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# Sun bear predation on an oriental pied hornbill nest

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**Abstract:** Sun bears (*Helarctos malayanus*) are opportunistic omnivores that feed predominantly on fruits and invertebrates, but predatory behavior by sun bears is rarely recorded. Although commonly described as a forest-dependent species, the sun bear is a generalist and seems to have some potential to adapt to changing environments. Here we report the first record of a sun bear preying on oriental pied hornbills (*Anthracoceros albirostris*) in their nest in the Lower Kinabatangan Wildlife Sanctuary in Sabah, Malaysian Borneo, during spring of 2019. It is a human-disturbed landscape surrounded by oil palm (*Elaeis guineensis*) plantations, with the remaining degraded forest providing a wildlife corridor for Borneo's wildlife. The sun bears photographed by camera traps along the wildlife corridor, including the predatory bear, appeared to be in good condition, therefore evidently finding sufficient food resources. Their opportunistic feeding behavior, not necessarily food shortage, may allow them to take vulnerable prey, such as this low-nesting hornbill.

**Key words:** *Anthracoceros albirostris*, Borneo, camera-trapping, feeding ecology, *Helarctos malayanus*, oriental pied hornbill, predation, sun bear

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The sun bear (*Helarctos malayanus*) is the smallest and most arboreal of the bear species (Sasaki et al. 2005). This bear is currently distributed across Southeast Asia (Fitzgerald and Krausman 2002, Scotson et al. 2017), occurs in a variety of different habitat types (mostly tropical forest; Scotson et al. 2017), and is an opportunistic feeder (Wong et al. 2002, Schneider et al. 2014). Sun bears' main diet appears to consist of fruits, invertebrates such as termites, ants, and beetle larvae, as well as honeycomb and honey (Scotson et al. 2017). In Borneo, sun bears are mostly insectivores, but feed on fruits during mast-fruiting events and on figs (*Ficus* spp.) during inter-mast periods (Fredriksson et al. 2006). In some

instances, if the home range of the bear borders human landscapes, bears consume human crops such as fruits, oil palm (*Elaeis guineensis*), and coconuts (*Cocos nucifera*), and are therefore described as a nuisance by local farmers (Fredriksson 2005, Scotson et al. 2014, Wong et al. 2015, Guharajan et al. 2018). Wong et al. (2002) reported that sun bears have been found to also feed on vertebrates, such as lizards, bird eggs, turtles, and small rodents. In 2012, a sun bear was photographed via camera trap while 'handling' a Sunda pangolin (*Manis javanica*; Hedges and Aziz 2013). Here we report the first record, to our knowledge, of a sun bear preying on nesting oriental pied hornbills (*Anthracoceros albirostris*).

Oriental pied hornbills (Fig. 1) are monogamous and breed from January to June (Chan et al. 2007, Kinnaird and O'Brien 2007). These hornbills prefer undisturbed areas, but do breed in secondary forest, choosing to nest in *Bombax*, *Lagerstroemia*, and Dipterocarps trees (Shukla et al. 2015). Hornbills are secondary cavity nesters so they rely on tree cavities in large trees in order to nest (Datta and Rawat 2004, Shukla et al. 2015), with nest openings between 2 and 45 m above the ground (Poonswad 1995). When a nesting site has been chosen, the female seals herself into the nest, where she lays about 3 eggs (Chan et al. 2007, Ng et al. 2011). The male visits the nest to feed her and the chicks, making an average of 12 feeding trips per day (Rahman et al. 2019).

## Study area

The observation took place in Lot 7 (N 05.40557° E 117.98779°) of the Lower Kinabatangan Wildlife Sanctuary (LKWS) in Sabah, Malaysian Borneo. The LKWS consists of 10 lots (forest fragments) of protected forest landscape, which form a wildlife corridor, connecting rainforest vegetation communities in central Sabah with the mangroves (Rhizophoraceae) on the east coast (Evans et al. 2016). Even though the corridor is subjected to disturbances and consists mostly of degraded forest, it acts as a riparian buffer zone between plantations and the Kinabatangan River. The wildlife sanctuary also encompasses other landscape types, including semi-inundated areas and permanent swampland, dry lowland, small grassland, and swamp forests (Abram et al. 2014).

## Methods

We found an oriental pied hornbill nest containing 2 eggs inside a Bayur tree (*Pterospermum javanicum*) on

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**Fig. 1. Two adult oriental pied hornbills (*Anthracoceros albirostris*), female at the back, male in front (picture credit: Rudi Delvaux).**

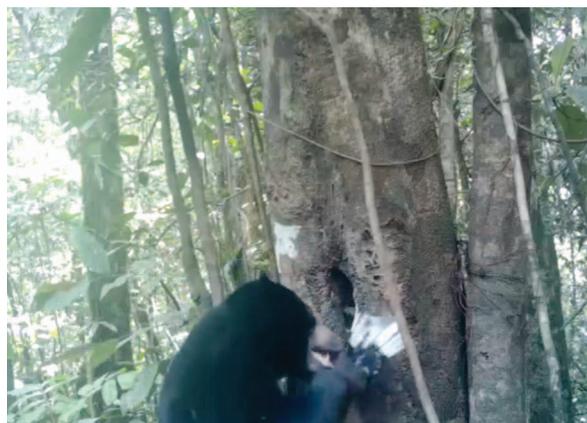
23 February 2019. The nest was 1.6 m above the ground, and we decided to video-monitor the nest to learn more about the nesting and chick-rearing behavior in wild hornbills. When we set up the video camera trap on 28 February, 2 chicks had already hatched. Therefore, hatching occurred between 24 and 27 February. We changed the secure digital card and batteries once per week.

We video-recorded the sun bear predated the hornbill using an Infrared Mobile Digital Scouting Camera (Model: MG983G-30M, Boly Inc., Santa Clara, California, USA). We set the camera to hunting mode, video record, motion trigger, filming for 40 seconds with a 1-minute delay between triggers. We set up the camera approximately 2 m from the hornbill nest, facing the entrance. We monitored the nest for 41 days.

## Results and discussion

On 15 March, it appeared that the nest only contained the female and one chick. The video camera-trap footage did not capture the fate of the other chick and we therefore hypothesized cannibalistic infanticide, as has been observed previously in this species (Chan et al. 2007).

On 12 April, we found the nest empty and scratch marks by the nest entrance. We did not find feathers on the ground, so we decided to look inside the nest cavity to see whether the female was still present. From previous visits, video recordings, and observations, we have learned that females respond differently to different threats approaching the nest. When a bearded pig (*Sus barbatus*) or a common palm civet (*Paradoxurus hermaphroditus*) approaches the nest, the female defends the nest fiercely and vocalizes loudly. When humans approach the nest,



**Fig. 2. Screenshot of the camera trap video. An adult sun bear (*Helarctos malayanus*) predated on an oriental pied hornbill nest (*Anthracoceros albirostris*). Here the bear appears to pull the female out of the nest.**

the female climbs into the hollow tree cavity, being very quiet but failing to conceal the chick with her body, thus leaving it exposed. On this visit, we did not see the chick and, when looking up into the cavity, we saw that the female was not in the nest. We therefore reviewed the video footage of the camera trap.

The footage showed a sun bear investigating the hornbill nest on 10 April 2019 at 1045 hours. The nest was quiet (neither chick nor female vocalized) and the female was not visible. The video captured the bear starting to claw away at the nest, circling the tree, and then returning to claw at the entrance of the nest. We did not capture the hornbill female emerging from the nest before 10 April, so we assumed that she was present at the time of the incident. The sun bear then reached into the hollow and clawed out what we perceived to be the female. We concluded that the animal taken from the nest in the footage was the female because the wing feathers were mature (Figs. 2, 3).

In the second video, the sun bear was captured at 1050 hours (5 min after the video that captured the predation event) climbing down the hornbill nesting tree. The bear appeared to have blood around its muzzle, suggesting that the bear had killed and consumed the bird(s) in close proximity to the nest (possibly while up in the tree). In this video, the bear investigated the nest once more but the footage was not conclusive enough to identify whether remains of the birds were present.

The bear was captured a third time on video camera on the same afternoon, at 1703 hours. In the third video, the



**Fig. 3. Screenshot of the camera trap video. A sun bear (*Helarctos malayanus*) pulls a female oriental pied hornbill (*Anthracoceros albirostris*) from the nest, killing her in the procedure.**

bear was seen clawing the inside of the nest cavity, but again it remained inconclusive whether there were further remains of the birds inside.

The video footage also showed the male hornbill returning to the nest site at 1143 hours, an hour after the predation event, with food for the female and chick. He was calling, but his calls were not answered and no female or chick appeared. We recorded the male returning on the following days with food, but no female or chick responded to the feeding attempts.

We video-monitored the nest for another week to confirm that the female had not escaped the predation event (e.g., to confirm that no female returned to the nest). Although the camera-trap footage was not conclusive enough to capture a second predation event, the fact that the nest was empty and no female was filmed leaving the nest prior to or after the incident led us to conclude that the bear killed the female and the chick. The chick would have been a maximum of 45 days old when killed.

On 21 April, we returned to the nest site to take measurement of the nest space. The entrance hole was 23 cm long and 6 cm wide. Oriental pied hornbills appear to select for nest openings that are elongated and relative to their body size (Shukla et al. 2015). The nest cavity (the hollow space inside the tree trunk) measured 3.2 m in height and 25.5 cm in depth. Most oriental pied hornbills choose nest sites that are between 4 and 25 m above the ground (Poonswad 1995). The nest was only 1.6 m above the ground (possibly due to the lack of more favorable nesting sites), so the female was probably exposed to unusual threats, such as humans, bears, and pigs.

From this predation we hypothesize that sun bears, being opportunistic feeders, may engage in predatory behavior as described here if the opportunity presents itself. In previous and ongoing camera-trap detections of

sun bears in the LKWS, all resident sun bears appeared to be in a healthy condition, suggesting sufficient food abundance. This predation event was recorded in a degraded forest corridor, surrounded by plantations and heavy human disturbance. Interestingly, this incident occurred at 1045 hours, although sun bears in a heavily disturbed habitat have been described as nocturnal (Griffiths and Van Schaik 1993). In the Lower Kinabatangan, sun bears appear to be active throughout the day and can be seen on camera traps in the morning hours until noon and then from late afternoon throughout the night. The predatory sun bear on the camera had a ‘fair’ body score (according to the scoring system developed by Wong et al. [2005]) and appeared in good health, suggesting that this bear was not starving (if it were, it may have used food sources that it would not normally consume).

Camera traps allow new insight into secretive and unusual behaviors. To our knowledge, this is the first recording of a sun bear predating on nesting hornbills.

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