the corridors.

Botanical surveying began this year in the corridors and will continue to inform on the floral biodiversity as research continues. Grasses were the most common type of flora in Corridors 1 and 3, while trees were most common in Corridors 2 and 4. While Acacia were the tallest tree species in the corridors, native tree species such as *Ahipoly* and *Tegny* were common across all corridors. This is a positive development for the future of the native species in the corridors and it is imperative that SEED continues to monitor the floral diversity as the corridors continue to develop.

5 Conclusion

Since the inception of the Ala Programme in 2019, a variety of faunal species have been observed in the forest corridors, both as part of formal monitoring and opportunistic recording, with new species of herpetofauna, birds, and mammals observed in the corridors during the last technical year. Most herpetofauna and invertebrate species observed in the corridors are generalist species well suited to open matrix habitats. Since January 2022, however, seven new herpetofauna species have colonised the novel habitat. Nocturnal lemurs *C. thomasi* and *M. tanosi*, have been documented on the corridor edges, and *E. collaris* have been observed in multiple corridors, including a group of three lemurs crossing Corridor 3. Fires have proved a major setback to both *Acacia* and native tree survival and growth progress. Native seedlings that have survived however, continue to increase in size within the corridors. As the floral biodiversity in the corridors continues to recover and regenerate, lemurs are expected to start utilising the corridors to facilitate their movement and feed.

In the coming years, the research produced by this Programme will provide a unique opportunity to increase understanding of littoral forest reforestation with the purpose of reconnecting fragmented forest. Madagascar has one of the highest rates of deforestation and environmental decline globally, yet with tangible evidence of successful reforestation projects, this trend can be mitigated.

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7 Annexes

Annex 1

Dates of the start of planting and data collection for *Acacia* and native seedlings in each of the Ala Programme's Forest corridors.

Corridor	Start of Planting: *Acacia*	Start of Data Collection: *Acacia*	Start of Planting: Natives	Start of Data Collection: Natives
C1	July 2019	16/07/2019	January 2020	08/02/2020
C2	July 2020	01/10/2020	January 2021	05/02/2021
C3	November 2019	28/11/2019	January 2020	14/02/2020
C4	August 2019	02/09/2019	January 2020	07/02/2020
C5	March 2022	03/09/2022	February 2024	11/04/2024[4]

Annex 2

Descriptions of each of the conditions assigned to the seedlings.

Condition	Description
1	Dead: Seedling has wilted, lost its leaves, and turned brown or is not visible
2	Poor: Severe signs of either damage, pest infestation, discolouration, fungi, or abnormal growth
3	Fair: Signs of either damage, pest/infestation, discolouration, fungi, or abnormal growth
4	Excellent: No signs of damage or pest/infestation, no discolouration or fungi growth and growing steadily

Annex 3

Table of all non-lemur faunal camera trap records.

Corridor	Species	Location in Corridor	Number of Observations
C1	Guinea fowl (*Numida meleagris*)	Middle	1
	Bird (unknown)	Edge	1
	Owl (unknown spp)	Edge	1
C2	Modest day gecko (*Phelsuma modesta*)	Edge	2
C3	Black rat (*Rattus rattus*)	Edge and Middle	4 (Edge: 3; Middle: 1)
	Modest day gecko (*Phelsuma modesta*)	Edge	1
	Bird (unknown)	Edge	1
	Madagascar long-eared owl (*Asio madagascariensis*)	Middle	1
	Gecko (unknown)[5]	Middle	1
	Indian Civet (*Viverricula indica*)	Edge	1
C4	Indian Civet (*Viverricula indica*)	Edge	1
	Souimanga sunbird (*Cinnyris sovimanga*)	Middle	1
	Black rat (*Rattus rattus*)	Edge	3
	Madagascar Nightjar	Edge	4
	Bird (unknown)	Edge	1

[4] The data collection for the native seedlings in C5 that started on 11/04/2024 was monthly data collection.

[5] Possibly *Phelsuma modesta* but it is unclear in this nocturnal photo.