

Evaluation of human disturbance on the activity of medium – large mammals in Myanmar

GIACOMO CREMONESI, FRANCESCO BISI, LORENZO GAFFI, THET ZAW, HLA NAING, KYAW MOE, ZARNI AUNG, ALESSANDRA GAGLIARDI, LUCAS A. WAUTERS, DAMIANO G. PREATONI and ADRIANO MARTINOLI

SUPPLEMENTARY TABLE S1 Sampling effort per site and per session (year): number of camera trap activation days (Days) and number of functioning camera traps per site (Number). Site S001, S002, S003 and S004 were located in Htamanthi Wildlife Sanctuary and S005, S006, S007 and S008 in Rakhine Yoma Elephant Range.

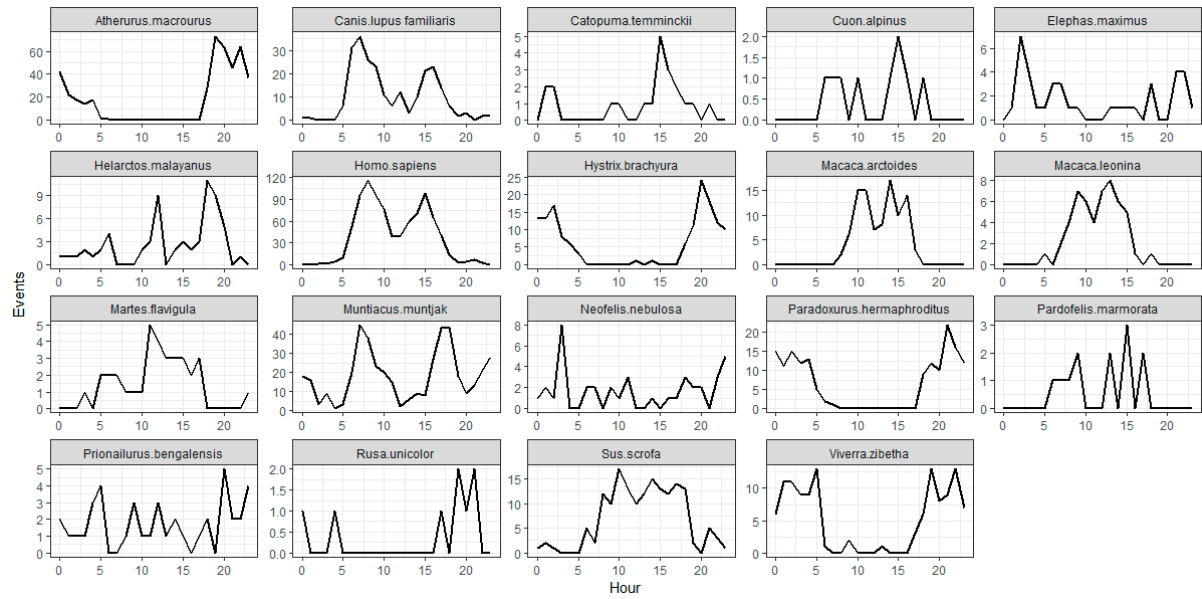
	S001	S002	S003	S004	S005	S006	S007	S008
Year 1								
Days	45	46	45	45	74	57	67	52
Number	27	30	29	28	31	31	28	26
Year 2								
Days	45	46	47	46	56	55	52	51
Number	30	30	30	29	32	29	31	31

SUPPLEMENTARY TABLE S2 Table of the 17 species (without human and domestic dogs) with at least 20 different events and the activity patterns classification given by us and found in literature.

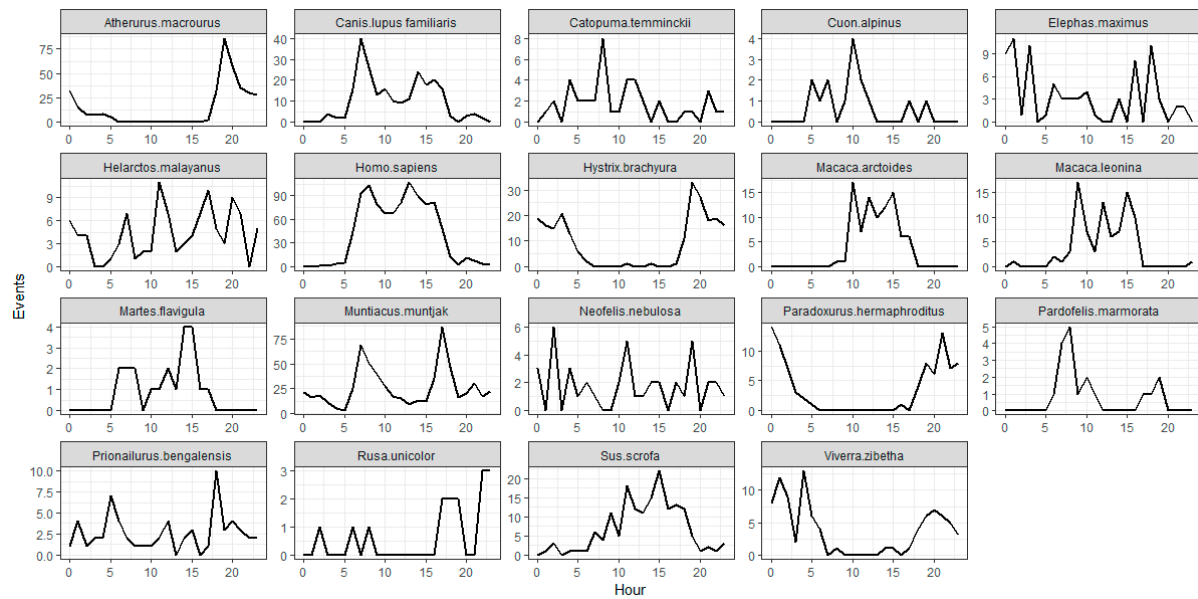
Species	Our classification	Literature classification
<i>Atherurus macrourus</i>	nocturnal	nocturnal (Molur, 2016)
<i>Catopuma temminckii</i>	diurnal	diurnal (Lynam et al., 2013) catheMERal (Azlan, 2006) nocturnal (Kawanishi and Sunquist, 2008)
<i>Cuon alpinus</i>	diurnal	diurnal (Kamler et al., 2012 and Bashir et al., 2014)
<i>Elephas maximus</i>	nocturnal	nocturnal (Youngpoy, 2012 and Gray and Phan, 2011) diurnal (Bhatt et al., 2018)
<i>Helarctos malayanus</i>	catheMERal	mostly diurnal (Wong et al., 2004) mostly nocturnal (Guharajan et al., 2013)
<i>Hystrix brachyura</i>	nocturnal	nocturnal (Gray and Phan, 2011)
<i>Macaca arctoides</i>	diurnal	diurnal (Htun et al., 2008)
<i>Macaca leonina</i>	diurnal	diurnal (Gray and Phan, 2011)
<i>Martes flavigula</i>	diurnal	mostly diurnal (Duckworth, 1997 and Grassman et al., 2005)
<i>Muntiacus muntjak</i>	diurnal	diurnal (Ross et al., 2013) catheMERal (Gray and Phan, 2011)
<i>Neofelis nebulosa</i>	nocturnal	nocturnal (Lynam et al., 2013) mostly nocturnal (Azlan, 2006)
<i>Paradoxurus hermaphroditus</i>	nocturnal	nocturnal (Gray and Phan, 2011) nocturnal (Joshi et al., 1995)
<i>Pardofelis marmorata</i>	diurnal	diurnal (Ross et al., 2010 and Lynam et al., 2013).
<i>Prionailurus bengalensis</i>	nocturnal	catheMERal (Gray and Phan, 2011) mostly nocturnal (Azlan, 2006)
<i>Rusa unicolor</i>	nocturnal	Nocturnal (Ross et al., 2013. Kamler et al., 2012)
<i>Sus scrofa</i>	diurnal	catheMERal (Gray and Phan, 2011) diurnal (Kawanishi and Sunquist, 2008)
<i>Viverra zibetha</i>	nocturnal	nocturnal (Gray and Phan, 2011)

SUPPLEMENTARY TABLE S3 Table of the 19 species with at least 20 detection and their percentage of daily activity overlap (Delta) between year 1 and year 2. CI represent the confidence interval (min. and max.). The species are divided by area (Rakhine and Sagaing). Asterisks denote where the overlap is considered low ($\Delta < 0.50$) with a possible differences between years.

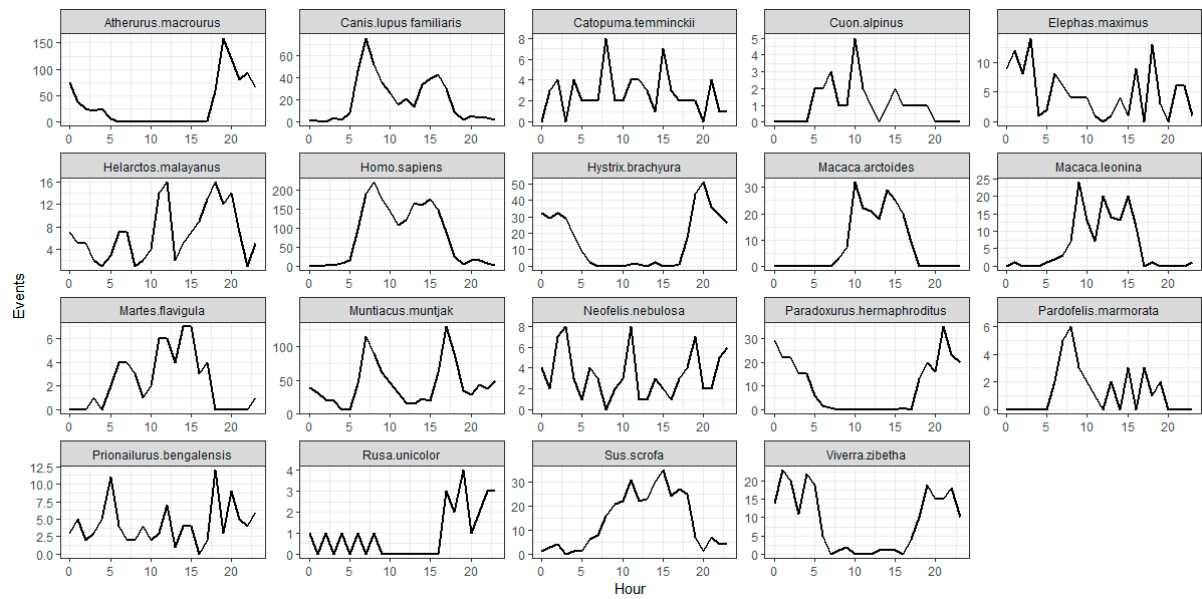
Species	Area	Delta	CImin	CImax
<i>Atherurus macrourus</i>	Rakhine	/	/	/
	Sagaing	0.88	0.81	0.94
<i>Canis lupus familiaris</i>	Rakhine	0.84	0.78	0.90
	Sagaing	/	/	/
<i>Catopuma temminckii</i>	Rakhine	0.44*	0.26	0.65
	Sagaing	0.53	0.44	0.82
<i>Cuon alpinus</i>	Rakhine	0.56	0.51	0.99
	Sagaing	0.06*	0.01	0.14
<i>Elephas maximus</i>	Rakhine	0.76	0.66	0.91
	Sagaing	/	/	/
<i>Helarctos malayanus</i>	Rakhine	0.71	0.58	0.80
	Sagaing	0.60	0.44	0.82
<i>Homo sapiens</i>	Rakhine	0.88	0.84	0.91
	Sagaing	0.81	0.76	0.99
<i>Hystrix brachyura</i>	Rakhine	0.86	0.79	0.94
	Sagaing	0.85	0.78	0.99
<i>Macaca arctoides</i>	Rakhine	/	/	/
	Sagaing	0.89	0.84	0.99
<i>Macaca leonina</i>	Rakhine	0.81	0.72	0.97
	Sagaing	0.60	0.36	0.78
<i>Martes flavigula</i>	Rakhine	/	/	/
	Sagaing	0.71	0.56	0.90
<i>Muntiacus muntjak</i>	Rakhine	0.85	0.81	0.94
	Sagaing	0.83	0.78	0.90
<i>Neofelis nebulosa</i>	Rakhine	0.51	0.33	0.79
	Sagaing	0.70	0.62	0.97
<i>Paradoxurus hermaphroditus</i>	Rakhine	0.84	0.79	0.99
	Sagaing	0.81	0.69	0.93
<i>Pardofelis marmorata</i>	Rakhine	/	/	/
	Sagaing	0.50	0.26	0.75
<i>Prionailurus bengalensis</i>	Rakhine	0.69	0.57	0.86
	Sagaing	0.56	0.43	0.89
<i>Rusa unicolor</i>	Rakhine	0.65	0.49	0.98
	Sagaing	/	/	/
<i>Sus scrofa</i>	Rakhine	0.73	0.56	0.81
	Sagaing	0.87	0.84	0.99
<i>Viverra zibetha</i>	Rakhine	0.85	0.81	0.99
	Sagaing	0.64	0.47	0.84



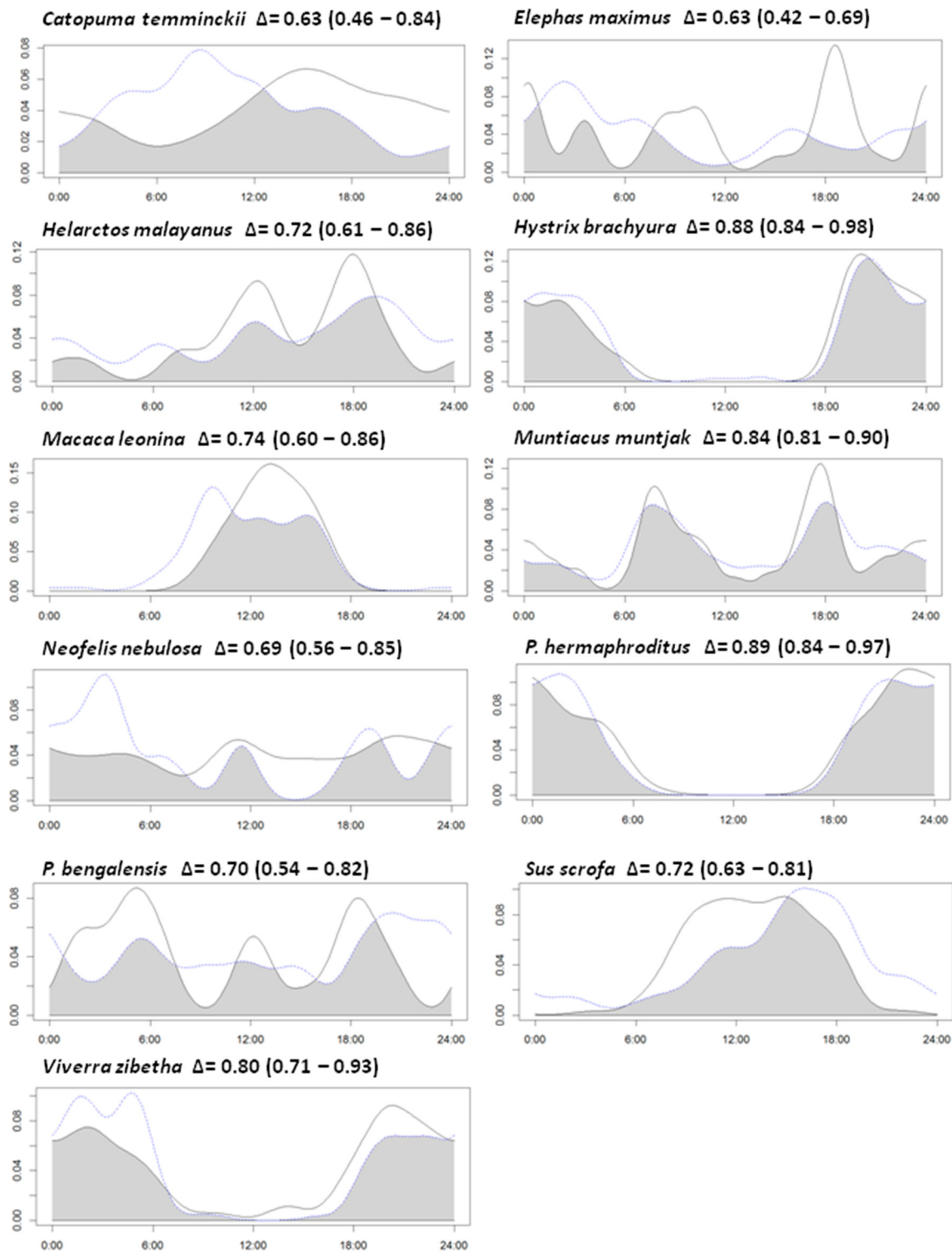
SUPPLEMENTARY FIG. S1 Activity patterns of the 19 mammals species with at least 20 detection recorded in both areas (Rakhine and Sagaing) the first year (2016 - 2017). Y axis shows number of events, X axis shows time of the day (0=midnight, standard time, since Myanmar does not use DST).



SUPPLEMENTARY FIG. S2 Activity patterns of the 19 mammals species with at least 20 detection recorded in both areas (Rakhine and Sagaing) the second year (2017 - 2018). Y axis shows number of events, X axis shows time of the day (0=midnight, standard time, since Myanmar does not use DST).



SUPPLEMENTARY FIG. S3 Activity patterns of the 19 mammal species with at least 20 detection recorded in both areas (Rakhine and Sagaing) with both years together (2016 – 2017 and 2017 - 2018). Y axis shows number of events, X axis shows time of the day (0=midnight, standard time, since Myanmar does not use DST).



SUPPLEMENTARY FIG. S4 Overlap between the kernel density curve of the activity of the same species in a low human impact area (Sagaing, continuous lines) and a high human impact area (Rakhine, dotted lines). The area colored in dark grey represent the percentage of overlaps (Δ). In the X axis are reported the hours of the day, in the Y axis the density of the activity in the 24h.

REFERENCES

- Azlan, J. M. & Sharma, D. S. (2006). The diversity and activity patterns of wild felids in a secondary forest in Peninsular Malaysia. *Oryx*, 40(1), 36-41.
- Bashir, T. A. W. Q. I. R., Bhattacharya, T., Poudyal, K., Roy, M., & Sathyakumar, S. (2014). Precarious status of the Endangered dhole *Cuon alpinus* in the high elevation Eastern Himalayan habitats of Khangchendzonga Biosphere Reserve, Sikkim, India. *Oryx*, 48(1), 125-132.
- Bhatt, U. M., Habib, B., Sarma, H. K., & Lyngdoh, S. (2018). Catch me if you can: Species interactions and moon illumination effect on mammals of tropical semi-evergreen forest of Manas National Park, Assam, India. *BioRxiv*, 449918.
- Duckworth, J.W. (1997). Small carnivores in Laos: a status review with notes on ecology, behaviour and conservation. *Small Carnivore Conservation* 16: 1–21.
- Grassman, L.I., Jr., Tewes, M.E. & Silvy, N.J. (2005). Ranging, habitat use and activity patterns of binturong *Arctictis binturong* and yellow-throated marten *Martes flavigulain* north-central Thailand. *Wildlife Biology* 11: 49-57.
- Gray, T. N., & Phan, C. (2011). Habitat preferences and activity patterns of the larger mammal community in Phnom Prich Wildlife Sanctuary, Cambodia. *The Raffles Bulletin of Zoology*, 59(2), 311-318.
- Guharajan, R., Arnold, T. W., Bolongon, G., Dibden, G. H., Abram, N. K., Teoh, S. W., ... & Garshelis, D. L. (2018). Survival strategies of a frugivore, the sun bear, in a forest-oil palm landscape. *Biodiversity and conservation*, 27(14), 3657-3677.
- Htun, S., Timmins, R.J., Boonratana, R. & Das, J.(2008). *Macaca arctoides* . *The IUCN Red List of Threatened Species* 2008: e.T12548A3354519.
- Joshi, A. R., David Smith, J. L., & Cuthbert, F. J. (1995). Influence of food distribution and predation pressure on spacing behavior in palm civets. *Journal of Mammalogy*, 76(4), 1205-1212.
- Kamler, J. F., Johnson, A., Vongkhamheng, C., & Bousa, A. (2012). The diet, prey selection, and activity of dholes (*Cuon alpinus*) in northern Laos. *Journal of Mammalogy*, 93(3), 627-633.
- Kawanishi, K., & Sunquist, M. E. (2008). Food habits and activity patterns of the Asiatic golden cat (*Catopuma temminckii*) and dhole (*Cuon alpinus*) in a primary rainforest of Peninsular Malaysia. *Mammal Study*, 33(4), 173-177.
- Lynam, A. J., Jenks, K. E., Tantipisanuh, N., Chutipong, W., Ngoprasert, D., Gale, G. A., ... & Cutter, P. (2013). Terrestrial activity patterns of wild cats from camera-trapping. *Raffles Bulletin of Zoology*, 61(1).
- Molur, S. (2016). *Atherurus macrourus*. The IUCN red list of threatened species 2016: e. T2354A22231214.
- Ross, J., Hearn, A. J., Bernard, H., Secoy, K., & Macdonald, D. (2010). A Framework for a Wild Cat Action Plan for Sabah. Global Canopy Programme.
- Ross, J., Hearn, A. J., Johnson, P. J., & Macdonald, D. W. (2013). Activity patterns and temporal avoidance by prey in response to Sunda clouded leopard predation risk. *Journal of Zoology*, 290(2), 96-106.
- Wong, S.T., Servheen, C. W., & Ambu, L. (2004). Home range, movement and activity patterns, and bedding sites of Malayan sun bears *Helarctos malayanus* in the rainforest of Borneo. *Biological Conservation*, 119(2), 169-181.
- Youngpoy, N. (2012). *Population and Activities of Wild Elephants (Elephas Maximus) in Salakphan Wildlife Sanctuary, Kanchanaburi Province, Thailand* (Doctoral dissertation, Mahidol University).