frontiers

Supplementary Material

Table S1. Summary of all 63 peer-reviewed publications describing the use of canopy camera-traps to study arboreal mammals. Results obtained via Web of Knowledge in February 2021 using the search terms "camera trap" AND "arboreal", and, separately, "camera trap" AND "canopy", with time-period set to all years. A summary of our study appears on the top row for comparison. Tildes (~) denote where number of camera-trap nights (CTN) was not explicitly stated, but could be estimated from the number of camera-traps and sampling period reported in the study.

	Reference	Main focus	Country	Canopy camera-trap number (n), height range (h) & bait/lure use	Other sampling	Forest type	No. CTN Canopy	No. CTN Terrestrial	No. mammal species detected (multi-species studies only)
	This study	***Inventory, Method, Disturbance effects*** *Canopy & terrestrial camera traps to inventory mammal communities of unlogged & logged forest*	*Malaysia (Borneo)*	*n = 69* *h = 9.8-52.3 m*	*Terrestrial cameras* *n = 49*	*Tropical lowland-hill rainforest*	*10565*	*6661*	*Total = 57* *Canopy only = 18* *Terrestrial only = 30* *Both heights = 9*
1	Azcarraga et al. 2020	**Activity** Activity patterns of arboreal mammals	Mexico	n = 9 h = 8-12 m	n/a	Semi-deciduous tropical rainforest	2664	n/a	Total = 12
2	Chan et al. 2020	**Bridge use** Canopy bridge use by critically endangered Hainan gibbon *Nomascus hainanus*	China	n = 1 h = 7-10 m	n/a	Seasonal tropical rainforest	~1170	n/a	n/a
3	Debruille et al. 2020	**Species presence** Canopy cameras to improve detection of binturongs (*Arctictis binturong*)	Philippines	n = 15 h = 1.7-18 m	n/a	Logged tropical forest	2973	n/a	n/a
4	Fang et al. 2020	**Species presence**	China	n = 30			~5400	n/a	

		Canopy cameras confirm range extension for critically endangered western black crested gibbon *Nomascus concolor*		h = 8-15 m	Line transects, interviews, call monitoring	Temperate montane forest			Presence suspected from call recordings & interviews, identity confirmed by cameras. Species not detected by transects.
5	Hongo et al. 2020	**Inventory** Using multi-layer (terrestrial, <15 m & >15 m) camera trapping to inventory mammals. Medium and large mammals only.	Cameroon	n = 150 h = 4-24 m	Terrestrial cameras n = 88	Evergreen & semi-deciduous rainforest	5404	2901	Total = 40 Canopy cameras only = 8* **including 4 previously unknown from area* Terrestrial cameras only = 22 Both heights = 10
6	Laughlin et al. 2020	**Behaviour** Seasonal behaviour of white-footed mouse, *Peromyscus leucopus* & deer mouse, *P. maniculatus*	USA	n not stated h = 8-24 m	Terrestrial live trapping to mark species	Temperate - pine	8491	n/a	n/a
7	Linden et al. 2020	**Bridge use** Canopy bridge use by samango monkey *Cercopithecus albogularis*	South Africa	n = 10 h = 3-4.5 m	Behaviour observations	Disturbed evergreen forest / road	480	n/a	n/a
8	Linnell & Lesmeister 2020	**Behaviour (multi-taxa)** Predator-prey interactions in the canopy (mammals & birds)	USA	n = 168 h = 12-20 m	n/a	Temperate forest	~110,595	n/a	4 mammal species 3 bird species
9	Moore et al. 2020	**Inventory, Method** Canopy camera traps, terrestrial camera traps & line transects	Rwanda	n = 54 h = 4-17 m	Terrestrial cameras n = 50 Line transects (total distance = 118.23 km)	Montane tropical forest	~1620	~1560	Total = 35 Canopy cameras only = 7* **including 1 previously unknown from area (see Moore & Niyigaba 2018)* Terrestrial cameras only = 15 Both heights = 10 Transects = 11

10	Nekaris et al. 2020	**Bridge use** Canopy bridge use between forest fragments	Indonesia (Java)	n = 20 h = 1-8 m	n/a	Agricultural/ montane rainforest	2206	n/a	19 species of mammals & birds, number in each category not stated
11	Tongkok et al. 2020	**Behaviour** Arboreal & terrestrial camera traps to monitor frugivory	China & Thailand	n not stated h not stated	Terrestrial cameras, number not stated	Tropical forest	Not stated	Not stated	Total = 26 Number on canopy vs terrestrial cameras not stated
12	Balbuena et al. 2019	**Bridge use** Canopy bridge use over gas pipeline	Peru	n = 14 h = 21.5-32.5 m	n/a	Tropical rainforest	4593	n/a	Canopy = 16
13	Birot et al. 2019	**Bridge use** Canopy bridge use by Javan slow loris *Nycticebus javanicus*	Indonesia (Java)	n not stated h = 2-8 m	Observations	Agroforest in montane rainforest	1561	n/a	n/a
14	Kaizer 2019 (PhD thesis)	**Method** Canopy camera traps vs line transects for primate monitoring	Brazil	n = 16 h = 7.5-16 m	Line transects (total distance ~200 km)	Montane forest	2613	n/a	Both methods detected 3 of 5 primate species known from the area
15	McComb et al. 2019	**Behaviour** Monitoring predation of critically endangered Leadbeater's possum *Gymnobelideus leadbeateri* at nest boxes by feral cats	Australia	Information not available	Stomach content analysis of cats	Information not available	n/a	n/a	n/a
16	Whitworth et al. 2019a	**Inventory, Disturbance effects** Canopy & terrestrial cameras in protected & non-protected areas. Med-large mammals only	Peru	n = 145 h = 3.5-30 m	Terrestrial cameras n = 77	Tropical rainforest	20364	11253	Total = 46 Canopy only =20 Terrestrial only = 22 Both heights = 4
17	Whitworth et al. 2019b	**Behaviour** Sleeping site use & role in seed dispersal of Geoffroy's spider monkey *Ateles geofroyii*	Costa Rica	n = 39 h not stated	Follows to find sleeping sites & Terrestrial cameras, n = 56	Tropical rainforest, varying disturbance levels	1055	2287	n/a
18	Suzuki & Ando 2019	**Species presence**	Japan	n = 154	n/a		4620	n/a	n/a

		Effective rapid survey for endangered Japanese flying squirrel *Pteromys momonga*		h = 2-3 m		Temperate: conifer-broadleaf			
19	Godoy-Guinao et al. 2018	**Behaviour** Confirming arboreal habits & investigating functional role of small arboreal marsupial *Dromiciops gliroides*	Chile	n = 6 h = 12-21 m	n/a	Temperate forest	~720	n/a	n/a
20	Lama 2018 (Masters thesis)	**Species presence, Method, Activity** (as part of wider terrestrial camera study), comparing the effectiveness of canopy vs. terrestrial cameras to survey red panda *Ailurus fulgens*	Nepal	n = 19 h = <10 m	Terrestrial cameras n = 19	Montane forest	~810	~810	Canopy cameras = 807 photos of target species Terrestrial cameras = 96 photos of target species
21	Mella et al. 2018	**Behaviour** Canopy cameras provide first evidence of tree climbing in red fox *Vulpes vulpes*	Australia	n = 10 h = 2.3 m	n/a	Not stated	Not stated	n/a	n/a
22	Moore & Niyigaba 2018	**Species presence** Canopy cameras provide first record of Central African oyan *Poiana richardsonii* in Rwanda	Rwanda	n = 54 h = 6-10 m	n/a	Montane rainforest	~4200	n/a	Records of up to 8 individual *P.richardsonii*
23	Ribeiro-Silva et al. 2018	**Behaviour (multi-taxa)** Canopy cameras a viable tool for monitoring nest predation of birds, by birds & mammals, in a tropical rainforest environment	Brazil	n = 68 h not stated	n/a	Atlantic Forest - submontane rainforest	2604	n/a	Predator species: 6 mammals (including small-bodied <1 kg) & 6 birds
24	Yang et al. 2018	**Species presence** Using canopy cameras with other methods to confirm the presence of, and study a new population of critically endangered Myanmar snub-nosed monkey *Rhinopithcus strykeri*	China	n not clear h = 15-20 m	Terrestrial cameras, n not stated; transects & follows, faeces analysis	Temperate montane forest	Not stated	Not stated	Images of species obtained, along with observations & faeces samples from follows
25	Fang et al. 2018	**Monitoring (multi-taxa)** Canopy & terrestrial cameras to monitor mammals & birds (abstract only – paper in Chinese language)	China	n = 10 h = 5-10 m	Terrestrial camera traps n = 10	Temperate montane forest	~1150	~1150	Total = 20 Canopy only = 3 Terrestrial only = 9 Both heights = 8

26	Aziz et al. 2017	**Behaviour** Canopy camera traps to confirm role of island flying fox *Pteropus hypomelanus* in durian pollination	Malaysia (Peninsular)	n = 13 h = 2-20 m	n/a	Fruit orchard (durian)	~702	n/a	Total = 5 (target + 4 additional species)
27	Bowler et al. 2017	**Inventory, Method** Canopy camera traps vs line transects. Medium-large arboreal mammals only.	Peru	n = 42 h = 16.6-29.9 m	Transects (total distance = 2014 km)	Lowland tropical rainforest, historic logging & hunting	3147	n/a	Total = 19 Canopy cameras only = 6 (*including 1 previously unknown from area)* Transects only = 1 Both methods = 12
28	Gregory et al. 2017	**Bridge use** Canopy bridge use over gas pipeline	Peru	n = 25 h = 13.5-33.7 m	Terrestrial cameras n = 112	Tropical rainforest	7102	7154	Total = 40 Canopy only = 19 Terrestrial only = 15 Both heights = 6
29	Loria & Mendez-Carvajal 2017	**Behaviour** Use of habitat and activity pattern of whitefaced monkey *Cebus imitator* (abstract only – paper in Spanish)	Panama	n not stated h = 8-10 m	Direct observations	Coffee agroforest	3233	n/a	n/a
30	Suzuki & Ando 2017	**Activity** Seasonal changes in activity pattern of Japanese flying squirrel *Pteromys momonga*	Japan	214 locations h = 2-3 m	n/a	Temperate forest	7317	n/a	n/a
31	Boulerice & Van Fleet 2016	**Species presence** Canopy cameras & bait tubes to detect northern flying squirrel *Glaucomys sabrinus*	USA	n not stated h = 1.5 m bait used	n/a	Temperate pine	6640	n/a	n/a
32	Cotsell & Vernes 2016	**Behaviour (multi-taxa)** Examining tree hollow use by birds, mammals & reptiles	Australia	n = 80 h =< 25 m	n/a	Eucalyptus forest	1158		9 mammals 21 birds 8 reptiles
33	Goldingay & Taylor 2016	**Bridge use** Canopy bridge use in urban area by koala *Phascolarctos cinereus*	Australia	n = 10 h = 5 m	n/a	Eucalyptus	Not stated	n/a	Total = 4 (target + 3 additional species)
34	Mills et al. 2016	**Species presence** Canopy cameras & footprint tracking for small & elusive hazel dormouse	UK	n = 5 h = ~2.5 m bait used	n/a	Temperate oak/mixed woodland	405	n/a	n/a

		Muscardinus avellanarius & wood mouse *Apodemus sylvaticus*							
35	Suzuki et al. 2016	**Activity** Diurnal activity of juvenile Russian flying squirrels *Pteromys volans*	Japan	n = 1 h = 2.6 m	n/a	Temperate forest	~26	n/a	n/a
36	Whitworth et al. 2016	**Inventory, Method** Canopy cameras vs line transects & incidental observations. Medium-large arboreal mammals only.	Peru	Total n = 30: h =10 m (n = 15) h = 18.4-33 m (n = 15)	Transects (total distance = ~78 km) & incidental observations from year-round surveys	Disturbed tropical rainforest – some logging & hunting	2929	n/a	Total = 24 Canopy cameras = 18 *(6 exclusive to method, 1 previously unknown from area)* Transects = 13 *(1 exclusive to method)* Observation = 18 *(5 exclusive to method)*
37	Gregory et al. 2015	**Species presence, Behaviour, Activity** Confirming range extension & describing activity & behaviours of streaked dwarf porcupine *Coendou ichillus*	Peru	n not clear (part of larger study, see Gregory et al. 2014, 2017) h not stated	Live trapping mid-canopy	Tropical rainforest	7198	n/a	Records represent range extension of 900 km
38	Rivas-Romero & Soto-Shoender 2015	**Behaviour (multi-taxa), Method** Canopy camera traps as a method of examining frugivory in birds and mammals	Guatemala	n = 8 h = 10-15 m	n/a	Tropical cloud forest	902	n/a	3 mammal species 9 bird species
39	Soanes et al. 2015	**Bridge use** Monitoring use of bridges & glider poles across a highway by arboreal marsupials	Australia	n = not clear h = 4-18 m	Transponder tags & readers	Agricultural land & multi-lane highway	3929	n/a	5 species confirmed to use crossing structures
40	Yokochi & Bencini 2015	**Bridge use** Rapid habituation to rope bridge by endangered western ringtail possum *Pseudocheirus occidentalis*	Australia	n = 1 h = 8.5 m	Live capture & transponder tagging	Peppermint trees across major road	270	n/a	n/a
41	Fonturbel et al. 2014	**Activity** Activity pattern of monito del monte, *Dromiciops gliroides* (small arboreal marsupial)	Chile	n = 25 h not stated bait used	n/a	Temperate rainforest &	5012	n/a	n/a

						Eucalyptus plantations			
42	Gregory et al. 2014	**Method, Bridge use** First major study on canopy camera effectiveness in context of monitoring canopy bridges over gas pipeline	Peru	n = 25 h = 13.5-33.7 m	n/a	Tropical rainforest	3608	n/a	Total = 20
43	Harley et al. 2014	**Species presence** Canopy cameras to detect cryptic Leadbeater's possum, *Gymnobelideus leadbeateri*	Australia	n = 15 h = 3-4 m bait used	n/a	Eucalyptus forest	1519	n/a	Total = 5 (target + 4 additional species)
44	Mendez-Carvajal 2014	**Method** Testing system of setting canopy cameras without need to climb trees	Panama	n = 13 h = 8-18 m	n/a	Tropical montane forest	232	n/a	Canopy only = 10
45	Goldingay et al. 2013	**Bridge use** Arboreal mammals use of rope bridges across a major highway	Australia	n not stated h not stated	n/a	Not stated	Not stated	n/a	Total = 4
46	Soanes et al. 2013	**Bridge use** Effectiveness of road-crossing mitigation for squirrel glider *Petaurus norfolcensis*	Australia	n = 7 h = 6-14 m	Radio-tracking & transponder tags	Agricultural land & highway	1806	n/a	n/a
47	Tan et al. 2013	**Activity** Canopy cameras reveal nocturnal activity in presumptive diurnal primate: Guizhou snub-nosed monkey *Rhinopithecus brelichi*	China	n = 2 h = 5-6 m	n/a	Temperate evergreen & broadleaf forest	294	n/a	n/a
48	Teixeira et al. 2013	**Bridge use** Monitoring wildlife use of road overpasses in fragmented urban landscapes.	Brazil	n = 6 h not stated	Community observational monitoring	Semi-deciduous seasonal forest patches & roads	689	n/a	Camera traps = 3 Community observation = 2 (same species as cameras)
49	Wahyudi & Stuebing 2013	**(Primarily terrestrial)** Wildlife monitoring in mixed use landscape	Indonesia (Borneo)	n = 17 h = 10-12 m lure used	Terrestrial cameras n = 40 lure used	Disturbed forest & oil palm	424	8204	Total = 33 Canopy only = 8 Terrestrial only = 23 Both heights = 2
50	Cassano et al. 2012	**Disturbance effects**	Brazil	n = 18 h = 3-4 m	Terrestrial cameras		~2000	~2000	Total = 22 Canopy = 6

		Mammal use of agroforest vs forest: canopy & terrestrial camera traps. Large-bodied species only.		bait used	n = 18	Logged forest & agroforest			Terrestrial = 16
51	Dalloz et al. 2012	**Behaviour** Climbing behaviour in bare-tailed woolly opossum, *Caluromys philander*	Brazil	n = 10 h = 2.5-5 m	n/a	Montane forest	~3650	n/a	Total = 10 (target + 9 additional species)
52	Olson et al. 2012	**Species presence** Validate sightings of greater bamboo lemur, *Prolemur simus* (critically endangered)	Madagascar	n = 7 h = 2-14 m	n/a	Tropical rainforest	231	n/a	n/a
53	Van Berkel et al. 2012	**(Primarily terrestrial)** Biodiversity survey	Indonesia (Borneo)	n = 2 h not stated	Terrestrial cameras n = 25	Tropical rainforest	7	570	Total = 26 Canopy only = 2 Terrestrial only = 24
54	Weston et al. 2011	**Bridge use** Canopy bridge use over roads	Australia	n not stated h = 7-8 m	Observation, scat collection, hair funnels	Tropical rainforest	Not stated	n/a	Total on cameras = 7 Detected by other methods but not cameras = 2
55	Oliveira-Santos et al. 2008	**Activity** Activity patterns of small arboreal mammals	Brazil	n = 3 h = 3-6 m bait used	Terrestrial cameras (data from different study) n = 14	Atlantic Forest	Not stated	Not stated	Canopy cameras = 11 (Terrestrial cameras targeted only 1 species)
56	Forsman & Swingle 2007	**Behaviour (multi-taxa)** Use of arboreal tree vole *Arborimus spp.* nests by amphibians	USA	n = 3 h not stated	n/a	Temperate forest	Not stated	n/a	n/a
57	Jayasekara et al. 2007	**Behaviour** Using canopy and terrestrial camera traps to study frugivory at fruiting trees	Sri Lanka	n = 15 h <35 m bait used	Terrestrial cameras n = 15	Tropical lowland rainforest	Not stated	Not stated	Total = 14 Canopy only = 5 Terrestrial only = 6 Both = 3
58	Malt & Lank 2007	**Behaviour, Activity (multi-taxa)** Nest predation & activity patterns of marbled murrulet *Brachyramphus marmoratus*, red squirrel *Tamiasciurus hudsonicus* & deer mice *Peromyscus spp.*	Canada	n = 136 h = 25 ± 7 m	Artificial nests constructed	Temperate forest	Not stated	n/a	n/a

59	Schipper 2007	**Method** Camera trap avoidance by kinkajous, *Potos flavus*	Costa Rica	n = 1 h = 15 m	n/a	Moist forest	20	n/a	n/a
60	Goosem et al. 2005	**Bridge use** Testing the effectiveness of rope overpasses & faunal underpasses for wildlife connectivity across a road	Australia	n = ~3 h = 7-7.5 m	Overpasses: Spotlighting, hair & scat collection; Underpasses: Sand-tracks, roadkill, occasional camera use	Highland rainforest & road	Not stated	Not stated	6 arboreal species detected by cameras, 7 detected by scat collection, 4 by spotlighting, 2 by hair sample
61	Hirakawa 2005	**Method** Testing a new bat lure	Japan	n = 40 h = 1.5 m lure used	n/a	Temperate forest	~400	n/a	n/a
62	Kierulff et al 2004	**Species presence** Surveying buff-headed capuchin, *Cebus xanthosternos* (endangered & elusive)	Brazil	n not stated h = 2 m bait used	n/a	Atlantic Forest	Not stated	n/a	n/a
63	Otani 2001	**Behaviour** Measuring fig foraging by Yakushima macaque, *Macaca fuscata yakui*	Japan	n = 7 h = 10 m	n/a	Temperate forest	~77	n/a	n/a

Table S2. Mammal species recorded by camera-traps in terrestrial and canopy strata in unlogged and logged forest (noted in parentheses where the detections contradict available knowledge from field guides). Species are grouped according to: IUCN threat status ('threatened' = categories Vulnerable, Endangered or Critically Endangered; 'not threatened' = Near Threatened, Least Concern or Data Deficient); body size (small <1 kg, medium 1-5 kg, large >5 kg); and broad taxonomic group (with elephant included in 'ungulates' and pangolin with 'Insectivora', according to closest relatives and/or feeding strategy). Species names in parentheses are those detected only by our experimental second canopy camera-traps (Bornean pygmy squirrel and Temminck's flying squirrel). Species shaded grey are those thought to be present at our sampling locations and likely detectable using camera-traps, but not detected in this study. Assumption of presence and detectability was based on known body size, geographic distribution, elevation range, habitat preferences (information obtained from Payne & Francis 2007, and the IUCN Red List, accessed February 2021), as well as data from live-trapping studies at our sampling locations (S. Heon, *pers. comm.*). *Asterisks denote species endemic to Borneo. Note that Brooke's squirrel was previously known only from mountains outside of our sampling locations, and our records here likely reflect a range expansion. Three species frequently detected by canopy camera-traps, but recorded once each on terrestrial camera-traps, were classed as arboreal in line with available knowledge and considering the one-off nature of these records in the context of our extensive sampling period. These species were: Thomas' flying squirrel (1 terrestrial record, 58 canopy records), Sabah grey langur (1 terrestrial record, 98 canopy records) and maroon langur (1 terrestrial record, 230 canopy records).

Order	Family	Species	Forest type: Detected vs. (presumed, where different)	Strata: Detected vs. (presumed, where different)	IUCN Threat Status	Body Size	Taxonomic Group
Carnivora	Felidae	*Catopuma badia** Borneo bay cat*	n/a (both)	n/a (terrestrial)	threatened	medium	Carnivora
		Neofelis diardi Sunda clouded leopard	Both	Terrestrial (semi-arboreal)	threatened	large	Carnivora
		Pardofellis marmorata Marbled cat	Both	Terrestrial (semi-arboreal)	not threatened	medium	Carnivora
		Prionailurus bengalensis Leopard cat	Both	Terrestrial	not threatened	medium	Carnivora
		Prionailurus planiceps Flat-headed cat	n/a (both)	n/a (terrestrial)	threatened	medium	Carnivora
	Herpestidae	*Herpestes brachyurus* Short-tailed mongoose	Both	Terrestrial	not threatened	medium	Carnivora

		Herpestes semitorquatus Collared mongoose	Unlogged (both)	Terrestrial	not threatened	medium	Carnivora
	Mustelidae	*Martes flavigula* Yellow-throated marten	Both	Semi-arboreal	not threatened	medium	Carnivora
		Mustela nudipes Malay weasel	n/a (both)	n/a (terrestrial)	not threatened	medium	Carnivora
		Mydaus javanensis Sunda stink badger	Both	Terrestrial	not threatened	medium	Carnivora
	Viverridae	*Arctictis binturong* Binturong	Both	Semi-arboreal	threatened	large	Carnivora
		Arctogalidia trivirgata Small-toothed palm civet	Both	Arboreal	not threatened	medium	Carnivora
		Cynogale bennettii Otter civet	n/a (both)	n/a (terrestrial)	threatened	medium	Carnivora
		Hemigalus derbyanus Banded civet	Both	Semi-arboreal	not threatened	medium	Carnivora
		*Hemigalus hosei** Hose's civet*	n/a (both)	n/a (terrestrial)	threatened	medium	Carnivora
		Paguma larvata Masked palm civet	Both	Terrestrial (semi-arboreal)	not threatened	medium	Carnivora
		Paradoxurus hermaphroditus Common palm civet	Unlogged (both)	Terrestrial (semi-arboreal)	not threatened	medium	Carnivora
		Viverra tangalunga Malay civet	Both	Terrestrial	not threatened	medium	Carnivora
	Prionodontidae	*Prionodon linsang* Banded linsang	n/a (both)	n/a (semi-arboreal)	not threatened	medium	Carnivora
	Ursidae	*Helarctos malayanus* Sun bear	Both	Terrestrial (semi-arboreal)	threatened	large	Carnivora
Cetartiodactyla	Suidae	*Sus barbatus* Bearded pig	Both	Terrestrial	threatened	large	Ungulates
	Tragulidae	*Tragulus kanchil* Lesser mousedeer	Both	Terrestrial	not threatened	medium	Ungulates
		Tragulus napu Greater mousedeer	Both	Terrestrial	not threatened	medium	Ungulates

	Cervidae	*Muntiacus atherodes* Bornean yellow muntjac	Both	Terrestrial	not threatened	large	Ungulates
		Muntiacus muntjak Red muntjac	Both	Terrestrial	not threatened	large	Ungulates
		Rusa unicolor Sambar deer	Both	Terrestrial	threatened	large	Ungulates
	Bovidae	*Bos javanicus* Banteng	Logged (both)	Terrestrial	threatened	large	Ungulates
Dermoptera	Cynocephalidae	*Galeopterus variegatus* Sunda colugo	Both	Arboreal	not threatened	medium	Gliding mammals
Eulipotyphla	Erinaceidae	*Echinosorex gymnura* Moonrat	Both	Terrestrial	not threatened	small	Insectivora
Pholidota	Manidae	*Manis javanica* Sunda pangolin	Both	Terrestrial (semi-arboreal)	threatened	medium	Insectivora
Primates	Cercopithecidae	*Presbytis rubicunda** Maroon langur*	Both	Arboreal	threatened	large	Primates
		*Presbytis sabana** Sabah grey langur*	Unlogged (both)	Arboreal	threatened	large	Primates
		Macaca fascicularis Long-tailed macaque	Unlogged (both)	Semi-arboreal	threatened	large	Primates
		Macaca nemestrina Pig-tailed macaque	Both	Semi-arboreal	threatened	large	Primates
	Hylobatidae	*Hylobates funereus** Bornean gibbon*	Both	Arboreal	threatened	large	Primates
	Lorisidae	*Nycticebus menagensis* Philippine slow loris	n/a (both)	n/a (arboreal)	threatened	small	Primates
	Pongidae	*Pongo pygmaeus** Bornean orangutan*	Logged	Semi-arboreal	threatened	large	Primates
	Tarsiidae	*Cephalopacus bancanus* Horsfield's tarsier	n/a (both)	n/a (arboreal)	threatened	small	Primates
Proboscidea	Elephantidae	*Elephas maximus* Asian elephant	Logged (both)	Terrestrial	threatened	large	Ungulates

Rodentia	Sciuridae	*Aeromys tephromelas* Black flying squirrel	Both	Arboreal	not threatened	medium	Gliding mammals
		*Aeromys thomasi** Thomas' flying squirrel*	Both	Arboreal	not threatened	medium	Gliding mammals
		*Callosciurus adamsi** Ear-spot squirrel*	Logged (both)	Arboreal (semi-arboreal)	not threatened	small	Non-gliding Rodents
		Callosciurus notatus Plantain squirrel	n/a (both)	n/a (semi-arboreal)	not threatened	small	Non-gliding Rodents
		Callosciurus prevostii Prevost's squirrel	Both	Arboreal	not threatened	small	Non-gliding Rodents
		Callosciurus sp. Large mystery squirrel	Logged (both?)	Arboreal	?	small	Non-gliding Rodents
		(Exilisciurus exilis)* (Bornean pygmy squirrel*)	Unlogged (both)	Arboreal	not threatened	small	Non-gliding Rodents
		Hylopetes spadiceus Red-cheeked flying squirrel	n/a (both)	n/a (arboreal)	not threatened	small	Gliding mammals
		Iomys horsfieldi Horsfield's flying squirrel	Logged (both)	Arboreal	not threatened	small	Gliding mammals
		*Lariscus hosei** Four-striped ground squirrel*	n/a (both)	n/a (terrestrial)	not threatened	small	Non-gliding Rodents
		*Petaurillus hosei** Hose's pygmy flying squirrel*	n/a (unlogged)	n/a (arboreal)	not threatened	small	Gliding mammals
		Petaurista petaurista Red giant flying squirrel	Unlogged (both)	Arboreal	not threatened	medium	Gliding mammals
		Petinomys genibarbis Whiskered flying squirrel	n/a (both)	n/a (arboreal)	Threatened	small	Gliding mammals
		(Petinomys setosus) (Temminck's flying squirrel)	Unlogged (both)	Arboreal	Threatened	small	Gliding mammals
		Pteromyscus pulverulentus Smoky flying squirrel	Unlogged	Arboreal	Threatened	small	Gliding mammals
		Ratufa affinis Giant squirrel	Both	Arboreal	not threatened	medium	Non-gliding Rodents
		*Rheithrosciurus macrotis** Tufted ground squirrel*	Both	Semi-arboreal	Threatened	medium	Non-gliding Rodents

	*Sundasciurus brookei** Brooke's squirrel*	Both (unlogged)	Arboreal	not threatened	small	Non-gliding Rodents
	Sundasciurus lowii Low's squirrel	Both	Semi-arboreal	not threatened	small	Non-gliding Rodents
	Sundasciurus hippurus Horse-tailed squirrel	Both	Semi-arboreal	not threatened	small	Non-gliding Rodents
Muridae	*Chiropodomys major** Large pencil-tailed tree mouse*	n/a (both)	n/a (arboreal)	not threatened	small	Non-gliding Rodents
	*Haeromys margarettae** Ranee mouse*	n/a (both)	n/a (semi-arboreal)	not threatened	small	Non-gliding Rodents
	Leopoldamys sabanus Long-tailed giant rat	Unlogged (both)	Terrestrial	not threatened	small	Non-gliding Rodents
	*Maxomys baeodon** Small spiny rat*	n/a (both)	n/a (terrestrial)	not threatened	small	Non-gliding Rodents
	*Maxomys ochraceiventer** Chestnut-bellied spiny rat*	n/a (both)	n/a (terrestrial)	not threatened	small	Non-gliding Rodents
	Maxomys rajah Brown spiny rat	Unlogged	Terrestrial	Threatened	small	Non-gliding Rodents
	Maxomys surifer Red spiny rat	Logged	Terrestrial	not threatened	small	Non-gliding Rodents
	Maxomys whiteheadi Whitehead's rat	Unlogged (both)	Terrestrial	threatened	small	Non-gliding Rodents
	Niviventer cremoriventer Dark-tailed tree rat	n/a (both)	n/a (semi-arboreal)	not threatened	small	Non-gliding Rodents
	Sundamys muelleri Muller's rat	n/a (both)	n/a (semi-arboreal)	not threatened	small	Non-gliding Rodents
Hystricidae	*Hystrix brachyura* Malay porcupine	Both	Terrestrial	not threatened	medium	Non-gliding Rodents
	*Hystrix crassispinis** Thick-spined porcupine*	Both	Terrestrial	not threatened	medium	Non-gliding Rodents
	Trichys fasciculata Long-tailed porcupine	Both	Terrestrial	not threatened	medium	Non-gliding Rodents

Scandentia	Ptilocercidae	*Ptilocercus lowii* Pentail treeshrew	Logged (both)	Arboreal	not threatened	small	Insectivora
	Tupaiidae	*Tupaia dorsalis** Striped treeshrew*	n/a (both)	n/a (terrestrial)	not threatened	small	Insectivora
		*Tupaia gracilis** Slender treeshrew*	n/a (both)	n/a (semi-arboreal)	not threatened	small	Insectivora
		*Tupaia longipes** Plain treeshrew*	Both	Semi-arboreal (terrestrial)	not threatened	small	Insectivora
		Tupaia tana Large treeshrew	Unlogged (both)	Terrestrial	not threatened	small	Insectivora
		Tupaia minor Lesser treeshrew	Unlogged (both)	Terrestrial (semi-arboreal)	not threatened	small	Insectivora

Table S3. Community structure of mammals in each strata and forest type, according to capture events per 100 camera trap nights (CTN). Canopy data are from single canopy camera-traps, except records of Bornean pygmy squirrel, Temminck's flying squirrel and horse-tailed squirrel in unlogged forest, and banded civet in logged forest, which were only detected by our additional canopy camera-traps at those sites (marked by parentheses). Note that the orangutan is known to be absent from Maliau Basin, our unlogged site. Asterisks denote species endemic to Borneo. Shading denotes no captures in that strata and forest type. Indicator species analyses utilised data from the first 91 CTN at each camera location to visualise similarities or dissimilarities between mammal community structure across forest type and, separately, across strata. No indicator species were identified that could be aligned with unlogged or logged forest since the community-level differences between these habitats were weak. Species reported are therefore indicators of terrestrial or canopy strata (denoted 'T' or 'C') according to vector fitting (envfit) or Pearson's coefficient of association based on the ordination and species detection data. Significant values are highlighted in bold.

	Capture Events per 100 CTN				Indicator species (Envfit test)		Indicator species (Pearson association)	
	Canopy Cameras		Terrestrial Cameras					
Species	**Unlogged**	**Logged**	**Unlogged**	**Logged**	**R^2**	**P value**	**Φ**	**P value**
Sunda clouded leopard, *Neofelis diardi borneensis*			0.48	0.04	0.03	0.348	0.21	0.082
Marbled cat, *Pardofellis marmorata*			0.08	0.08	0.03	0.237	0.17	0.193
Leopard cat, *Prionailurus bengalensis*			0.28	0.41	0.07	0.045	**0.33**	**0.002 (T)**
Short-tailed mongoose, *Herpestes brachyurus*			0.63	0.34	0.05	0.116	**0.26**	**0.002 (T)**
Collared mongoose, *Herpestes semitorquatus*			0.13					
Yellow-throated marten, *Martes flavigula*	0.18	0.19	0.25	0.30	0.03	0.325	0.02	0.924
Sunda stink badger, *Mydaus javanensis*			0.05	0.04				
Binturong, *Arctictis binturong*	0.25	0.16	0.08	0.08	0.01	0.833	0.05	0.713
Small-toothed palm civet, *Arctogalidia trivirgata*	0.31	1.73			**0.19**	**0.001 (C)**	**0.42**	**<0.001 (C)**
Banded civet, *Hemigalus derbyanus*		(0.01)	2.88	1.39	**0.15**	**0.004 (T)**	**0.47**	**<0.001 (T)**
Masked palm civet, *Paguma larvata*			0.23	0.11	0.07	0.063	**0.25**	**0.031 (T)**
Common palm civet, *Paradoxurus hermaphroditus*			0.08					
Malay civet, *Viverra tangalunga*			3.58	5.14	**0.27**	**0.001 (T)**	**0.60**	**<0.001 (T)**
Sun bear, *Helarctos malayanus*			1.20	2.14	**0.17**	**0.003 (T)**	**0.39**	**<0.001 (T)**
Bearded pig, *Sus barbatus*			9.61	28.84	**0.12**	**0.010 (T)**	**0.43**	**<0.001 (T)**
Lesser mousedeer, *Tragulus kanchil*			2.73	8.18	0.08	0.058	**0.28**	**<0.001 (T)**
Greater mousedeer, *Tragulus napu*			14.62	11.97	**0.18**	**0.001 (T)**	**0.53**	**<0.001 (T)**
Bornean yellow muntjac, *Muntiacus atherodes*			14.59	21.91	**0.19**	**0.002 (T)**	**0.51**	**<0.001 (T)**

Red muntjac, *Muntiacus muntjak*			13.29	9.00	**0.20**	**0.001 (T)**	**0.53**	**<0.001 (T)**
Sambar deer, *Rusa unicolor*			1.18	3.98	0.08	0.047	**0.36**	**<0.001 (T)**
Banteng, *Bos javanicus*				1.16	0.02	0.306	0.13	0.199
Sunda colugo, *Galeopterus variegatus*	0.05	0.03			0.03	0.213	0.11	1.000
Moonrat, *Echinosorex gymnurus*			0.58	0.11	0.06	0.105	**0.28**	**0.007 (T)**
Sunda pangolin, *Manis javanica*			0.23	0.04	0.03	0.312	0.17	0.194
Bornean gibbon*, *Hylobates funereus**	0.71	1.03			0.05	0.128	**0.25**	**0.011 (C)**
Orangutan*, *Pongo pygmaeus**		0.93		0.83	0.01	0.587	0.03	0.811
Maroon langur*, *Presbytis rubicunda**	3.41	0.61			0.04	0.186	**0.14**	**0.043 (C)**
Sabah grey langur*, *Presbytis sabana**	1.57				**0.09**	**0.029 (C)**	0.22	0.060
Long-tailed macaque, *Macaca fascicularis*	1.16		0.15		**0.12**	**0.014 (C)**	0.12	0.407
Pig-tailed macaque, *Macaca nemestrina*	0.63	1.93	20.33	12.00	**0.14**	**0.004 (T)**	**0.46**	**<0.001 (T)**
Asian elephant, *Elephas maximus*				0.08				
Black flying squirrel, *Aeromys tephromelas*	0.15	0.19			0.01	0.726	0.15	0.255
Thomas' flying squirrel*, *Aeromys thomasi**	0.81	0.03			**0.20**	**0.001 (C)**	0.18	0.104
Ear-spot squirrel*, *Callosciurus adamsi**		0.42			0.03	0.295	0.13	0.250
Prevost's squirrel , *Callosciurus prevostii*	1.39	4.91			**0.08**	**0.035 (C)**	**0.32**	**<0.001 (C)**
Large mystery squirrel, *Callosciurus sp.?*		0.03						
Bornean pygmy squirrel*, *Exilisciurus exilis**	(0.01)							
Horsfield's flying squirrel, *Iomys horsfieldi*		0.03						
Red giant flying squirrel, *Petaurista petaurista*	0.53				**0.08**	**0.033 (C)**	0.21	0.126
Temminck's flying squirrel, *Petinomys setosus*	(0.01)							
Smoky flying squirrel, *Pteromyscus pulverulentus*	0.02							
Giant squirrel, *Ratufa affinis*	0.38	0.90			0.03	0.238	**0.20**	**0.001 (C)**
Tufted ground squirrel*, *Rheithrosciurus macrotis**	0.02		1.08	0.34	**0.11**	**0.017 (T)**	**0.35**	**<0.001 (T)**
Brooke's squirrel*, *Sundasciurus brookei**	0.08	0.13			0.04	0.161	0.15	0.498
Low's squirrel, *Sundasciurus lowii*		0.03	0.03					
Horse-tailed squirrel, *Sundasciurus hippurus*	(0.04)	0.13	0.05	0.19	0.01	0.990	0.02	1.000
Long-tailed giant rat, *Leopoldamys sabanus*			0.53		0.03	0.316	0.20	0.080
Brown spiny rat, *Maxomys rajah*			0.88		0.03	0.266	**0.21**	**0.034 (T)**
Red spiny rat, *Maxomys surifer*				0.15	0.02	0.555	0.17	0.1895
Whitehead's rat, *Maxomys whiteheadi*			0.08					

Malay porcupine, *Hystrix brachyura*			2.33	2.89	**0.08**	**0.049 (T)**	**0.31**	**<0.001 (T)**
Thick-spined porcupine*, *Thecurus crassispinis**			3.70	0.64	0.03	0.306	**0.21**	**<0.001 (T)**
Long-tailed porcupine, *Trichys fasciculata*			1.05	0.38	0.06	0.109	**0.25**	**0.002 (T)**
Pentail treeshrew, *Ptilocercus lowii*		0.06			0.04	0.183	0.15	0.504
Plain treeshrew*, *Tupaia longipes**	0.02		0.08					
Large treeshrew, *Tupaia tana*			0.08					
Lesser treeshrew, *Tupaia minor*			0.05					

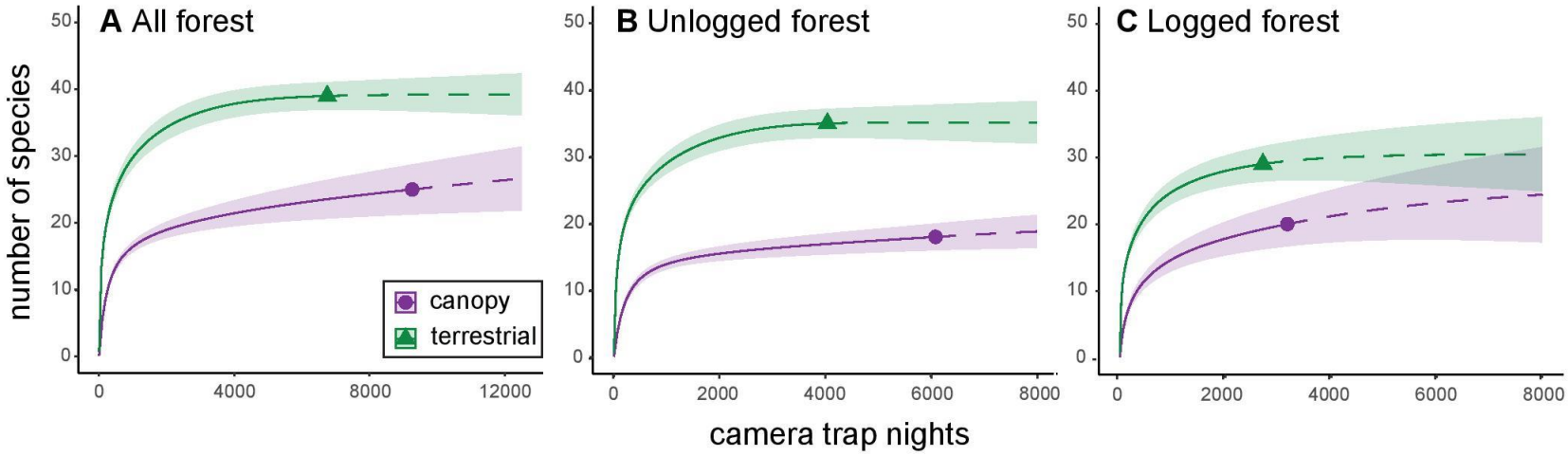

Figure S1 (A-C). Rarefied species accumulation curves for arboreal and terrestrial mammal communities in (A) both forest types combined, (B) unlogged forest only, and (C) logged forest only. Curves were extrapolated (dashed line) to approximately double the minimum observed sample size in each comparison. Confidence intervals were set at 95% and are represented by shaded areas around the curves.

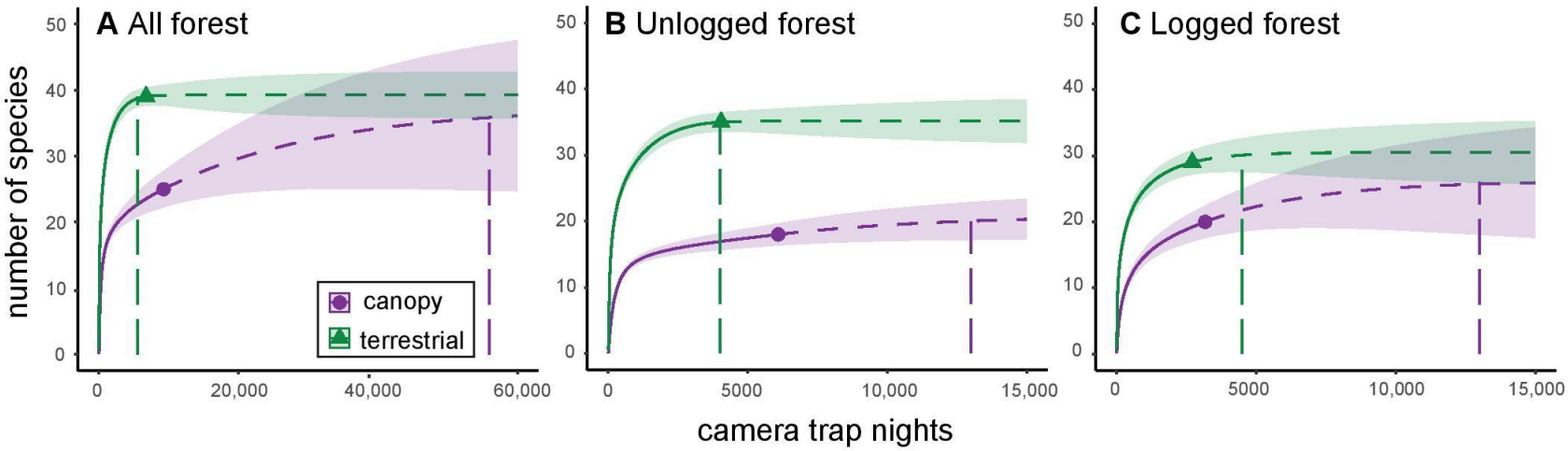

Figure S2 (A-C). Rarefied species accumulation curves for arboreal and terrestrial mammal communities in (A) both forest types combined, (B) unlogged forest only, and (C) logged forest only. Curves were extrapolated (dashed line) to the point of asymptote for arboreal communities. Approximate sampling effort required to reach asymptote is marked by vertical dashed lines. Confidence intervals were set at 84% and are represented by shaded areas around the curves

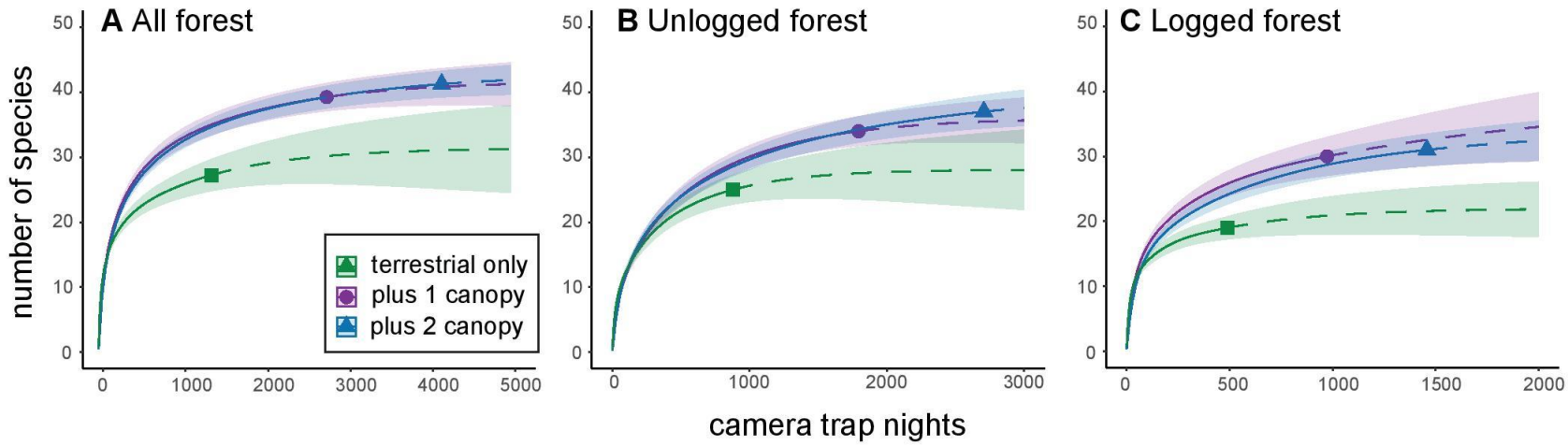

Figure S3 (A-C). Control species accumulation curves for (A) both forest types combined, (B) unlogged forest and (C) logged forest, comparing overall species numbers obtained from a subset of 1,409 CTN each for: terrestrial-only camera-traps, terrestrial camera-traps plus single canopy camera-traps, and terrestrial camera-traps, single canopy camera-traps plus the 19 experimental second canopy camera-traps. Confidence intervals were set at 84% and are represented by shaded areas around the curves.

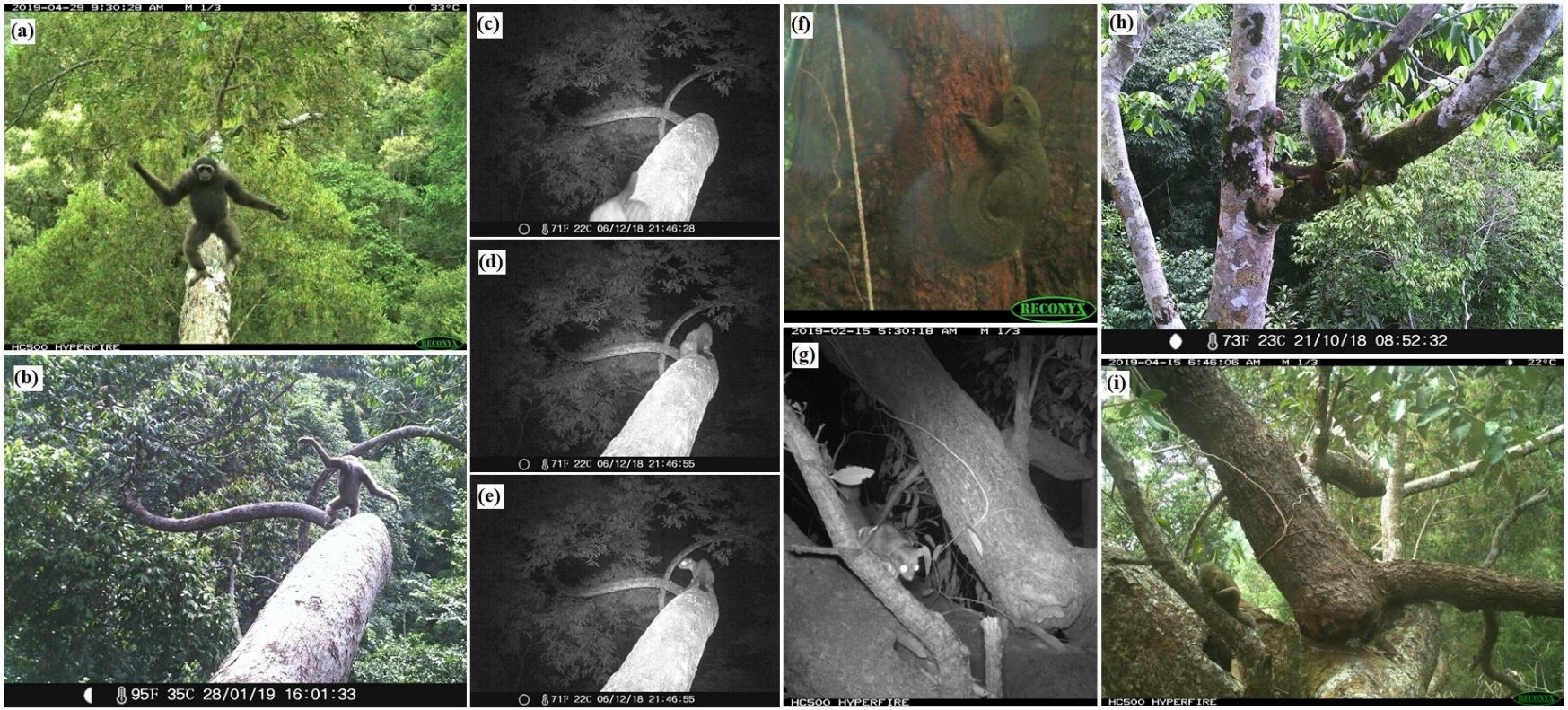

Figure S4. Examples of new insights from canopy camera-traps. (a), (b) branch-walking locomotion in Bornean gibbon *Hylobates funereus*; (c)-(e) likely mating event of the strictly arboreal small-toothed palm civet *Arctogalidia trivirgata* at 33.6 m height; (f) arboreal squirrel not fitting any known description for Bornean species (image cropped for clarity); (g) putative record of smoky flying squirrel *Pteromyscus pulverulentus*, for which no confirmed photographic image currently exists (Thorington et al. 2012, IUCN Red List accessed February 2021); (h) likely scent-marking behaviour in tufted ground squirrel *Rheithrosciurus macrotis*, a rarely-seen Borneo endemic thought to be largely terrestrial; (i) use of the canopy strata (camera-trap at 22 m height) by plain treeshrew *Tupaia longipes*, a species previously considered strictly terrestrial (Payne & Francis 2007).

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