Ranging Behaviours and Activity Budgets of Rehabilitated and Reintroduced Howler Monkeys

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Neotropical primate species face a variety of threats including habitat loss, hunting and disease. These threats are not mutually exclusive and can occur together, affecting one another and exacerbating the risk to Neotropical primates. Rehabilitation and reintroduction efforts are some of many conservation strategies implemented to attempt to attenuate threats in primate range countries. However, reintroduction and rehabilitation attempts are viewed as unreliable by many due to previous improper planning and management, lack of post-release monitoring and unknown effects on the surrounding ecosystems.

The Yucatán black howler monkey (*Alouatta pigra*) has the smallest range of all *Alouatta* spp. with populations in southern Mexico, northern Guatemala and throughout Belize. The Yucatán black howler monkey is listed as Endangered in the IUCN Red List. The hunting and pet trade of primate species is illegal in Belize although these practises still occur. In Belize, the Forest Department works alongside local NGO *Wildtracks* to confiscate illegally held wildlife. *Wildtracks* is the only primate rehabilitation centre in Belize and receives all confiscated Yucatán black howler monkeys and black-handed spider monkeys (*Ateles geoffroyi*). Translocations of monkeys stranded by increasing forest clearance and fragmentation elsewhere in northern and central Belize are also undertaken by *Wildtracks*.

The process of rehabilitation helps prepare howler monkeys for survival in the wild. Reintroductions of these rehabilitated and translocated monkeys by *Wildtracks* initially occurred within Fireburn Nature Reserve (736 ha) and Kakantulix Archaeological Reserve (113 ha). Subsequent releases took place in Shipstern Nature Reserve (8,252 ha) and then in the Northern Biological Corridor (11,000 ha). Reintroduction of troops of these rehabilitated individuals has been ongoing since 2011 and has experienced a success rate of at least 70%. Post-release monitoring is used to ensure high release success and animal survival. The release sites constitute part of the historic range of *A. pigra* where the populations have become extirpated.

From June to August 2019, I collected data on reintroduced troops of howler monkeys. GPS coordinates were collected as well as behavioural data every 15 minutes. I tested if there was a significant difference between the daily path length (DPL) of rehabilitated troops (n= 3) and translocated troops (n=2). Data recording began on a focal individual when they were located in the morning (between 07:00- 10:00) and continued to 17:30. Troop composition was also recorded and compared with original release troops (*Table 1*). All individuals were identified using anogenital characteristics such as markings, unique pink and black pigmentation and shape, which were compared using an identification guide.

Troop composition was recorded. Eighty-nine percent of individuals found in this study migrated from original troops (*Table 1)*. Almost all rehabilitated individuals migrated to troops composed of other rehabilitated individuals. The same was found with migrating translocated individuals. Those not identified are assumed to be the wild born offspring of previously reintroduced individuals that have immigrated into other troops.

Table 1: Troop composition before and after release of named individuals.

Troops Reintroduced from 2011 to 2018 (pertinent to this study)		Troops found in 2019	
Troop 1†	Troop 5†	Rehabilitated Troop A	Translocated Troop A
Spartacus	Ty	Spartacus	Coco
Jenny	Beth	Tilly*	Tower Hill Oldy
		Unidentified Female*	Unidentified Female
Troop 2‡	Troop 6†		
Tower Hill Male	Innie	Rehabilitated Troop B	Translocated Troop B
Tower Hill Oldy	Vicky	Elliott	Tower Hill Male
Chewbacca	Maggie	Vicky	Chewbacca*
Tower Hill Female B	Finn	Maggie	Unidentified Female
Troop 3‡	Troop 7†		
Coco	Annie	Rehabilitated Troop C	Troop sighted but not tracked
	Molly	Ty	Innie
Troop 4†		Unidentified Female*	Molly
Elliott	Troop 8†	Unidentified Female	Annie
Athena	Teddy		
	Tilly		

* also had a dependant infant

† Rehabilitated troops

‡ Translocated troops

I recorded an average of 227 location points per troop. Mean DPL of rehabilitated troops was 390 meters and mean DPL of translocated troops was 292 meters. Although rehabilitated troops had a higher overall average DPL, there was not a significant difference between rehabilitated and translocated troops. All DPLs ranged from 99 - 691 metres and are typical of wild troops of the same species.

Behavioural data were used to construct activity budgets of the troops. All troops tracked during this study had activity budgets reflecting those of wild troops. Resting was the most observed behaviour, contributing 72.1% of all behaviour across five troops. The reintroduced howler monkeys' second most exhibited behaviour was feeding, constituting 17.6% of behaviour, a similar proportion to wild troops. Travelling and social behaviour each constituted less than 6% of activity.

The behaviour of these reintroduced troops mirrored that of released troops tracked in previous studies. Although survival rate and production of offspring are primary indicators of successful releases, exhibition of natural behaviours can act as additional indicators of reintroduction success. Reintroductions are a debated/controversial conservation strategy, but if planned and managed properly, successful reintroductions can mitigate many issues. Rehabilitation and rescue centres can supply proper housing and care for wildlife rescues and confiscations. Reintroduction of flagship species can be utilised for habitat protection as well as seeing the return of threatened species to the wild.