The Distribution and Persistence of Primate Species in Disturbed Forest Landscape in Sabah, Malaysian Borneo

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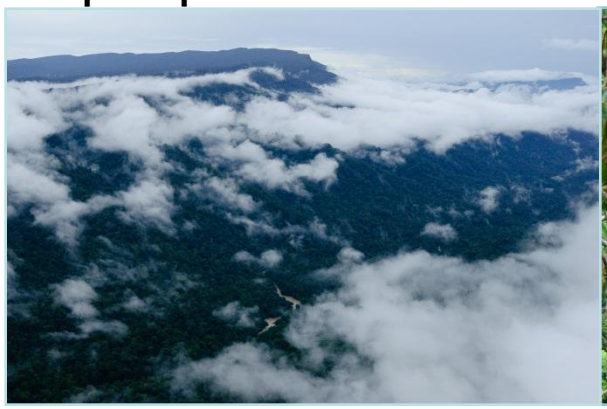
STUDY BACKGROUND AND OBJECTIVES

- Borneo is a centre of biodiversity and endemism. Yet, it is under substantial threat from logging and other human-related pressures such as large-scale agriculture.

- The situation in Sabah, Malaysian Borneo, is no different. Disturbed forests and other converted habitats are increasingly covering much larger areas.

- Since this trend of land use is likely to continue in the foreseeable future here, many tropical forest faunas will depend more heavily on the management of degraded forests and converted habitats for their long term survival.

- This study investigated the persistence of non-human primate community across a gradient of habitat disturbance from **primary forest** to **logged forest** to **heavily logged forest** to **oil palm plantation**.




STUDY AREA

- This study was conducted in Maliau Basin Conservation Area (MBCA), Kalabakan Forest Reserve and oil palm plantation located in the South central part of Sabah, Malaysia (Borneo) within the Stability of Altered Forest Ecosystem (SAFE) Project area.

- The SAFE project is currently running a large-scale fragmentation experiment which will take advantage of planned logging in Sabah. See <http//www.safeproject.net > for details of the SAFE Project.

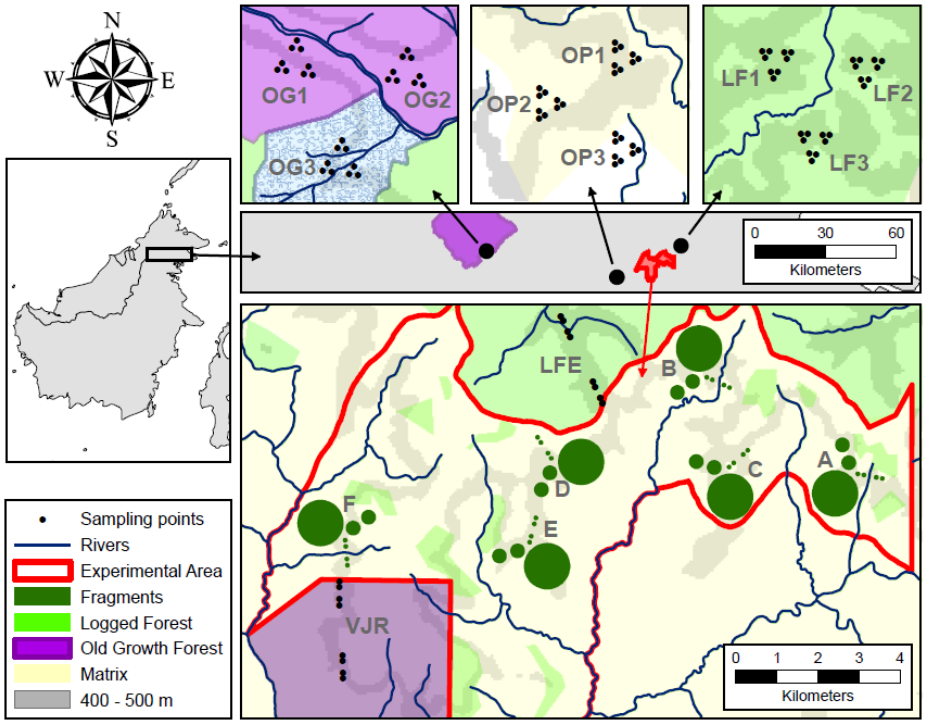


Fig. 1. Map of the study area indicating the 10 sampling sites located in south central part of Sabah, northern part of Borneo. The experimental area depicting Block A-F is the location of the Stability of Altered Forest Ecosystems (SAFE) project area.

METHOD

- We walked through 10 human-made trails between 1.9 to 5.4 km long, in 10 sampling sites representing four habitat classes:
  1. **Old growth forest (OGF),**
  2. **Logged forest (LF),**
  3. **Heavily logged forest (HLF)**
  4. **Oil palm plantation (OP).**

- The 10 sampling sites were classified as follows **(see Fig. 1)**:
  1. **OGF (2 sites) – OG, VJR**
  2. **LF (1 site) – LF**
  3. **HLF (6 sites) – A,B,C,D,E,F**
  4. **OP (1 site) – OP**

- We recorded primate species encountered during the day (06:00-12:00) and night walk (19:00-24:00) over a period of 12 months from November 2011 to October 2012.

RESULTS

- Total number of independent detections of primate individual(s) or group(s) (or signs of their activities e.g. vocalization and newly constructed nest) at all sampling sites combined over the 12 months study period was 225.

- The average detection rate of a primate individual or group during the study was generally low with 0.38 detection per km/month.

- Although the surveyed sites consisted mainly of disturbed forests, altogether nine species of primates (out of the total of 10 species of primates that can be found in the whole of Sabah) were detected. These included species that are of high conservation status **(Table 1)**.

- Primate species number varied across sampling sites. The highest species number was recorded at the HLF sites i.e., E and F (followed by at sites OG and VJR) **(Table 1)**. But, when transect length and number of survey at each site were taken into account, the primate species detection rate was recorded the highest at VJR **(Fig. 2a)**.

- The detection rate of primate individual(s) or group(s) **(Fig. 2b)** also followed the same trend as for the species detection rate with OG and VJR recorded the highest rates.

- Variations in the primate community (based on species number and relative abundance data) across sampling sites showed that the presence of primate community at a sampling site was related to the level of disturbance of the site concerned**(Fig 3a,3b & 3c)**.

Table 1. Primate species detected at 10 different sampling sites in and around the SAFE project area

ENGLISH NAME	SCIENTIFIC NAME	IUCN*	SAMPLING SITES									
			OG	VJR	LF	A	B	C	D	E	F	OP
Orangutan	*Pongo pygmaeus*	EN		+	+	+	+	+	+	+	+	+
Bornean gibbon	*Hylobates muelleri*	EN	+	+	+	+	+		+	+	+	
Western trasier	*Tarsius bancanus*	VU	+	+		+			+	+		
Hose's langur	*Presbytis hosei*	VU	+			+				+	+	
Red leaf monkey	*Presbytis rubicunda*	LC	+	+					+	+		
Long-tailed macaque	*Macaca fascicularis*	LC	+	+			+				+	
Bornean Slow loris	*Nycticebus menagensis*	VU				+		+		+	+	
Pig-tailed macaque	*Macaca nemestrina*	VU					+	+				+
Proboscis monkey	*Nasalis larvatus*	EN									+	
	Total species number		**5**	**5**	**2**	**5**	**4**	**3**	**4**	**6**	**6**	**2**
	Transect length (km)		**2.9**	**1.4**	**3.3**	**2.5**	**3.9**	**2.5**	**1.9**	**2.8**	**2.8**	**5.4**
	Number of surveys		**6**	**6**	**9**	**11**	**11**	**11**	**12**	**12**	**11**	**9**

*IUCN (2013): *IUCN Red List of globally threatened species status*, EN=endangered, VU=vulnerable, LC=least concern

(a)

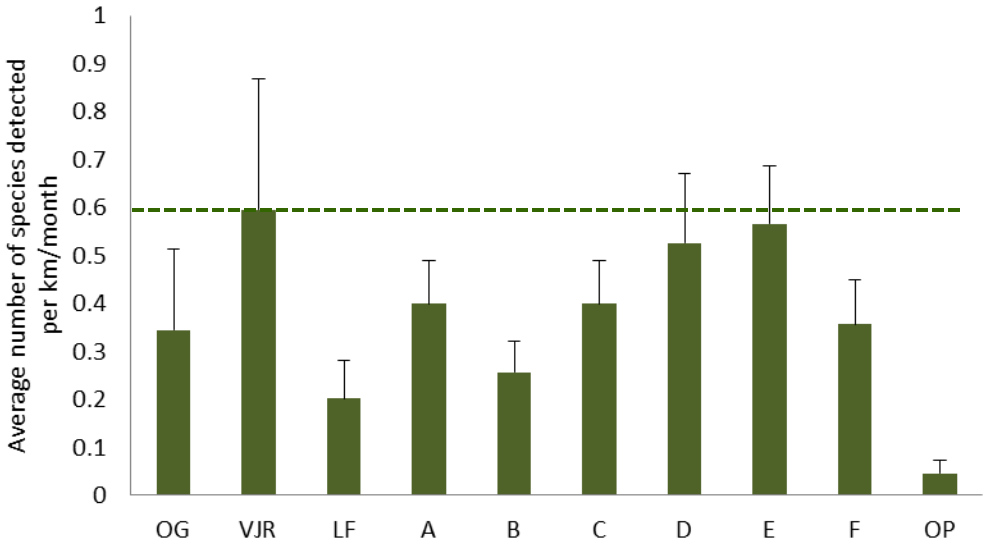


Fig 2a. Average number of species detected per km/month (± SEM) at each of 10 sampling sites.

(b)

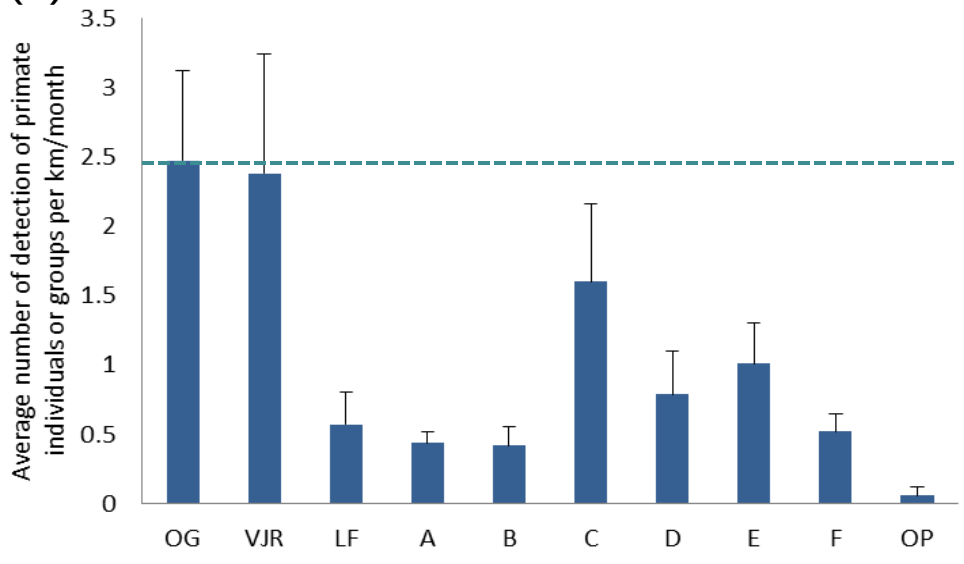


Fig 2b. Average number of individuals or groups detected per km/month at each of 10 sampling sites.

Note: Horizontal lines indicate the highest species detection rate (Fig 2a) or primate relative density (Fig 2b) in an old growth forest sampling site (i.e., OG or VJR).

(a)

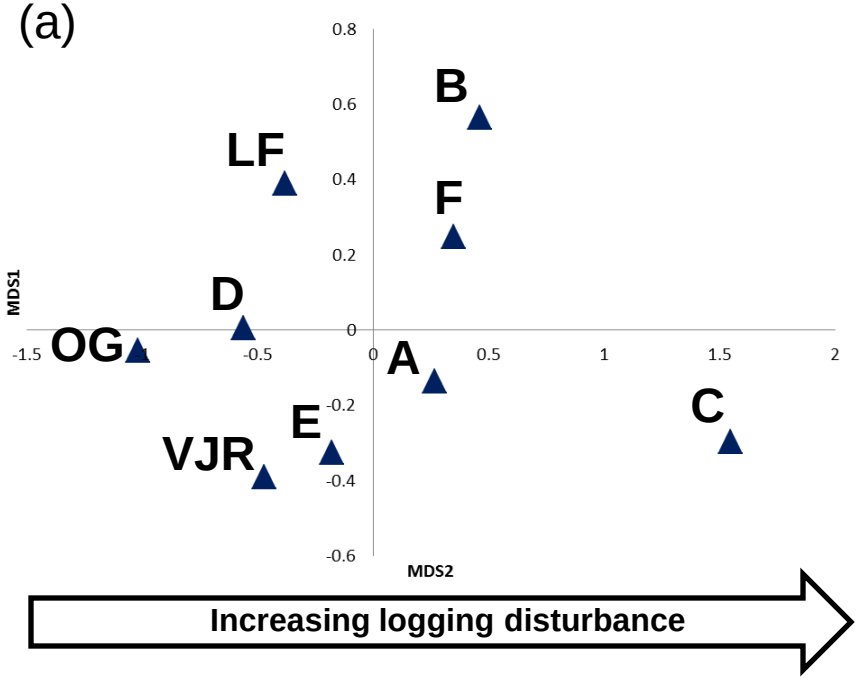
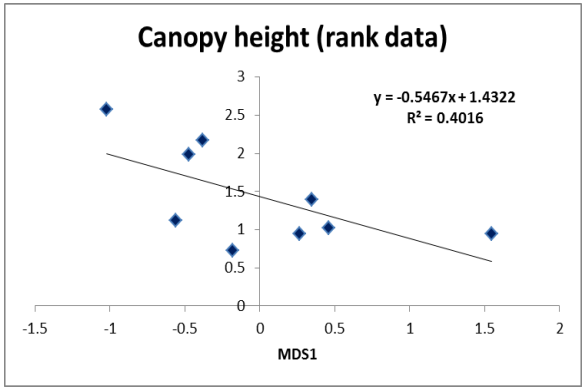


Fig. 3a. Non-metric multi- dimensional scaling (NMDS) ordinations based on Bray-Curtis dissimilarity coefficients using primate species-relative abundance data (i.e., number of independent detections per km/month).

(b)



(c)

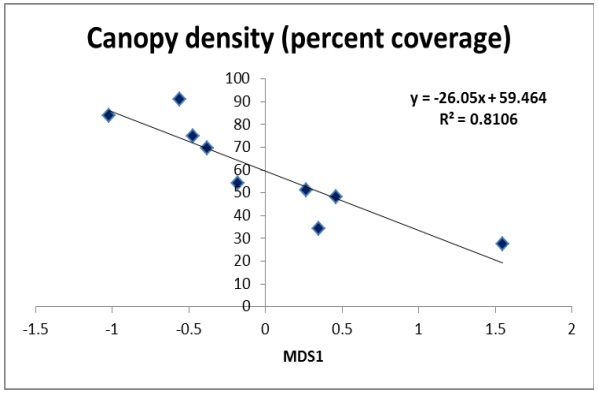


Fig. 3b & 3c: NMDS Axis1 scores (i.e., MDS1) show significant association with canopy height and canopy density ($P < 0.001$).

CONCLUSIONS

- The effects of habitat disturbance on primate species richness and density varied across the gradient of disturbance levels, though there was a clear negative effect of oil palm plantation development.

- Detection rates of primate species tended to be higher for least disturbed forests than for heavily degraded forests.

- Nonetheless, in addition to areas of old growth forest and primary forests, heavily degraded forests have an important role to play in terms of primate species conservation.

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