Journal of Threatened Taxa

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

Communication

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26 October 2019 | Vol. 11 | No. 13 | Pages: 14631–14642
DOI: 10.11609/jott.5013.11.13.14631-14642

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 October 2019 | 11(13): 14631–14642

Camera trap survey of mammals in Cleopatra's Needle Critical Habitat in Puerto Princesa City, Palawan, Philippines

Paris N. Marler [1], Solomon Calago [2], Mélanie Ragon [3] & Lyca Sandrea G. Castro [4]

[1],[2] Centre for Sustainability PH, Inc. PENRO Road, Puerto Princesa City, 5300 Palawan, Philippines.
[3] 1321 Route de Deyrier, 74350 Cruseilles, France.
[4] Western Philippines University-Puerto Princesa Campus, Sta. Monica, Puerto Princesa City, Palawan, Philippines.
[1] pariscsph@gmail.com (corresponding author), [2] solomoncsph@gmail.com, [3] ragon.melanie.r@gmail.com,
[4] lycasandrea_castro@yahoo.com

ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

PLATINUM OPEN ACCESS

Abstract: A camera trap survey was conducted in the recently protected Cleopatra's Needle Critical Habitat (CNCH) in Puerto Princesa City, Palawan, Philippines from February to May 2015 at 39 camera trap sites. A bait of common pig's blood was used at 36 sites, while the three remaining sites were surveyed without a bait and monitored a stream with a latrine site or mud bath with tracks. Seven native species were detected and three of these species were endemic to the island province. Species included: Common Palm Civet *Paradoxurus philippinensis*, Palawan Porcupine *Hystrix pumila*, Collared Mongoose *Urva semitorquata*, Palawan Stink Badger *Mydaus marchei*, Palawan Leopard Cat *Prionailurus bengalensis heaneyi*, Asian Small-clawed Otter *Aonyx cinereus*, and Malay Civet *Viverra tangalunga*. Analysis of the activity patterns of the three most commonly captured species revealed predominantly nocturnal activity for the Common Palm Civet, Palawan Porcupine, and Palawan Stink Badger. The Philippine Palm Civet showed occasional diurnal activity. The seven photo-captured species appeared most common, or were at the least recorded, below 750m. Five species (the Philippine Palm Civet, Palawan Porcupine, Collared Mongoose, Palawan Stink Badger, and Palawan Leopard Cat) were also recorded above 1000m. The CNCH supports two threatened species, the Palawan Porcupine and the Asian Small-clawed Otter, which are listed as Vulnerable by the IUCN, and the Collared Mongoose is listed as Near Threatened. The Palawan Leopard Cat is considered Vulnerable within the Philippines, although it has yet to be assessed by the IUCN. This documentation highlights the biodiversity significance within the newly protected critical habitat and the need to support ongoing conservation efforts within the critical habitat.

Keywords: Activity patterns, camera trap, carnivores, Felidae, Herpestidae, Hystricidae, Mephitidae, Mustelidae, Viverridae.

Abbreviations: CNCH—Cleopatra's Needle Critical Habitat | IUCN—International Union for the Conservation of Nature | SD—Secure Digital.

DOI: https://doi.org/10.11609/jott.5013.11.13.14631-14642 | **ZooBank:** urn:lsid:zoobank.org:pub:6E79FC3B-C503-4CA4-820C-CB3752D014E5

Editor: Giovanni Amori, CNR - Institute of Research on Terrestrial Ecosystems, Roma, Italy. **Date of publication:** 26 October 2019 (online & print)

Manuscript details: #5013 | Received 16 April 2019 | Final received 06 June 2019 | Finally accepted 26 September 2019

Citation: Marler, P.N., S. Calago, M. Ragon & L.S.G. Castro (2019). Camera trap survey of mammals in Cleopatra's Needle Critical Habitat in Puerto Princesa City, Palawan, Philippines. *Journal of Threatened Taxa* 11(13): 14631–14642. https://doi.org/10.11609/jott.5013.11.13.14631-14642

Funding: IdeaWild, Centre for Sustainability PH, Inc., Southsea Exclusive Philippines, Inc.

Competing interests: The authors declare no competing interests.

Author details: Paris N. Marler graduated from the University of California, Berkeley and is currently a researcher with Centre for Sustainability PH, Inc. Her past research involved conservation and ecology of *Cycas micronesica*. Solomon Calago is the senior field officer and co-founder at Centre For Sustainability Philippines, Inc. He is an expert cave spelunker and leads the cave spelunking team with research and cave assessments. He also leads tree-climbing and cone collection for tree propagation in the Saving the Almaciga Tree Project. He assists with any education and assessment research. Mélanie Ragon has a license degree in rural planning and geography in the University of Lyon 3. Her master work (in sustainable tourism) focused on the touristic potentiality of the rural places in France. Lyca Sandrea G. Castro is a faculty at the College of Fisheries and Aquatic Sciences, Western Philippines University.

Author contribution: PM—conceptualized study, collected and analyzed data, wrote final version of manuscript. SC—collected data, translated in the field. MR—collected and analyzed data. LC—supervised study, helped in the revision of the manuscript.

Acknowledgements: We thank the following: Batak and Tagbanua residents in the communities (sitios) Kalakwasan and Tagnaya for allowing us to pursue this study in their forest; the Barangays Tanabag, Concepcion, and Binduyan for their support; Wing Wing Sican, Anito Dinampo, Jobert Alisin, and Adono Mutin for their valuable work as porter guides throughout this study; Centre for Sustainability PH, Inc. and Southsea Exclusive Philippines, Inc. for providing personnel and resources necessary for this project; Idea Wild for the camera traps used in this study; the Palawan Council for Sustainable Development Staff (PCSDs) for the permits necessary to conduct this fieldwork and the College of Fisheries & Aquatic Sciences at Western Philippine University (WPU) for the personnel and faculty support for this project.

INTRODUCTION

The seven carnivore species inhabiting Palawan, Philippines belong to five families: Viverridae, Herpestidae, Mephitidae, Felidae, and Mustelidae (Esselstyn et al. 2004). One porcupine species (family Hystricidae) also inhabits this island province (Esselstyn et al. 2004). Of these eight species, four are endemic to Palawan: Palawan Porcupine *Hystrix pumila* Günther, 1879; Palawan Stink Badger *Mydaus marchei* Huet, 1887; Palawan Leopard Cat *Prionailurus bengalensis heaneyi* Groves, 1997; and Palawan Bearcat *Arctictis binturong whitei* Allen, 1910. The remaining four species are indigenous: Common Palm Civet *Paradoxurus philippinensis* Jourdan, 1837; Collared Mongoose *Urva semitorquata* Gray, 1846; Malay Civet *Viverra tangalunga* Gray, 1832; and Asian Small-clawed Otter *Aonyx cinereus* Illiger, 1815. Researchers have reported the occurrence and morphology of these species in Palawan since the early 20th century (Allen 1910; Sanborn 1952; Rabor et al. 1986; Heaney et al. 1998; Esselstyn et al. 2004; Castro & Dolorosa 2006; Santiago-Flores et al. 2010; Manalo et al. 2016). Veron et al. (2015a & b) recently conducted molecular analyses of *U. semitorquata* and *P. philippinensis* in Palawan, resulting in some taxonomic changes.

Deforestation and mining are widespread in Palawan, evident in the 11% of forest loss between 2000 and 2005 and over 300 pending mining applications in 2008 (Mallari et al. 2011). Increased human immigration to Palawan has put greater stress on the land to sustain agriculture for the growing human population (Shivley & Martinez 2001). These mounting environmental pressures have been inadequately studied, but may have devastating effects on the habitats of the island's native species. We need ongoing ecological research to increase our understanding of how Palawan's wildlife will respond to the accumulating anthropogenic changes and how we can protect Palawan's wildlife.

In 2017, as part of a collaborative effort by the Centre for Sustainability PH, Inc., the City Government of Puerto Princesa, and the Palawan Council for Sustainable Development, the Cleopatra's Needle Critical Habitat (CNCH) in northeast Puerto Princesa City, Palawan was legally proclaimed, as per the Philippine Wildlife Act. This effort has safeguarded the native species occupying this forest from deforestation, while ensuring the rights of access for the Batak and Tagbanua indigenous people communities living within the critical habitat. Prior surveys of mammals within this newly-protected forest have been limited in sampling time and extent (Esselstyn et al. 2004; Marler et al. 2018).

In this study we aimed to document the eight target mammal species within the CNCH and observe patterns in the activity times of these species using baited and unbaited camera traps over a four-month period. The findings from this study contributed to the 2017 protection of the CNCH and will help guide future mammal research in this forest. We provide elevational occurrence and for the first time, activity patterns for several species of mammals in Palawan.

MATERIALS AND METHODS

Study Area

The CNCH is situated in Puerto Princesa City, Palawan, Philippines, approximately 50km north of the city proper (Figure 1b). Seven 'barangays' (Tagalog: smallest political districts in the Philippines) that comprise the 41,350-hectare critical habitat include: Binduyan, Concepcion, Langogan, New Pangangan, San Rafael, Tagabinet, and Tanabag. The centerpiece of the CNCH is Cleopatra's Needle Mountain (10.123^{0}N & 118.995^{0}E 1,593m; Figure 2). The CNCH is adjacent to the Puerto Princesa Subterranean River National Park, which extends to the west coast of the island. The CNCH is bordered by the Sulu Sea to the southeast. Major vegetation types in the CNCH include: lowland tropical/ evergreen forest, lower montane forest, mossy forest, swamp forest, beach forest, and cultivated land for perennial and annual crops (Fernando et al. 2008). This study was conducted between February and May of 2015 in three political districts within the CNCH: Binduyan, Concepcion, and Tanabag. Study sites spanned lowland tropical forest (0–~900 m), lower montane forest (~900–~1100 m), and mossy forest (~1100–~1593 m) (Table 1).

METHODS

Camera trapping was conducted using Bushnell Trophy Cams (Model 119537C and Model 119436C). These trail cameras use a passive infrared (PIR) motion sensor, wherein cameras are triggered when heat passes within the detection cone of the infrared sensor. The cameras use built in infrared LED's to capture low light images and a color flash to capture brighter, daytime images. Model 119537C was capable of recording photographs or videos, while Model 119436C was capable of recording photographs followed by a video.

When camera model 119537C was used, it was set to

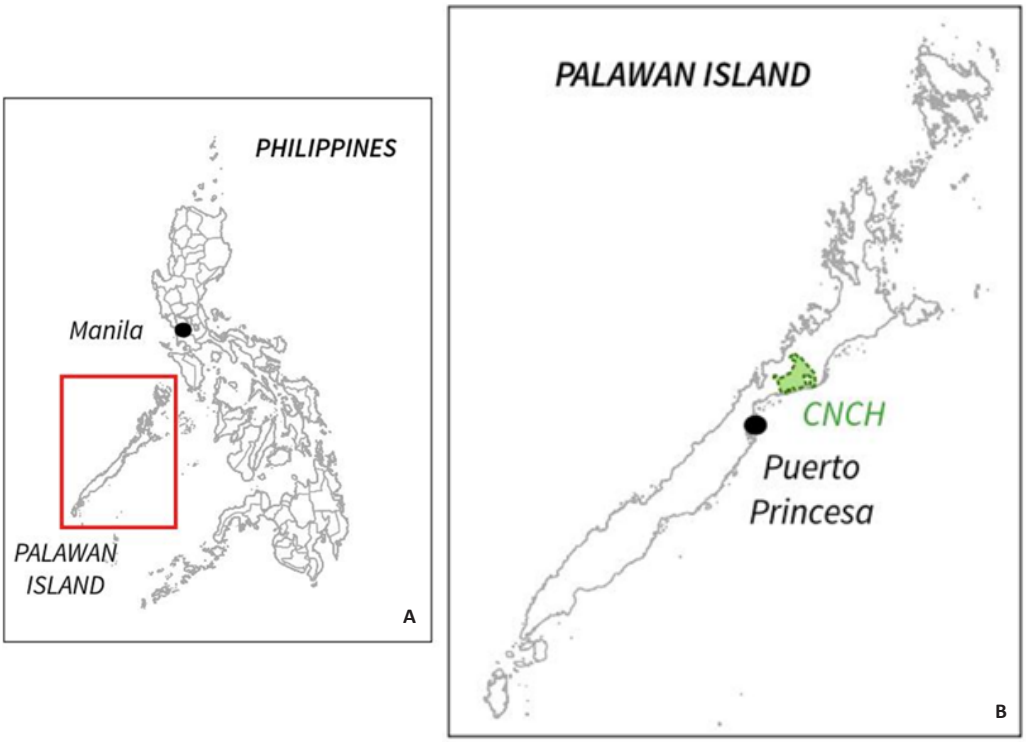

Figure 1. A—Palawan in the Philippines | B—Cleopatra's Needle Critical Habitat in Palawan. © Centre for Sustainability PH, Inc.

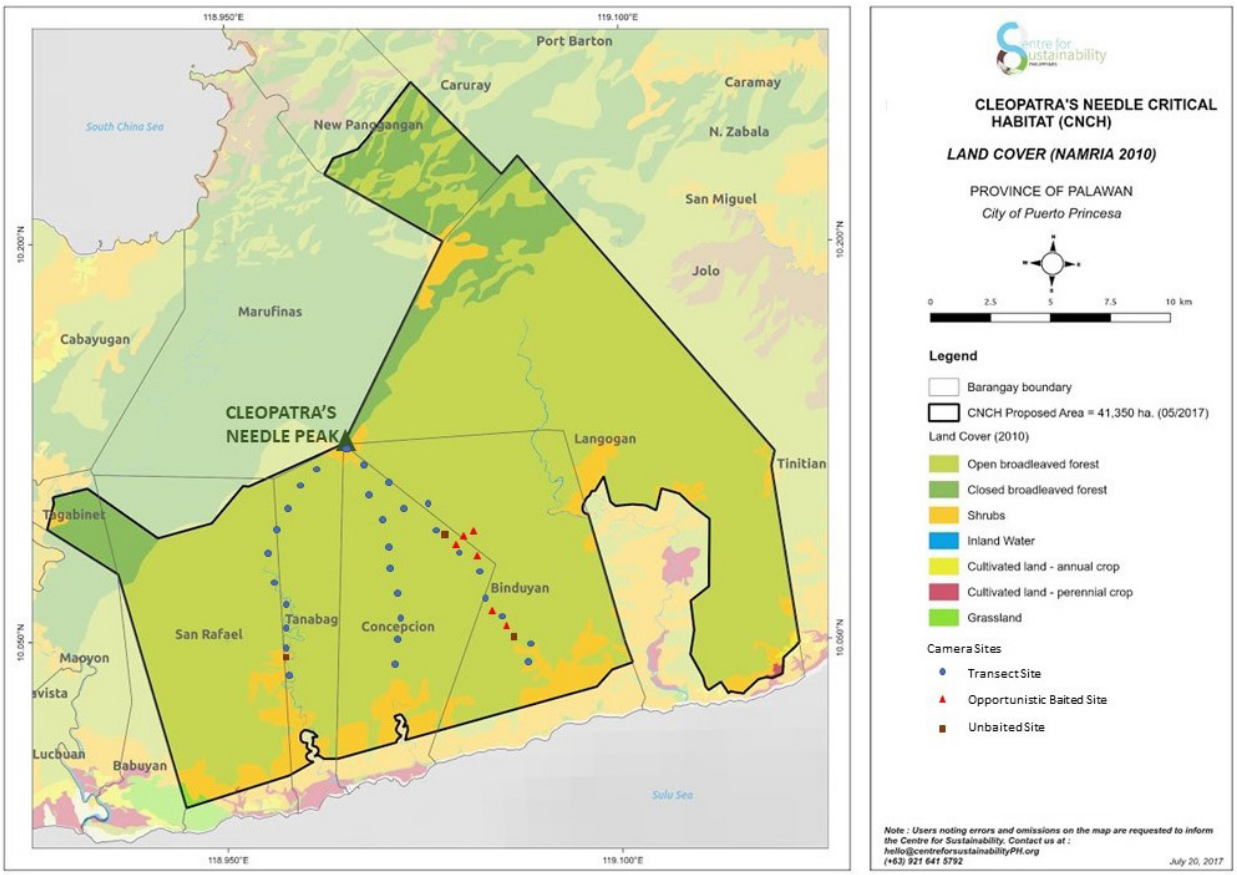

Figure 2. Map of the Cleopatra's Needle Critical Habitat with the locations of 39 camera trap sites. © Centre for Sustainability PH, Inc.

Table 1. Camera trap effort and elevational occurrence for the study sites in the Cleopatra's Needle Critical Habitat.

Study location	Camera trap effort		Trap-nights per elevation Unit (m)						
	Trap-nights	Hours	0–250	251–500	501–750	751–1000	1001–1250	1251–1500	1501–1593
Transect sites	769	8,456	129	280	96	144	96	0	24
Opportunistic baited sites	73	1,752	0	11	23	39	0	0	0
Unbaited sites	81	1,944	7	37	0	0	37	0	0
Total	923	12,152	136	328	119	183	133	0	24

take three photographs; when camera model 119436C was used, it was set to take three photographs followed by a 10-second video. A 32GB secure digital (SD) card was used in each camera. Cameras functioned for 24-hour cycles with a five-second trigger time between trigger events. Cameras were deployed at 39 locations throughout the critical habitat for a total of 12,152 trapping hours (Table 1). Thirty sites in three transects were referred to as the 'transect sites;' six sites set randomly were referred to as the 'opportunistic baited sites;' and three sites set near a stream or mud bath were referred to as the 'unbaited sites' (Figure 2).

For the transect sites, 10 cameras were set along each of the three 10-kilometer transects. Each transect extended from the southern border of the critical habitat towards the peak of Cleopatra's Needle Mountain (Figure 2), with one camera trap positioned at the peak. These sites employed the same methods used for the CNCH sites in Marler (2016). We followed regular trail routes created by hunters and by almaciga tree *Agathis philippinensis* Warb. resin collectors to reach pre-selected UTM coordinates (Gerber et al. 2010; Gerber et al. 2012). We created our own trails only when there were no existing trails. Camera trap sites were established near signs of animal presence (such as animal trails, droppings, or dig marks in the ground) at least 10m from the trail (O'Brien et al. 2003; Ancrenaz et al. 2012; Meek 2012). New coordinates were recorded using a Garmin etrex handheld GPS unit at each camera trap site. Camera traps were strapped to large trees 30 –40 cm from the ground with 150ml of domestic pig's blood bait placed 2m in front of each camera trap (Thorn et al. 2009; Gerber et al. 2011; Meek 2012). This bait is likely to attract the carnivores in the forest, however, *H. pumila* is herbivorous and *A. binturong whitei* is mostly frugivorous, so they are unlikely to be strongly attracted to this bait. From the GPS coordinates recorded in the field, camera traps were ultimately spaced 1.05 km± 0.1 km (mean ± standard deviation) away from the next camera in each transect (O'Brien et al. 2003; Ancrenaz et al. 2012). These sites were surveyed for 21–39 nights.

Six opportunistic baited sites were surveyed east of the transect sites in Binduyan. Camera trap site selection was performed in the field at random, but the sites were similarly selected near signs of animal presence (O'Brien et al. 2003; Ancrenaz et al. 2012; Meek 2012). Once a site was selected, the coordinates were recorded, and the camera traps were strapped to large trees with a pig's blood bait, following the procedure for the transect sites. These sites were surveyed for 11–14 nights.

For the unbaited sites, two sites were selected near streams with *A. cinereus* spraints and one site was selected near a mud bath (1165 masl) created by Palawan Bearded Pigs *Sus ahoenobarbus* Huet, 1888 (Anito Dinampo and Pedro Mutin 2015 pers. comm.). The coordinates for these locations were recorded. Camera traps were strapped to large trees or sturdy logs at 40–90 cm above the ground and 1m away from the stream to best attain images of the stream or mud bath nearby. No bait was used in these locations. These sites were surveyed for 7–37 nights.

Upon retrieval of the camera traps in the field, SD cards were securely packed. The SD cards were observed for the presence of the eight target species and labeled accordingly from a computer in the lab. Photo-captures were recorded from the photographs and videos of the target species: if a species triggered the camera within a one-hour time frame, it was considered one photo-capture, regardless of the number of individuals in the image. The photo-captures were used to create time activity patterns for mammals with 4% or more of the target species photo-captures, following Sreekumar & Nameer (2018) who excluded carnivores under 4% of photo-captures from their time activity analysis. Photo-captures of the same species at the same camera-trap location within a one-hour time frame were considered one independent event; multiple species photo-captured in one image were each considered an independent

event. We examined the independent events at various elevations across the camera trap array.

RESULTS

A total of 8,963 images and videos were recorded among 38 sites during the study period, as one camera within the transect sites malfunctioned. Seven of our target species were detected in 2,328 images and videos, with the following percentage of photo-captures: *P. philippinensis* (50%), *H. pumila* (42%), *M. marchei* (4%), *U. semitorquata* (3%), *P.b. heaneyi* (2%), *A. cinereus* (1%), and *V. tangalunga* (<1%) (Images 1–7, Table 2).

Time activity patterns were analyzed for *P. philippinensis*, *H. pumila* and *M. marchei*. We used 2,189 images for this analysis (Figure 3), which resulted in 318 independent time stamps. All three species were active throughout the night between 18.00–06.00 h. *Paradoxurus philippinensis*, however, showed activity as late as 10.00h in the morning and as early as 16.00h in the afternoon, with peak activity occurring near crepuscular hours between 04.00–06.00 h and 18.00–22.00 h. *Hystrix pumila* was active into crepuscular hours, with three peaks in activity occurring from 01.00–02.00 h, 19.00–20.00 h, and 22.00–23.00 h. *Mydaus marchei* was only found to be active at night, with stark peaks in activity between 00.00–01.00 h and 19.00–20.00 h.

Urva semitorquata was recorded eight times between 16:00 and 18:00 and three times during the day (06.54h, 09.33h and 14.41h). *Prionailurus bengalensis heaneyi* was recorded five times at night and twice after dawn (06.34h and 07.34h). *Aonyx cinereus* was recorded once at night, once at 16.51h, and twice after dawn (06.01h and 06.36h). *Viverra tangalunga* was recorded twice at 05.47h and 06.39h.

The independent events recorded for each species at various elevation ranges are found in Table 3. *Paradoxurus philippinensis* was found at every elevation range where we had camera traps and appeared most common between 250m and 1,000m. *Hystrix pumila* was documented up to 1,165m, but was more common below 1,000m. *Urva semitorquata* was photo-captured between 251m and 1,000m and twice at the peak of Cleopatra's Needle Mountain. *Mydaus marchei* was more readily found between zero and 750m, with one record at 1,233m. *Prionailurus bengalensis heaneyi* was found between zero and 1,250m, but was more common at elevations above 1,000m. *Aonyx cinereus* was recorded from the two camera trap sites by streams at 382m and 120m. *Viverra tangalunga* was recorded twice at 403m and 962m.

DISCUSSION

We recorded *P. philippinensis*, *H. pumila*, *M. marchei*, *V. tangalunga*, *U. semitorquata*, *P.b. heaneyi*, and *A. cinereus* using camera traps within the CNCH. The three most commonly photographed species, *P. philippinensis*, *H. pumila*, and *M. marchei*, exhibited predominantly nocturnal activity. The remaining species represented too small a percentage of the photo-captures to visualize activity patterns.

Three ecological studies (Allen 1910; Rabor 1986; Esselstyn et al. 2004) recorded *Arctictis binturong whitei* in Palawan. But in this study, we were unable to photo-capture this species probably because they are not attracted to pig's blood as bait. Our lack of photo-captures might also be due to our camera trap positioning on the forest floor. *Arctictis binturong whitei* is largely arboreal (Wemmer & Murtaugh 1981), hence arboreal positioned camera traps could increase the probability of photo-captures. Previous studies have recorded *A. binturong* using terrestrial camera traps in forests outside of the Philippines (Azlan & Lading 2006;

Table 2. Recorded mammals with their family, common, scientific, and local names with their corresponding IUCN status.

Family	Common name	Scientific name	Local name	IUCN Red List status
Hystricidae	Palawan Porcupine	*Hystrix pumila*	Durian	Vulnerable (Clayton 2018)
Mustelidae	Asian Small-clawed Otter	*Aonyx cinereus*	Dungon	Vulnerable (Wright et al. 2015)
Herpestidae	Collared Mongoose	*Urva semitorquata*		Near Threatened (Mathai et al. 2015)
Viverridae	Common Palm Civet	*Paradoxurus philippinensis*	Musang/ Alamid	Least Concern (Duckworth et al. 2016a)
	Malay Civet	*Viverra tangalunga*	Musang/ Tinggalong/ Tangalung	Least Concern (Duckworth et al. 2016b)
Mephitidae	Palawan Stink Badger	*Mydaus marchei*	Pantot	Least Concern (Widmann 2015)
Felidae	Palawan Leopard Cat	*Prionailurus bengalensis heaneyi*	Singgarong	Not Yet Assessed

Image 1. Camera trap image of the Common Palm Civet *Paradoxurus philippinensis*.

Image 2. Camera trap image of the Palawan Porcupine *Hystrix pumila*.

Image 3. Camera trap image of the Palawan Stink Badger *Mydaus marchei*.

Image 4. Camera trap image of two Collared Mongoose *Urva semitorquata* individuals.

Image 5. Camera trap image of the Palawan Leopard Cat *Prionailurus bengalensis heaneyi*.

Image 6. Camera trap image of five Asian Small-clawed Otter *Aonyx cinereus* individuals.

Mathai et al. 2010), but these detections were limited.

We photo-captured multiple individuals in one photograph for *H. pumila*, *U. semitorquata* and *A. cinereus*. Two and three *H. pumila* individuals were photo-captured in a single image. Two *U. semitorquata* individuals were photo-captured in a single image. Four and six *A. cinereus* individuals were photo-captured in a single image. Further data collection could help us determine average family size for these gregarious species within the CNCH.

The time activity patterns visualized for *P. philippinensis*, *H. pumila*, and *M. marchei* are similar throughout the night (Figure 4). Palawan lacks large mammals (Reis & Garong 2001), which could give the mammals in our study greater freedom to range without the danger of being preyed on. The CNCH carnivores may have less competition for resources that would otherwise be present in forests with larger predators. Further studies analyzing the time activity patterns of carnivores within the CNCH could prove mutually exclusive activity at specific hours by species with similar diets.

Species Accounts

Common Palm Civet *Paradoxurus philippinensis*: This civet is the most common carnivore in Palawan (Esselstyn et al. 2004), with widespread sightings in published surveys (Allen 1910; Sanborn 1952; Esselstyn et al. 2004; Marler et al. 2018) and the most photo-captures among mammals in this study. *Paradoxurus philippinensis*' primarily nocturnal activity contributes to other nocturnal observations for *P. hermaphroditus*, a close relative (Chetana & Ganesh 2007; Gray & Phan 2011). The occasional diurnal activity observed here was also reported by Mathai et al. (2010) for *P. hermaphroditus* in Borneo. We photo-captured this species across the elevation ranges, which mirrors this civet's common occurrence from sea level up to 2400m within the Philippines (Heaney et al. 2010).

Palawan Porcupine *Hystrix pumila*: This porcupine is endemic to the Palawan Faunal Region where it holds a Vulnerable listing in the IUCN Red List due to threats of habitat loss and hunting for the pet and bushmeat trade (Clayton 2018). *Hystrix pumila* is thought to be locally common, with several sightings during surveys in Palawan (Sanborn 1952; Heaney et al. 1998; Esselstyn et al. 2004; Manalo et al. 2016). This species had the highest record of independent events in our study, even though it was not attracted to our pig's blood bait due to its herbivorous diet. This implies that it is relatively common in the CNCH and bait is not required to obtain a large number of images. Our observations indicate that *H. pumila* is primarily nocturnal with some crepuscular activity, which is similar to the findings in Esselstyn et al. (2004) with reported activity for this species at dusk and night. Although *H. pumila* was documented up to 1,165m in our study, we found it was more common below 1000m. Previous accounts also indicate it is common from sea level to above several hundred meters

Image 7. Camera trap image of the Malay Civet *Viverra tangalunga*.

Table 3. Independent events for each recorded species at each elevational range within the Cleopatra's Needle Critical Habitat.

	Independent events by elevation (meters)							
Species	**0–250**	**251–500**	**501–750**	**751–1000**	**1001–1250**	**1251–1500**	**1501–1593**	**Total**
Common Palm Civet	6	74	22	16	7	0	4	129
Palawan Porcupine	18	47	44	21	4	0	0	134
Collared Mongoose	0	7	1	2	0	0	2	12
Palawan Stink Badger	2	9	5	0	1	0	0	17
Palawan Leopard Cat	1	1	0	1	4	0	0	7
Malay Civet	0	1	1	0	0	0	0	2
Asian Small-clawed Otter	12	8	0	0	0	0	0	20

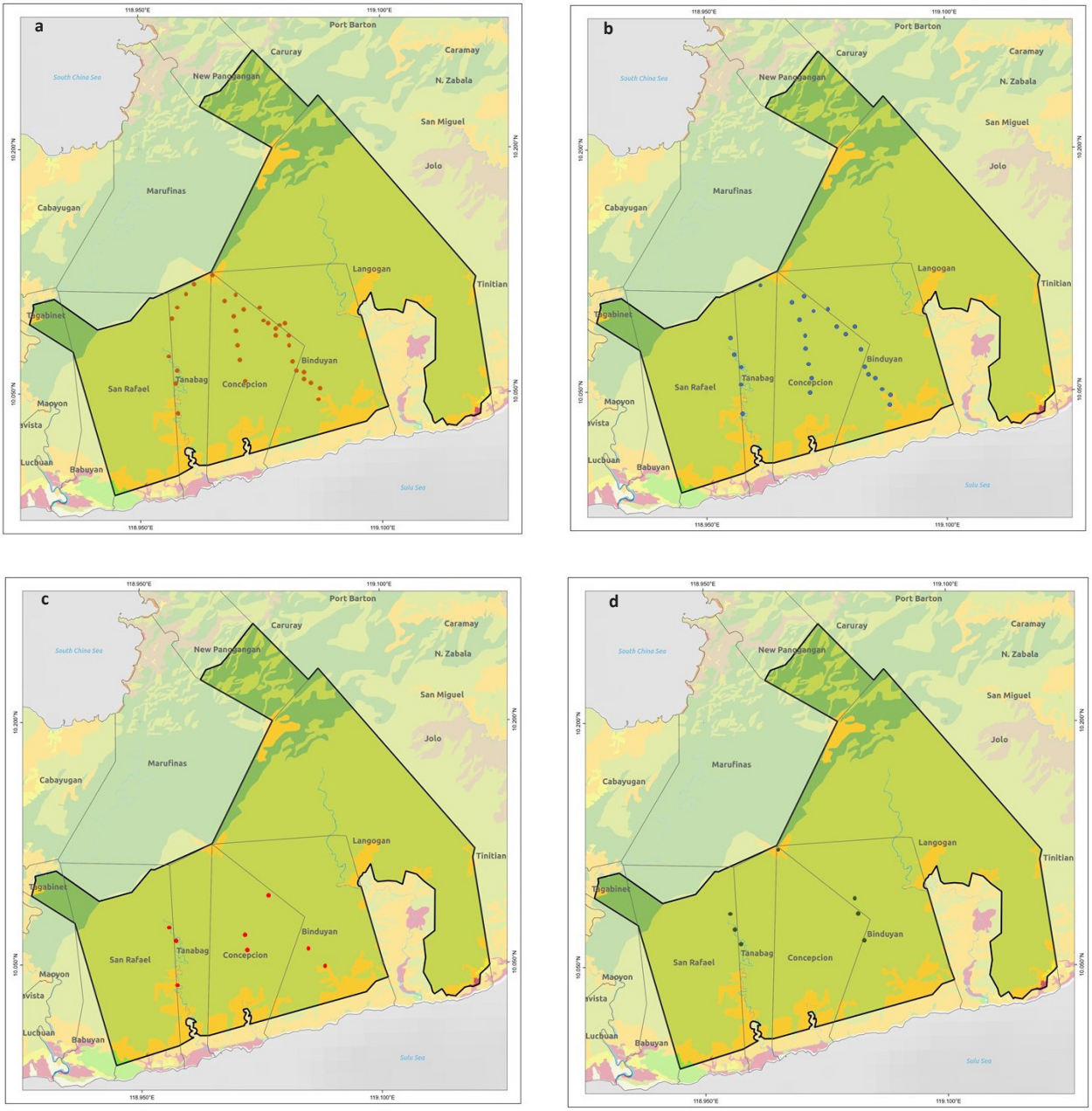

Figure 3. Occurrences of carnivores within the Cleopatra's Needle Critical Habitat: (a)—Common Palm Civet | (b)—Palawan Porcupine | (c)—Palawan Stink Badger | (d)—Collared Mongoose. ©Centre for Sustainability PH, Inc.

in elevation from disturbed to lowland forests (Heaney et al. 2010).

Palawan Stink Badger *Mydaus marchei*: This badger is endemic to and has a stable, widespread population in Palawan (Widmann 2015). This species has been reported in past surveys by sight and by smell (Sanborn 1952; Kruk 2000; Esselstyn et al 2004; Marler et al. 2018). *Mydaus marchei* is known to be nocturnal (Kruuk 2000) but has also been reported in the daytime (Grimwood 1976). Our findings support nocturnal activity for this species. *Mydaus marchei* is common in second growth and disturbed forests in Palawan (Heaney et al. 2010), suggesting it is primarily found in lowland areas where agriculture and land-modification occur. Our observations predominantly occurred in lowland tropical forest below 750m, with one sighting at 1233m.

Malay civet *Viverra tangalunga*: Scant information exists within the literature for *V. tangalunga* in Palawan (Allen 1910; Esselstyn et al. 2004), though there have been several sightings during surveys in other Philippine

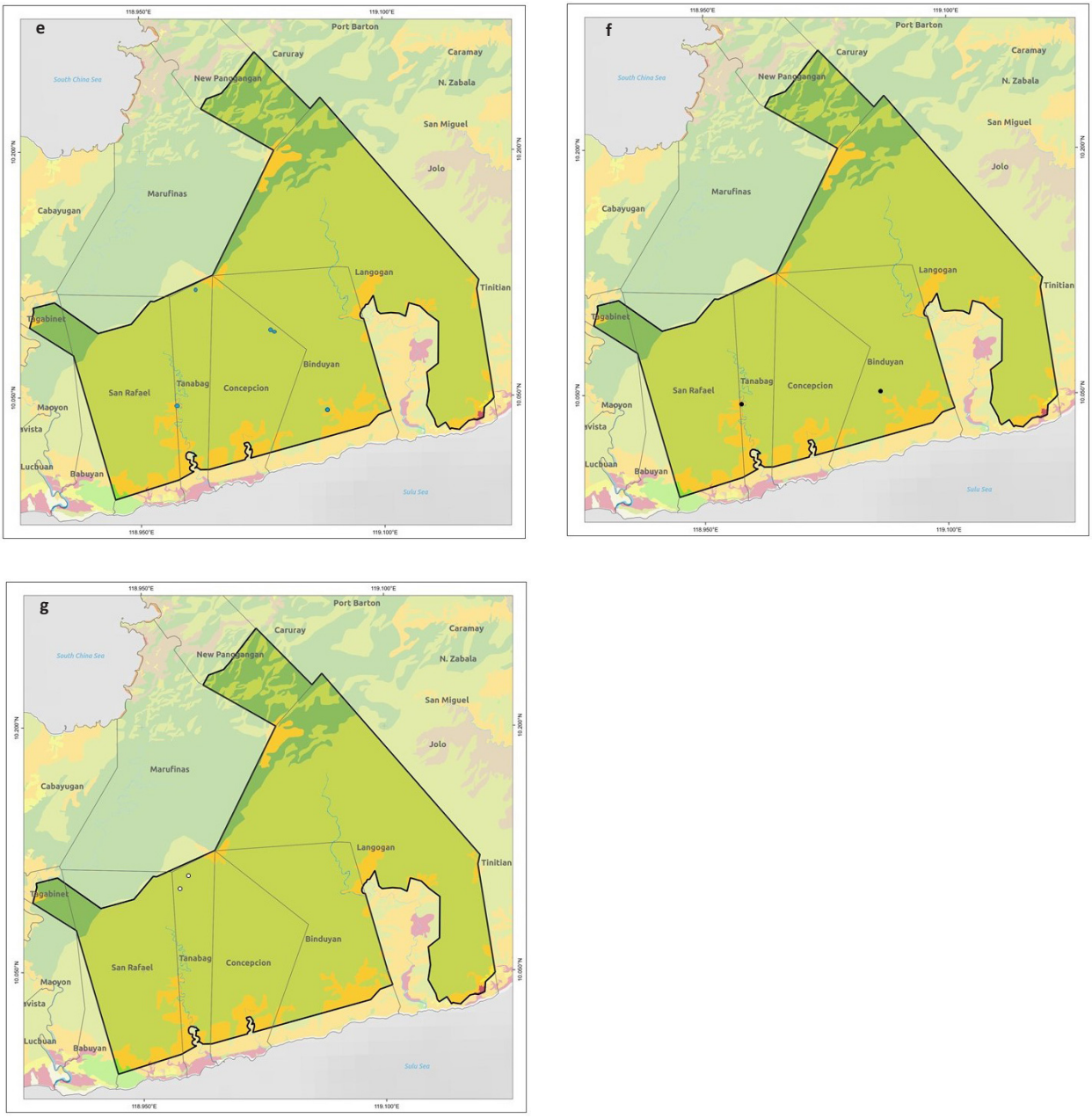

Figure 3 continued. Occurrences of carnivores within the Cleopatra's Needle Critical Habitat: (e)—Palawan Leopard Cat | (f)—Asian Small-clawed Otter | (g)—Malay Civet. ©Centre for Sustainability PH, Inc.

islands (Rickart 1993; Heaney et al. 1999). Surveys of this species in Sulawesi, Malaysia and Borneo confirmed that it is primarily nocturnal with occasional daytime activity (Colón 2002; Jennings et al. 2005, 2010; Mathai et al 2010). Our two sightings occurred around dawn. This species is found from sea level to 1600m in the Philippines (Heaney et al. 2010), hence, our limited data contributes to this elevational range of occurrence.

Collared mongoose *Urva semitorquata*: *Urva semitorquata* is listed by the IUCN as Near Threatened due to habitat reduction from deforestation (Mathai et al. 2015); however, specific threats to the Palawan populations have yet to be assessed. This mongoose is only known to occur in Palawan and Busuanga islands in the Philippines (Heaney et al. 1998); few published sightings of 1 to 3 individuals per study exist in Palawan (Allen 1910; Sanborn 1952; Rabor et al. 1986). The diurnal observations reported in our study were consistent with diurnal observations of *U. semitorquata* in Borneo (Cheyne et al. 2010; Brodie & Giordano 2011).

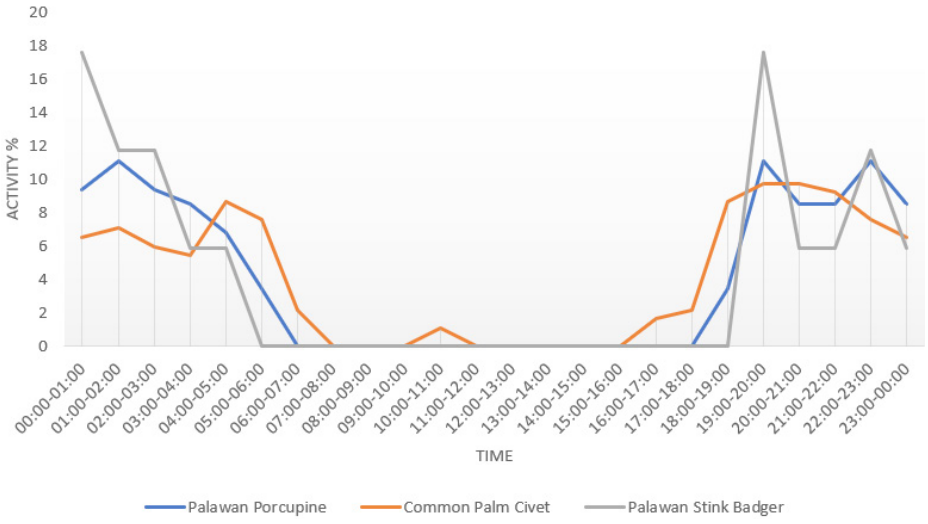

Figure 4. Time activity patterns for three mammals in the Cleopatra's Needle Critical Habitat.

This species is known at low elevations in Palawan, near rivers (Heaney et al. 2010). We predominantly found this species between 250m and 1,000m, however, we photo-captured this species twice at the peak of Cleopatra's Needle. Further elevational studies for *U. semitorquata* could support an expansion of its known elevational range on Palawan.

Palawan Leopard Cat *Prionaillurus bengalensis heaneyi*: This leopard cat subspecies is only found in Palawan (Groves 1997) where it holds a Vulnerable listing within the Philippines (Department of Environment & Natural Resources 2017; Gonzalez et al. 2018). The subspecies has not yet been assessed by the IUCN. Published records of *P.b. heaneyi* are sparse (Allen 1910; Sanborn 1952; Rabor et al. 1986; Esselstyn et al 2004; Marler et al. 2018). Activity patterns for this subspecies do not exist, but activity pattern studies for *P. bengalensis* in Borneo and Thailand confirmed that the species is nocturnal (Grassman et al. 2005; Cheyne & Macdonald 2011; Lynam et al. 2013) with some crepuscular activity (Grassman et al. 2005). Saxena & Rajanshi (2014) also observed diurnal activity in India. Our photo-captures were at night and dawn. Leopard cats are found from 0m to 1,500m within the Philippines (Heaney et al. 2010). We similarly recorded this species from low to high elevations, with more photo-captures above 1,000m.

Asian Small-clawed Otter *Aonyx cinereus*: This otter is only found in Palawan within the Philippines. The IUCN lists this species as Vulnerable and the Department of Environment and Natural Resources (2017) lists this species as Endangered within the Philippines. This species has been reported by sight and by their droppings within Palawan (Esselstyn et al. 2004; Castro & Dolorosa 2006; Marler et al. 2018). *Aonyx cinereus* studies in Malaysia reveal nocturnal and crepuscular activity (Foster-Turley 1992). Our few sightings reflected this activity pattern with one sighting in the late afternoon. *Aonyx cinereus* is believed to occur in lower portions of rivers in Palawan (Heaney et al. 2010), which is reflected in our findings at our unbaited sites beside rivers.

CONCLUSION

Primary forest is at risk of being converted and lost as mining pressures (Mallari et al. 2011) and anthropogenic land modification (Shivley & Martinez 2001) increase in Palawan. This habitat loss coupled with hunting pressures for various species (Castro & Dolorosa 2006; Clayton 2018) and lack of proper environmental law enforcement (Castro & Dolorosa 2006) makes conservation work on the island a high priority. The seven species observed here appeared most common, or were at least recorded, below 750m in lowland tropical forest. This lowland area is prime location for land modification, such as agriculture and logging, and is thus a crucial area to protect. The protection of the CNCH in 2017 was monumental for Palawan's wildlife and indigenous communities. We need to support the ongoing research to understand the species within the CNCH and develop management strategies to ensure their survival.

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Journal of Threatened Taxa

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PLATINUM OPEN ACCESS

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

October 2019 | Vol. 11 | No. 13 | Pages: 14631–14786
Date of Publication: 26 October 2019 (Online & Print)
DOI: 10.11609/jott.2019.11.13.14631-14786

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