Monkey business: How do previously captive Bolivian red howler monkeys (*Alouatta sara*) react to being released and how do they behave in comparison to wild howler monkeys in Madre de Dios, Peru

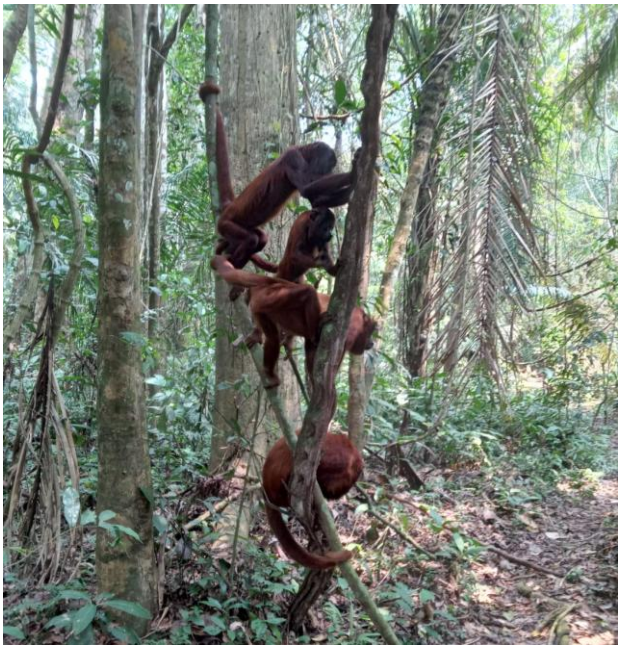

Photo by: Jessy van Wieringen: monkeys waiting for food

Jessy van Wieringen

Monkey business: How do previously captive Bolivian red howler monkeys (*Alouatta sara*) react to being released and how do they behave in comparison to wild howler monkeys in Madre de Dios, Peru

This paper was written by Jessy van Wieringen on 31/01/2025 as a 3rd-year internship assignment for the HAS Green Academy, Den Bosch with Gerben Hofstra as advisor. The research was conducted at Kawsay Biological Station, Madre de Dios, where the local advisor was Raúl Bello. This research has been conducted with special thanks to the Animal Shelter in Puerto Maldonado for trusting me and aiding me with the monitoring of the released monkeys.

Abstract

Of the 217 monkey species inhabiting Mexico, Central and South America, 42% is classified as at least threatened. One of these species is the howler monkey (*Alouatta sp.*), these monkeys face threats such as habitat loss, hunting, and illegal trade. Rescued howler monkeys can be sent to an animal shelter and released into the wild. However, monitoring after release does not happen often. Implementing supportive measures like regrouping or supplementary feeding can positively influence the survival rate of released animals. Furthermore, the behaviour of released groups can be used as an indicator of success or failure. A group of *A. sara* was released near Tambopata National Park. Events and supportive measures, behavioural data, strata preference, daily range, and home range were recorded in order to find out how captive-bred Bolivian red howler monkeys react and adapt to living in the wild. The survival rate after 3 months was 80% and the success rate was 20% to 40%. The group showed a similar activity budget (resting 70.1%, Feeding 19.9%, traveling 9.7%, and Other 0.4%) and home range size (4.32 ha) to other howler monkeys. The success rate however was lower than other rehabilitated and released groups. No sufficient explanations were found for this result and more research is needed to find the factors responsible for a successful release of captive-bred *Alouatta sara* in the Peruvian Amazon.

Resumen

De las 217 especies de monos que habitan en México, Centro y Sudamérica, el 42% está clasificado como al menos amenazado. Una de estas especies son los monos aulladores (*Alouatta sp.*), los cuales enfrentan amenazas como la pérdida de hábitat, la caza y el comercio ilegal. Los monos aulladores rescatados pueden ser enviados a un refugio de animales y eventualmente liberados en la naturaleza. Sin embargo, el monitoreo posterior a la liberación no ocurre con frecuencia. La implementación de medidas de apoyo, como la reagrupación o la alimentación suplementaria, puede influir positivamente en la tasa de supervivencia de los animales liberados. Además, el comportamiento de los grupos liberados puede utilizarse como un indicador de éxito o fracaso. Un grupo de *Alouatta sara* fue liberado cerca del Parque Nacional Tambopata. Se registraron eventos y medidas de apoyo, datos de comportamiento, preferencia de estratos, rango de desplazamiento diario y área de hogar para comprender cómo los monos aulladores rojos bolivianos criados en cautiverio reaccionan y se adaptan a la vida silvestre. La tasa de supervivencia después de tres meses fue del 80%, y la tasa de éxito entre el 20% y el 40%. El grupo presentó un presupuesto de actividad similar a otros monos aulladores (descanso 70.1%, alimentación 19.9%, desplazamiento 9.7% y otras actividades 0.4%) y un área de hogar comparable (4.32 ha). Sin embargo, la tasa de éxito fue menor en comparación con otros grupos rehabilitados y liberados. No se encontraron explicaciones suficientes para este resultado, por lo que se requiere más investigación para identificar los factores responsables de una liberación exitosa de *Alouatta sara* criados en cautiverio en la Amazonía peruana.

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Introduction

Worldwide there are 533 species of monkey, of which 217 live in Mexico, Central and South America (Primates-SG, 2023). Of these 217 monkeys, 42% are classified as at least vulnerable (Primates-SG - Red List, 2021). Howler monkeys (*Alouatta*) are found in the Americas, from Mexico to northern Argentina (Perelman, et al., 2011). To learn more about these monkeys, researchers started studying them in the 1930s (Braza, et al., 1981). Throughout the decades more research has been conducted on howler monkeys, and it is now known that they are facing problems such as habitat loss, hunting, and the illegal pet trade (Horwich, 1998; Peres, 1997). To help with their conservation, groups can be translocated to safer environments (Beck, 2016; Tricone, et al., 2017). Translocation has been successfully implemented in members of this genus, one of which is the Mexican howler monkey (*Alouatta palliata Mexicana*) (Franquesa-Soler, et al., 2022).

Illegally traded howler monkeys can be seized or surrendered to animal shelters, where they are rehabilitated. If a group is deemed fit enough, they are released into the wild. Seddon, et al. (2007) describe the importance and lack of post-release monitoring in conservation biology. However post-release monitoring is rarely implemented by animal shelters (Fischer & Lindenmayer, 2000). Furthermore, even though 12 species of howler monkeys are recognized (Cortés-Ortiz, et al., 2014) most behavioural studies focus on just 4 species: *A. caraya, A. seniculus, A. palliata, and A. pigra* (Garber & Kowalewski, 2014). And even though the survival and reproduction rate mainly determine the success of a reintroduction, the behaviour of the introduced monkeys can also be used to indicate a success (Parsons, z.d.).

One of the least studied species within the genus is the Bolivian red howler monkey (*A. sara*). This species is found in central and northern Bolivia, as well as the southern Amazon region of Peru (Goffard et al., 2008; Matauschek, 2012). *A. sara* split off from the species *A. seniculus*, which is considered a conservational management priority in Peru (SERFOR, 2018). In Peru, *A. sara* is being hunted for meat, medicine, and the illegal pet trade (Shanee et al., 2015). As of 2020, the species is listed as near threatened on the IUCN Red List (Cornejo et al., 2021). With the lack of knowledge on this species and the lack of post-release studies, not much is known about how *A. sara* adapts to a wild environment.

In the Madre de Dios region in Peru, a group of 5 howler monkeys of the species *A. sara* were released from an Animal Shelter in Puerto Maldonado, Peru. These monkeys were previously kept as pets or were born in captivity. This research focuses on the daily activity and vertical and horizontal habitat use of the released group, as well as all major events that happened in the first 3 months of release at the Kawsay Biological Station, located in the buffer zone of Tambopata National Reserve, Peru. The study group was observed for 10 days in a 1-month period in order to answer the question: How do previously captive Bolivian red howler monkeys react to being released and how do they behave in comparison to wild howler monkeys?

Materials and methods

Study area and subjects

The study area, Kawsay Biological Station, is located in the buffer zone of the Tambopata national reserve, in the Madre de Dios region, Peru. The area borders the Madre de Dios River. The study site transitions from a secondary to a primary subtropical rainforest (Holdridge, 1967). Several trails pass through the area (Figure 1); these trails are used by researchers on a daily basis. Furthermore, wild howler monkey groups have been seen and heard in the area.

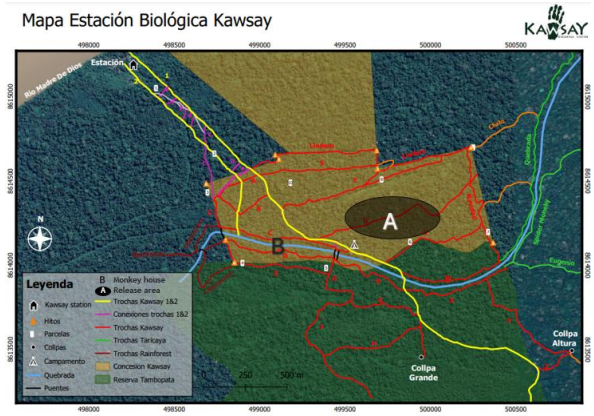

Figure 1: Map of Kawsay consession.

The study group consists of 5 individuals: David, Luciana, Dina, Ryan, and Andrea, excluding the infant Julius (Table 1). All adult monkeys were previously kept as pets and rehabilitated at the Amazon Shelter in Peru. Ryan, Andrea, and Julius were born at the animal shelter. The whole group was released at Kawsay Biological Station in Area A on 11/09/2024 (Figure 1).

Table 1: Study group and information, photos by: Jessy van Wieringen and Anny Pulido & Vera

Name	Age (years)	Origin	Distinguishable by
David	Adult	Ex pet	Biggest of the group, shaved ring around left ankle
Luciana	Adult	Ex pet	Missing left eye, golden colour on back
Dina & Julius	Adult & infant	Ex pet & born in captivity	Carrying Julius
Ryan	Sub adult	Born in captivity	Darkest fur, big ears
Andrea	Juvenile	Born in captivity	Smallest, after Julius

David **Luciana** **Dina & Julius** **Ryan** **Andrea**

Events and supportive measures

Any events during the first 3 months of release (e.g. feeding, disappearances, injuries), thought to be of importance by the observer, were noted ad libitum as a future reference for releases and to possibly explain or provoke questions. Apart from the 10 observation days of this study, the released group was monitored daily for the first 3 weeks after release (11/09/2024 – 02/10/2024).

Behaviour and strata preference

The activity budget and strata preference were monitored by 2 observers for 10 days in a one month period from 03/10/2024 to 06/11/2024. Observation days lasted for 11.10 hours, starting before the group woke up until after they went to sleep (06:00 to 17:10). The data was recorded using instantaneous group scans (Altmann, 1974) with 10-minute intervals. The observers stayed as far away from the group as possible, while still being able to see and follow them. The behaviour recorded includes resting (R), feeding (F), traveling (T), and other (O), the strata levels in meters were 0-1 (1), 1-5 (2), 5-15 (3), 15-30 (4) and >30 (5) (Appendix I). The strata level of the monkey was estimated using a pen of 15cm held at arm's length. If an individual was out of sight the code OOS was used. Additionally, the median temperature and humidity were recorded every day using a digital thermometer of unknown make and model, mounted in the shade and protected from rain (Figure 2)

Figure 2: Device used to measure daily temperature and humidity

Range and home range

The habitat use of the group was observed. Every 30 minutes a GPS point (GARMIN GPSMAP 67) was saved of the group's location. The point was taken as close to the group as possible, preferably at the base of the occupied tree. The locations were saved with a maximum error of 5m. The daily range was calculated as the total distance between all GPS locations of one day, in order. The last GPS point every day was taken at 17:30. This was considered the sleeping tree.

Comparison studies

21 studies were collected as comparison material (Appendix II). The studies were conducted on 1 of 3 species of *Alouatta* (*A. seniculus, A. palliata, or A. pigra*), the subjects in the studies were either translocated, rehabilitated, and released or wild. The data collected from these studies were the percentage of waking time spent on resting, feeding, traveling, and other, as well as the average travel distance per day and the home range size. The data collected from this study was compared to 3 subsets of the comparison studies: 1: all studies, 2: only the wild subjects, and 3: only the species *A. seniculus*.

Data analysis

The strata use and behavioural data were organised by monkey, day and time. In excel the count per behaviour type and strata level were divided by the total number of entries to create a representation of time spent on each behaviour and strata level.

In RStudio, a linear regression model was used to determine any trends in behaviour and strata use over the 10 sampling days. A Wilcoxon sum rank test was used to identify any temporal peaks or dips in behaviour. The total occurrences per behaviour per timestamp were calculated, these were compared to the average occurrences of the behaviour throughout the day.

The percentage of time spent on each behaviour and strata level for Luciana, Andrea and Ryan were tested using a Wilcoxon sum rank test to compare data before and after the supplementary feeding stopped and coincidentally also before and after David was sent away. Each behaviour was tested separately. The same test was performed on the behaviour and strata of Luciana and Andrea before and after Ryan disappeared.

A linear regression model was used to test whether the median temperature and humidity per day influenced the behaviour of the group. For this test the counts per behaviour type were averaged for all monkeys.

Any correlation between strata level and behaviour was tested using a contingency table, counting the occurrences for each behaviour/strata combination. After a G-test was used to test for correlation.

The GPS locations were analysed in ArcGIS Pro. The daily ranges were calculated using the measure distance tool and divided by the total traveling time per day. The home range size was calculated using the minimum bounding tool, around the location points with a 15 meter buffer. A map was created to visualise the home range, home range use and sleeping tree locations.

Comparing the data of all individuals per observation day to the comparison study subsets was done using Wilcoxon sum rank tests. The daily average for range, home range and each behaviour type was compared to the data found in the studies (Appendix II).

Results

Events and Interventions

The group was released on 11/09/2024 (Table 2). Dina separated from the rest before this study started and was brought back 5 Times. Supplementary feeding was stopped one month after release. David fought with a wild howler monkey and was sent back for medical care. Ryan disappeared and was never found. Luciana was alone but seemed healthy on 08/11/2024 and was found dead after the weekend on 11/11/2024. Dina appeared at the station and was sent back after a fight. The survival rate of this group was 80% and the success rate after 3 months of release is known to be 20%, however, Ryans location is unknown so a success rate of 40% is possible.

Table 2: Events that happened within the first 3 months of release

Date	Monkey	Event
11/09/2024	All	Group gets released
28/09/2024	Dina	Separates from the group
05/10/2024	All	Supplementary feeding was stopped
08/10/2024	David	Got in a fight with a wild howler monkey. Sent back to Amazon Shelter with broken tail.
08/10/2024	Dina	Was seen with a wild howler monkey group.
10/10/2024	Luciana	Followed observers for 50 meters on the ground.
13/10/2024	Ryan	Has not been seen since 10/10/2024
14/10/2024	Dina	Was found alone, 1 km away from the rest.
21/10/2024	Luciana	Walked on the ground for 250 meters.
06/11/2024	Luciana	Came to the ground to defecate and stayed there for 11 minutes.
11/11/2024	Luciana	Was found dead, cause is unknown and DNA was sent away to be tested.
16/11/2024	Dina	Appeared at the main station, was captured and sent back to the Amazon Shelter after a fight with local spider monkeys.
18/11/2024	Andrea	Andrea was found living solitary
25/11/2024	-	Howler monkey faeces were found at Andrea's last known location. The smell of a howler monkey was also present.

Daily behaviour, strata preference, and home range

The average percentage of daytime spent resting, feeding, traveling, and other of the collective group was respectively 70.07%, 19.87%, 9.69%, and 0.37% (Figure 4). The strata level where the most time was spent was level 3 (5 – 15 m) with 62.04% (Figure 3). The least amount of time was spent on strata level 5 (>30 m), this was only observed once. No differences were found between the behaviour and strata preference of the individuals (Kruskal-Wallis, p >0.05). No trends were found in the occurrence of behaviours or the strata preferences over the 10 observation days (LM, p >0.05) except for the behaviour "other" (LM, p <0.05) This behaviour was observed more in the last 2 observation days.

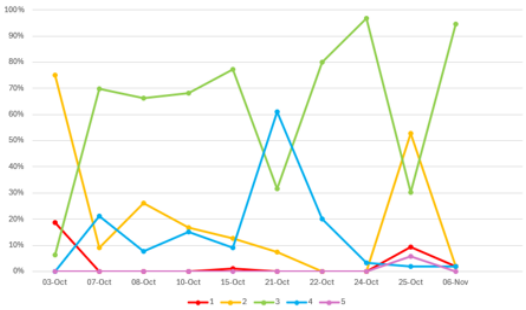

Figure 3: Percentage of day per strata of all individuals combined

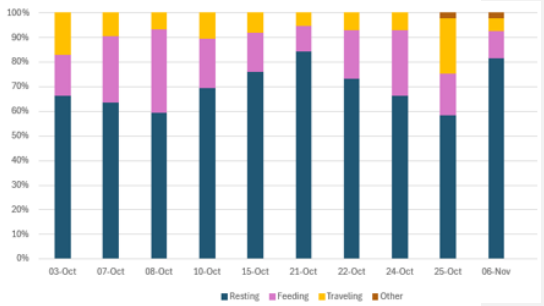

Figure 4: Percentage of day per behaviour of all individuals combined

However, a relationship between behaviour and strata preference was found (G-test, <2.2e-16). The relationship was found between resting and strata level 3 (Figure 5).

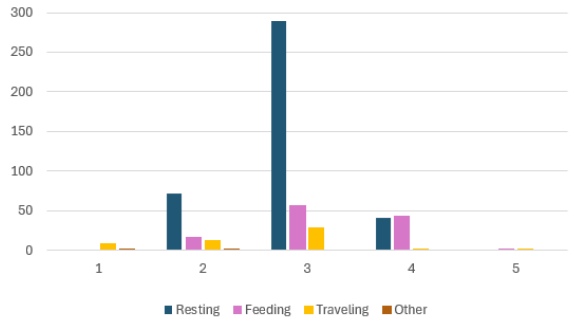

Figure 3: Count of behaviour types per strata level

There were no significant time related peaks or dips found for the behaviour types resting, feeding and traveling (Figure 6). The significance of time related occurrence of the behaviour type "other" was significant with a p-value of 6.265e-13.

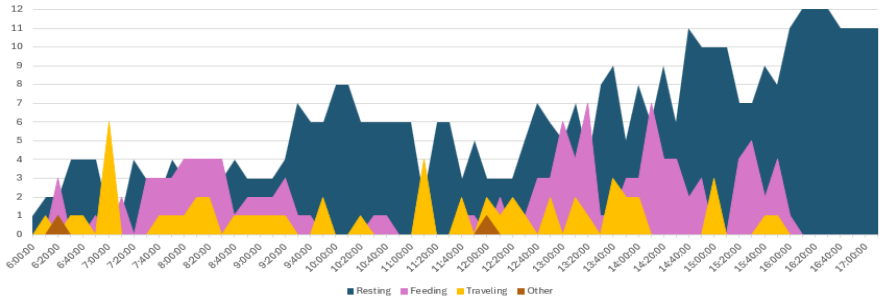

Figure 4: Total count per behaviour of all observation days and individuals correlating with the observation times

The average daily range of the group was 28.08m/traveling hour. A linear model found no in- or decreases in range over time. As for home range, the area circling all recorded observations was calculated at 4.32ha (Figure 7).

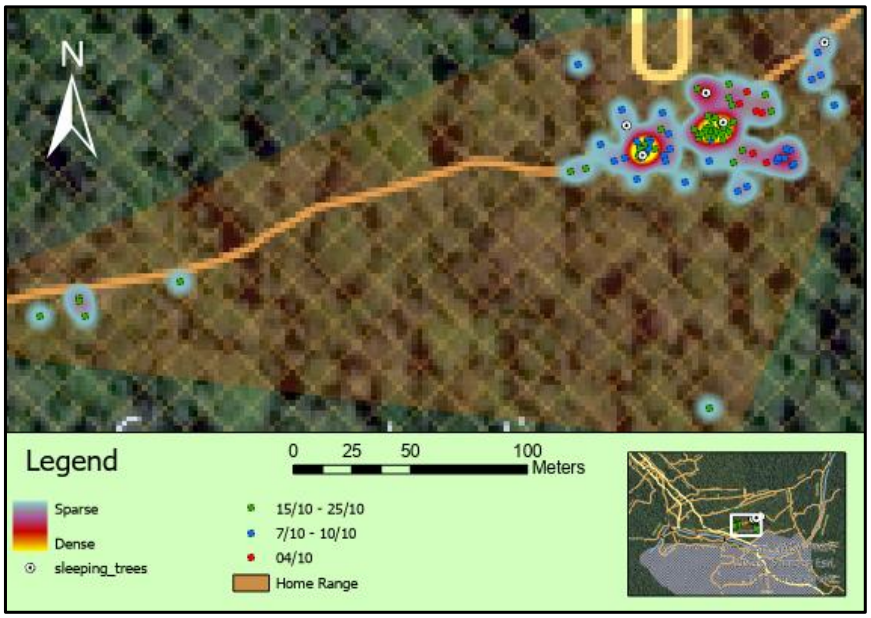

Figure 7: Home range use and locations before and after events

Behaviour before and after feeding/disappearances

A Wilcoxon test was used to determine any changes in behaviour and strata preference during and after supplementary feeding and with and without David and Ryan, but no changes were found (all p-values >0.05), except for Luciana. A Wilcoxon test showed an increase in resting time and decrease in feeding time after Ryan disappeared ($p < 0.05$) (Figure 8). It also seems like Luciana and Andrea expanded their home range after Ryan disappeared (Figure 7).

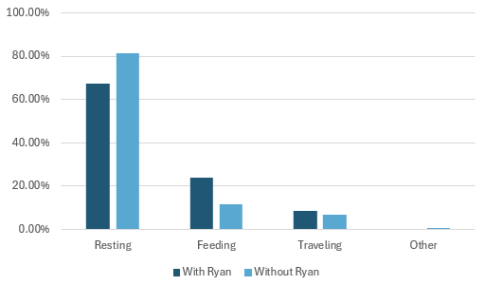

Figure 8: Luciana's behaviour before and after Ryan disappeared

Temperature and humidity

Temperature seems to have a slight negative effect on resting time and a positive effect on traveling and feeding time (Figure 9A). On the other hand, humidity seems to have the opposite effect. (Figure 9B). However, after using a linear regression model, there was no significant relationship found between temperature or humidity and behaviour ($p > 0.05$).

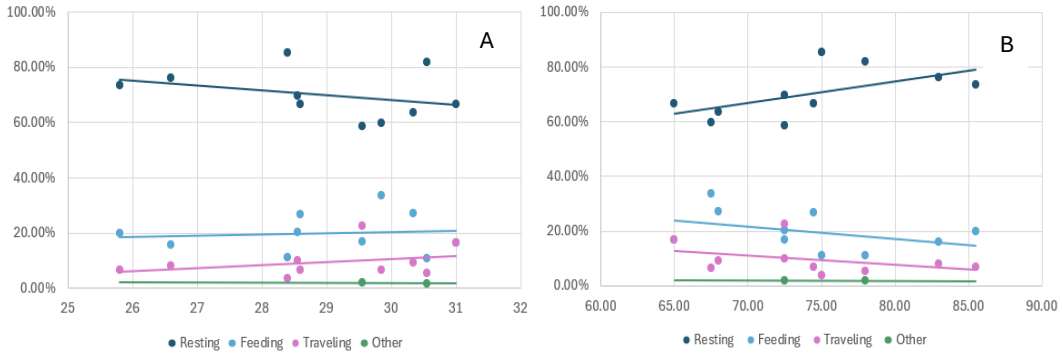

Figure 9: Activity budget in correlation to median temperature in Celsius (A) and median humidity (B)

Compared to other monkeys

When compared to the data from all comparison studies, the behaviour type other and range showed significant differences ($p < 0.001$, $p = 4.6e\text{-}06$)(Figure 10, 11). Compared to only wild howler monkeys, other, traveling and range are different ($p < 0.001$, $p < 0.05$, $p = 8.75e\text{-}06$). The behaviours other and traveling are different from studies in *A. seniculus* ($p < 0.05$, $p < 0.01$). The time spent resting, feeding and the home range are similar to every comparison group. Resting behaviour specifically is very similar to that of *A. seniculus* ($p = 0.8687$).

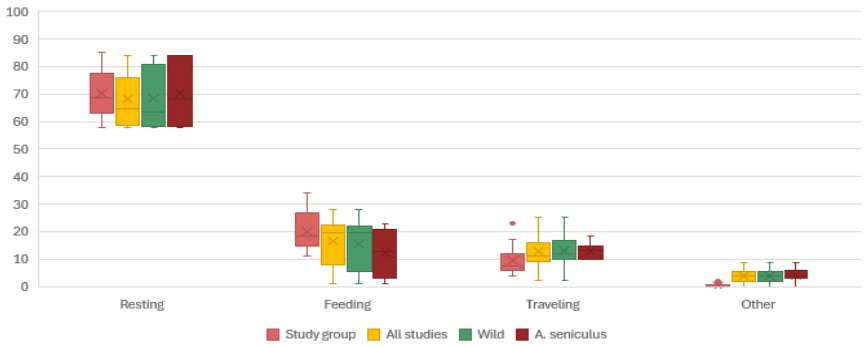

Figure 10: Average activity budget of the study group compared to studies on A. seniculus, general wild howler monkeys and all collected studies.

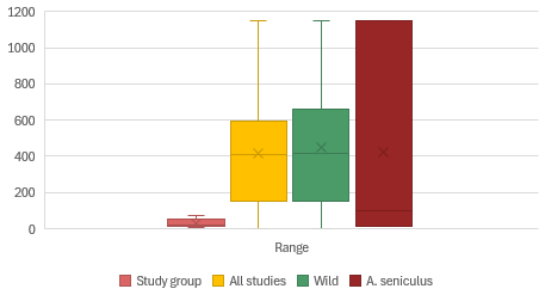

Figure 11: Average daily range compared to other studies

Discussion

The results of this study show an 80% survival rate, but, due to recaptures, the success rate ranges between 20% and 40%, this gives a failure rate to 60% to 80%. These findings do not align with a previous study's results of a 70% success rate with rehabilitated monkeys (*A. pigra*) (Tricone, et al., 2017). Events like death, dispersal and interactions with local groups were documented in other studies on translocated and rehabilitated monkeys (De Vries, 1991). The use of supportive measures like supplementary feeding might have had a positive influence on the survival rate, whereas the captive bred group can partially account for the low success rate(Fischer, et al., 2000).

The activity budget of the released *A. sara* closely resembles the activity budgets observed in wild populations. *Alouatta sp*. were found to spent 57.7% - 84% of their day resting, 1.2%-28% feeding, 2.2%-25.3% traveling and 0%-8.8% on other behaviours (Bernstein, 1964; Braza, et al., 1981; Escudero Páez, 2005; Juan, et al., 2000). This suggests the study group was showing natural behaviours which could have contributed to the survival rate. Significant differences in "other" are likely because of the limited observations as only 2 observations were recorded, possibly causing the low p values (Callum, et al., 1999). Furthermore, although previous studies have described different daily activity patterns in howler monkey groups, this study has found no proof of a distinct daily activity pattern apart from personal observations (Braza, et al., 1981; Pira Alegría & del R, 2023; Rojas, 2012; Soini, 1992).

The preference for strata level 3 (5 – 15 m), during resting aligns with other howler monkeys mid to high canopy (6 to 20m) preference for snoozing and sleeping (Braza, et al., 1981; Pira Alegría & del R., 2023; Soini, 1992). However in the study area, the mid to high canopy is considerate from 15 to 30 meters (R. Bello, Pers. Comm.). The strong correlation between resting and strata preference supports this result. Several reports of howler monkeys traveling on the ground also match with the findings of this study (Pozo-Montuy & Serio-Silva, 2007). However, traveling on ground is often reported in populations living in fragmented and open areas.

While rising temperatures and decreasing humidity seemed to have a slight positive effect on resting and negative effect on feeding behaviour, these trends were not statistically significant. The result could have been caused by the transition from the dry to wet season. As howler monkeys are known to move less and feed more in this season (Braza, et al., 1981). As the observation days ended early on in the dry season, insufficient data could have led to a non-significant result. A study focussing on changes between the wet and dry season could verify these results. Other studies have reported the opposite where resting time decreases and feeding time increases as temperatures rise and humidity drops (Pira Alegría & del R., 2023).

The group's average daily range fits within the 15 to 102 meter range documented in a translocated *A. seniculus* study (Richard-Hansen, et al., 2000). However another study on wild *A. seniculus* reported a range of 1150 meters (Palacios & Rodriguez, 2001). As the factors influencing range are not yet fully understood and can be dependent on many things, explaining this result is challenging (Arrowood, et al., 2003; Fortes, et al., 2015). On the other hand, the calculated home range aligns with home ranges documented in translocated and wild groups (Shedden-González & Rogríguez-Luna 2010). The expanded home range along with Luciana's decrease in feeding contrasts the findings of a study on *A. pigra* where 2 groups moved further when they spent more

time feeding (Arrowood, et al., 2003). This result is, like the range, challenging to explain as home range can be dependent on population density, area size and group composition (Stoner, 1996).

Conclusions and recommendations

The group had an average survival rate, but a low success rate. This is partly explained by the use of supportive measures and a captive bred group. Therefore, it is recommended to keep implementing supportive measures with future releases as the origin of the individuals can not be chosen. A radio collar or other tracking device is also recommended as to not lose any individuals. Time spent on basic behaviours, daily range and home range could not explain the outcome of this release. The behaviour of the study group mirrored that of wild groups, home range was similar as well, but understanding why requires further research into the group composition and release area. The release area should also be checked for population density and the locations of wild groups to prevent negative interactions and provide a suitable home range size. The study group had a very different range from what was reported in other studies, however factors influencing range are poorly understood and more research is needed to draw any conclusions. This implies the low success rate might be due to other factors like food preferences, group dynamics or the overall minimal amount of information on *Alouatta sara*. A study on the eating behaviour of released groups could aid in choosing future release sites and dates. Finally, in general more studies on *A. sara* are needed in order to better understand this species and its needs.

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Commented [JW1]: Ik denk dat dit de samenvatting is van een thesis, maar kan het origineel echt nergens vinden. Het is zover ik weet wel een betrouwbaar onderzoek, de universiteit bestaat en het heeft een echte award gewonnen

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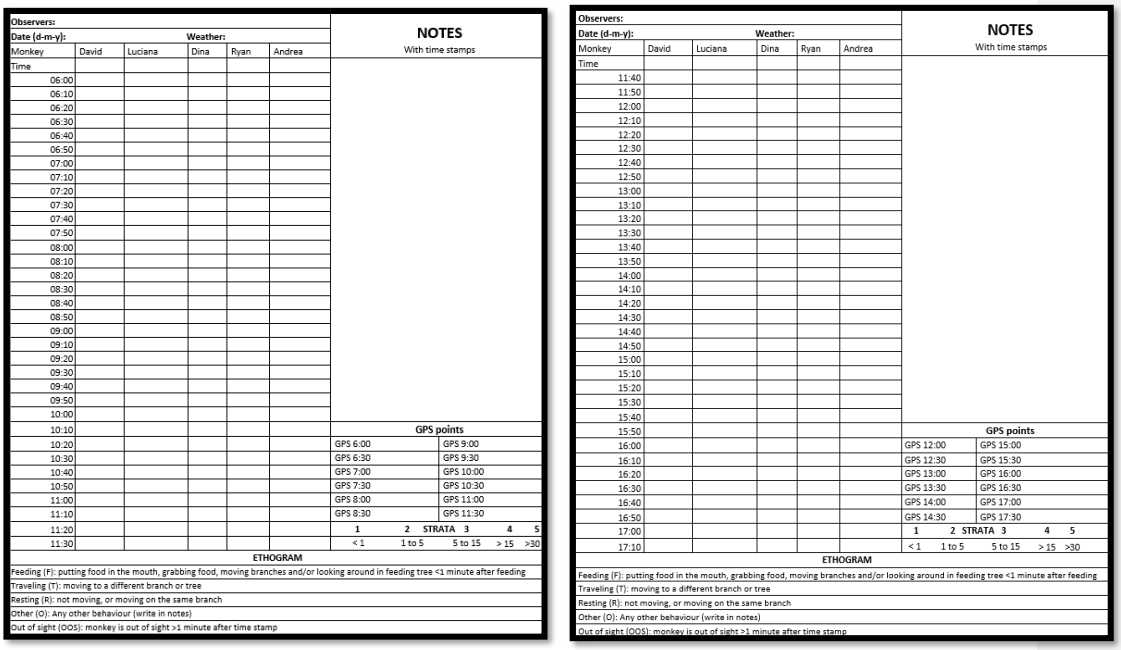
Appendix I: Observation sheets

Two observation sheets were used per day. One in the morning (06:00 – 11:30) and one in the afternoon (11:40 – 17:30) (Figures 1 & 2). Two observers will worked together taking data. Every 10 minutes, in each cell a code was written consisting of a letter for the behaviour (F, T, R, O, or OOS) and a number for the strata (1, 2, 3, 4, or 5). Events were be noted in the 'Notes' section with a starting and ending time.



Observers:						NOTES
Date (d-m-y):			Weather:			With time stamps
Monkey	David	Luciana	Dina	Ryan	Andrea	
Time						
06:00						
06:10						
06:20						
06:30						
06:40						
06:50						
07:00						
07:10						
07:20						
07:30						
07:40						
07:50						
08:00						
08:10						
08:20						
08:30						
08:40						
08:50						
09:00						
09:10						
09:20						
09:30						
09:40						
09:50						
10:00						
10:10						GPS points
10:20						GPS 6:00 / GPS 9:00
10:30						GPS 6:30 / GPS 9:30
10:40						GPS 7:00 / GPS 10:00
10:50						GPS 7:30 / GPS 10:30
11:00						GPS 8:00 / GPS 11:00
11:10						GPS 8:30 / GPS 11:30
11:20						1 2 STRATA 3 4 5
11:30						< 1 / 1 to 5 / 5 to 15 / > 15 / >30

ETHOGRAM
Feeding (F): putting food in the mouth, grabbing food, moving branches and/or looking around in feeding tree <1 minute after feeding
Traveling (T): moving to a different branch or tree
Resting (R): not moving, or moving on the same branch
Other (O): Any other behaviour (write in notes)
Out of sight (OOS): monkey is out of sight >1 minute after time stamp

Observers:						NOTES
Date (d-m-y):			Weather:			With time stamps
Monkey	David	Luciana	Dina	Ryan	Andrea	
Time						
11:40						
11:50						
12:00						
12:10						
12:20						
12:30						
12:40						
12:50						
13:00						
13:10						
13:20						
13:30						
13:40						
13:50						
14:00						
14:10						
14:20						
14:30						
14:40						
14:50						
15:00						
15:10						
15:20						
15:30						
15:40						
15:50						GPS points
16:00						GPS 12:00 / GPS 15:00
16:10						GPS 12:30 / GPS 15:30
16:20						GPS 13:00 / GPS 16:00
16:30						GPS 13:30 / GPS 16:30
16:40						GPS 14:00 / GPS 17:00
16:50						GPS 14:30 / GPS 17:30
17:00						1 2 STRATA 3 4 5
17:10						< 1 / 1 to 5 / 5 to 15 / > 15 / >30

ETHOGRAM
Feeding (F): putting food in the mouth, grabbing food, moving branches and/or looking around in feeding tree <1 minute after feeding
Traveling (T): moving to a different branch or tree
Resting (R): not moving, or moving on the same branch
Other (O): Any other behaviour (write in notes)
Out of sight (OOS): monkey is out of sight >1 minute after time stamp

Figure 1: Observation sheets for morning and afternoon, including an ethogram.

Appendix II: Comparison studies

The studies used as comparison material were labelled as A. pigra, A. palliata or A. seniculus and also as wild, translocated or rehabilitated. The data of the results was used to create a dataset and additionally the study area was noted.

Table 2: List of studies used with data used as comparison material

Study	Species	Status	Resting	Feeding	Traveling	Other	range	Homerange	Study location	titte
1	A. seniculus	wild	57.7	19.8	18.4				venezuela	Behaviour of the red howler monkey (Alouatta seniculus) in the Llanos of Venezuela
2	A. palliata	translocated	64.5	21.4	7.1				los tuxtlas biosphere reserve, mexico	Long-term assessment of the translocation of an endangered primate into an agroforestry system
3	A. palliata	wild	69	28	2.2	0.8			los tuxtlas biosphere reserve, mexico	CONTRASTES y SIMILITUDES EN EL Uso DE RECURSOS y PATRÓN GENERAL DE AcTIVIDADES EN TROPAS DE MONOS AULLADORES (ALOUATTA PALLIATA) EN FRAGMENTOS DE SELVA EN Los TUXTLAS, MÉXICO.
4	A. palliata	wild					202	12.5	los tuxtlas biosphere reserve, mexico	Seed Dispersal Patterns in Two Closely Related Howler Monkey Species (Alouatta palliata and A. pigra): A Preliminary Report of Differences in Fruit Consumption, Traveling Behavior, and Associated Dung Beetle Assemblages
4	A. pigra	wild					127	6.25	palenque national park chiapas, mexico	Seed Dispersal Patterns in Two Closely Related Howler Monkey Species (Alouatta palliata and A. pigra): A Preliminary Report of Differences in Fruit Consumption, Traveling Behavior, and Associated Dung Beetle Assemblages
5	A. palliata	wild	77.6	14.8	7.6		74.3		los tuxtlas mexico	The effect of energetic and psychosocial stressors on glucocorticoids in mantled howler monkeys (Alouatta palliata)
5	A. palliata	wild	63.5	26	10.5		117.4		los tuxtlas mexico	The effect of energetic and psychosocial stressors on glucocorticoids in mantled howler monkeys (Alouatta palliata)
6	A. palliata	translocated	64.1	25.6				5.5	los tuxtlas, fragmented, tropical forest understory palms	Responses of a translocated howler monkey Alouatta palliata group to new environmental conditions
7	A. palliata	wild	59	21	20		285	0.08	barro colorado island, panama canal	On the Daily Behaviour and Spacing of Howling Monkey Groups
7	A. palliata	wild						11.66	barro colorado island, panama canal, dry	On the Daily Behaviour and Spacing of Howling Monkey Groups
8	A. palliata	wild	58.4	13.3	25.3	3	200		barro colorado island, panama canal	A FIELD STUDY ON THE ACTIVITIES OF HOWLER MONKEYS *
9	A. pigra	translocated	72.1	17.6			292	395	barro colorado island, panama canal	Ranging Behaviours and Activity Budgets of Rehabilitated and Reintroduced Howler Monkeys
9	A. pigra	rehabilitated	72.1				390	395	barro colorado island, panama canal	Ranging Behaviours and Activity Budgets of Rehabilitated and Reintroduced Howler Monkeys
10	A. seniculus	wild	83.9	6.1	10	0		4.5	fragmented, san martin	PATRÓN DE ACTIVIDAD, RECORRIDOS DIARIOS Y DIETA DE Alouatta seniculus EN FRAGMENTOS DE BOSQUE DE GALERÍA SAN MARTÍN (META)
10	A. seniculus	wild	84	2.3	10	3.7		13	fragmented, san martin	PATRÓN DE ACTIVIDAD, RECORRIDOS DIARIOS Y DIETA DE Alouatta seniculus EN FRAGMENTOS DE BOSQUE DE GALERÍA SAN MARTÍN (META)
10	A. seniculus	wild	84	1.2	9.8	5		14.5	fragmented, san martin	PATRÓN DE ACTIVIDAD, RECORRIDOS DIARIOS Y DIETA DE Alouatta seniculus EN FRAGMENTOS DE BOSQUE DE GALERÍA SAN MARTÍN (META)
10	A. seniculus	wild	74	5.3	11.9	8.8		18	fragmented, san martin	PATRÓN DE ACTIVIDAD, RECORRIDOS DIARIOS Y DIETA DE Alouatta seniculus EN FRAGMENTOS DE BOSQUE DE GALERÍA SAN MARTÍN (META)
11	A. palliata	wild							catemaco, veracruz, mexico	Patrón de actividad diurno de los monos aulladores de manto (Alouatta palliata) y su variación en función de factores climáticos
12	A. seniculus	wild	58.3	21.1	14.8	5.8			andean forest	Activity patterns and diet of Red Howler Monkeys in an Andean Forest
13	A. seniculus	wild	58	23	15	3		46	continuous forest fragment colombia	Differences in home range, activity patterns and diet of red howler monkeys in a continuous forest and a forest fragment in Colombia
13	A. seniculus	wild						79	continuous forest fragment colombia	Differences in home range, activity patterns and diet of red howler monkeys in a continuous forest and a forest fragment in Colombia
14	A. seniculus	wild						9	by river, peru, pacaya-samiria	ECOLOGIA DEL COTO MONO (Alouatta seniculus, CEBIDAE) EN EL RIO PACAYA, RESERVA NACIONAL PACAYA-SAMIRIA, PERU
14	A. seniculus	wild						6	by river, peru, pacaya-samiria	ECOLOGIA DEL COTO MONO (Alouatta seniculus, CEBIDAE) EN EL RIO PACAYA, RESERVA NACIONAL PACAYA-SAMIRIA, PERU
15	A. pigra	translocated						2.6	yucatan	Assessment of a Yucatan black howler monkey population reintroduction
15	A. pigra	translocated						11.6	yucatan	Assessment of a Yucatan black howler monkey population reintroduction
16	A. pigra	wild					105		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. pigra	wild					825		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. pigra	wild					287		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. pigra	wild					1015		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. pigra	wild					175		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. pigra	wild					628		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. pigra	wild					0		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
16	A. seniculus	translocated					15		french guiana	Translocation of red howler monkeys (Alouatta seniculus) in French Guiana
17	A. pigra	wild					942		lamanai, belize	Determinants of day-range length in the black howler monkey at Lamanai, Belize
17	A. seniculus	translocated					102		french guiana	Translocation of red howler monkeys (Alouatta seniculus) in French Guiana
18	A. pigra	wild					417	2	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	wild					510	3.3	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	wild					497	3.1	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	wild					673	3.5	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	wild					520	3.3	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	wild					648	7.9	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	translocated					412	7.4	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	translocated					465	8.4	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	translocated					441	6.3	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
18	A. pigra	translocated					567	8.7	belize	Ranging behavior of translocated and established groups of black howler monkeys Alouatta pigra in Belize, Central America
19	A. seniculus	wild	62.25	19.59	14.07	4.09		1.5	fragmented, san juan	PATRON DE ACTIVIDAD, DIETA, ÁREA DE ACTIVIDAD Y DISPERSIÓN DE SEMILLAS DE Alouatta seniculus EN UN FRAGMENTO DE BOSQUE EN SAN JUAN DEL CARARE (SANTANDER).
19	A. seniculus	wild						0.7	fragmented, san juan	PATRON DE ACTIVIDAD, DIETA, ÁREA DE ACTIVIDAD Y DISPERSIÓN DE SEMILLAS DE Alouatta seniculus EN UN FRAGMENTO DE BOSQUE EN SAN JUAN DEL CARARE (SANTANDER).
19	A. seniculus	wild						1.6	fragmented, san juan	PATRON DE ACTIVIDAD, DIETA, ÁREA DE ACTIVIDAD Y DISPERSIÓN DE SEMILLAS DE Alouatta seniculus EN UN FRAGMENTO DE BOSQUE EN SAN JUAN DEL CARARE (SANTANDER).
19	A. seniculus	wild						2.4	fragmented, san juan	PATRON DE ACTIVIDAD, DIETA, ÁREA DE ACTIVIDAD Y DISPERSIÓN DE SEMILLAS DE Alouatta seniculus EN UN FRAGMENTO DE BOSQUE EN SAN JUAN DEL CARARE (SANTANDER).
19	A. seniculus	wild						0.4	fragmented, san juan	PATRON DE ACTIVIDAD, DIETA, ÁREA DE ACTIVIDAD Y DISPERSIÓN DE SEMILLAS DE Alouatta seniculus EN UN FRAGMENTO DE BOSQUE EN SAN JUAN DEL CARARE (SANTANDER).
19	A. seniculus	wild						2.1	fragmented, san juan	PATRON DE ACTIVIDAD, DIETA, ÁREA DE ACTIVIDAD Y DISPERSIÓN DE SEMILLAS DE Alouatta seniculus EN UN FRAGMENTO DE BOSQUE EN SAN JUAN DEL CARARE (SANTANDER).
20	A. seniculus	wild					1150	182	southeast colombia	Ranging pattern and use of space in group of red howler monkeys (Alouatta seniculus) in a southeastern Colombian rainforest
21	A. seniculus	wild						2.1	andes colombia	Alouatta seniculus: density, home range and group structure in a bamboo forest fragment in the Colombian Ande
21	A. seniculus	wild						4.8	andes colombia	Alouatta seniculus: density, home range and group structure in a bamboo forest fragment in the Colombian Ande

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