Short Communication:
The First Zooarchaeological Evidence for the Endemic Palawan Stink Badger (*Mydaus marchei* Huet 1887)

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Abstract

In this short communication we report for the first time zooarchaeological evidence for the Early Holocene occurrence of the stink badger in Palawan. Recent archaeological excavations at Ille Cave in the El Nido district of northern Palawan has produced tens of thousands of bone fragments dating from the Terminal Pleistocene to the sub-recent (see Szabó et al., 2004; Lewis et al., in press). Among these are numerous remains of the stink badger recovered from various chrono-stratigraphic phases of the site. The early Holocene presence of this carnivore, along with other endemic and native terrestrial mammals, suggests that the stink badger spontaneously colonised Palawan during a maximal period of sea-level reduction. Moreover, the remains of this carnivore were found in midden and hearth contexts mixed with ungulates and various other non-cavernicolous taxa, implying that it too was hunted and consumed by humans.

Thousands of well-preserved skeletal remains of terrestrial vertebrates have been recovered from archaeological excavations in Ille Cave, El Nido, Palawan. High-resolution recovery methods were applied on site resulting in the retrieval of a large volume of both macro- and micro-vertebrates. The vertebrate

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remains from the mid-Holocene to terminal Pleistocene deposits are generally in well-stratified and well-dated contexts (Lewis *et al.* in press) and found within these assemblages are the first fossil records of several endemic mammals including the stink badger.

The Stink Badger

The Palawan stink badger (*Mydaus marchei*) is endemic to the islands of Palawan, Busuanga and Calauit (Heaney *et al.* 1998). Known locally as the *pantot*, its closest relative in the family Mephitidae is the Indonesian stink badger (*M. javanensis*), which inhabits the islands of Java, Sumatra and Borneo (Hwang and Larivire 2004; Dragoo and Honeycutt 1997). The Palawan stink badger is distinguished from this relative by its smaller size, smaller ears, shorter tail and lighter pelage. It is the pungent yellowish fluid that the stink badger secretes from its anal glands that give the species its English common (Hwang and Larivire 2004) and vernacular names.

The stink badger is active both during night and day, occupying and rearing their young in the burrows that they dig. They frequent a variety of habitats including mixed grassland and secondary growth forest, and have been recorded in residential areas and cultivated fields (Esselstyn *et al.* 2004). Stink badgers root extensively around rivers and creeks, edges of rice paddies and open damp areas where they feed on freshwater crabs, various insects and beetles (Hwang and Larivire 2004; Rabor 1986). Due to its unpleasant odour, the current residents living near the site regard stink badgers as no more than a last resort starvation food. This makes the *pantot* a rarely hunted species that is still relatively common on Palawan (Kruuk 2000, in Esselstyn *et al.* 2004). Other native mammals have not been as fortunate, being more vulnerable to human consumption and habitat destruction and are thus becoming increasingly rare.

Numerous skeletal elements of the stink badger were recovered amongst human-derived and discarded bone aggregates. The most distinctive of these bones fragments (as in most other taxa) are the mandible, maxilla and distal articular end of the humerus (Figures 1-3). The mandible and maxilla are easily distinguished from other terrestrial mammalian taxa by size and the characteristic morphology of the mandible, anterior portions of the cranium and the shape, number and size of the teeth. The stink badger mandible is closest in size to the mongoose (*Herpestes brachyurus*) but the dental morphology and formula of the two species are quite distinct. The humerus is short and robust. The distal articular end is broad and protrudes in a medial direction to a much greater degree than most other mammals of its size. The small, shallow olecranon fossa and large

supracondylar fossa gives the element a superficial appearance similar to that of the endemic Palawan pangolin (*Manis culionensis*). On close examination however, and a knowledge of the morphology of the pangolin humerus, the two taxa are easily distinguished from one another.

Specimen ICWM- 1180 is the distal and midshaft portion of a right humerus from the mid-late Holocene context 1564 (Figure 4). A series of faint transverse cut marks are located on the antero-medial margins, just above the supracondylar fossa. The cut marks indicate that the humerus was carefully separated from the radius and ulna during processing ready for consumption. The common occurrence of the stink badger in the archaeological record and the clear evidence for butchery suggests that the Terminal Pleistocene and Early Holocene inhabitants of Ille Cave occasionally consumed stink badgers.

Measurements of the first lower molar are given in Table 1. All measurements are considerably larger than those from the reference, which may indicate body size reduction in past *pantot* populations. Size reduction has been observed for some mammalian island taxa throughout the Holocene (e.g., Bornean macaques, in Harrison 1996), and this has been correlated with climatic fluctuations and change of vegetative cover during the Late Pleistocene and the Holocene. However, in this case it is likely that the two comparative specimens are relatively small and not representative of the full intra-specific size range of the taxon.

Bone ID	*Context*	*Depth (cm)*	*Phasing**	*M1 Length*	*M1 Breadth*	*Length of M1 alveolus*
ICEM-19600	1252	70-90	Late Holocene	9.32	4.39	
ICEM-19449	—	90-100	Late Holocene	8.9**	4.94	
ICEM-17910	332	120-140	Middle Holocene			8.7
ICEM-19975	768	160-180	Early Holocene			8.71
ICEM-18056	784	—	Early Holocene			8.66
ICEM-18562	807	260-270	Early Holocene	9.7	4.61	
Reference						
NM Osteo 689				8.84	3.98	
NM Osteo 398						7.46

Table 1: Stink badger M_1 measurements (in mm). ICEM and ICWM respectively stand for Ille Cave's East and West Mouth trenches. Two specimens from the National Museum Zooarchaeology Section were measured.

*Phasing is based from radiocarbon dates from Lewis *et al.* (in press)
**very worn molar.

Stink badger remains were recovered in the early Holocene layers to the late Holocene contexts of Ille Cave (see Lewis *et al.* in press). Thus far, the oldest stink badger remains were recovered from a deposit (Context 807) radiometrically dated by the ^{14}C method using associated charcoal to 10252-10501 cal. Yr. B.P (Lewis *et al.* in press). Other extant sympatric small mammals have been identified in the deeper deposits of the cave, which are of Terminal Pleistocene in age. These non-volant mammals that are clearly of Sundaic affinity would have colonised Palawan from Borneo during a period of lowered sea levels. Past shoreline estimates based on sea level estimates (e.g., Voris 2000;) and current biogeographic evidence (Heaney 1986; Reis and Garong 2001) suggest that a land bridge connection between Borneo and Palawan did not emerge in the Last Glacial Maximum. Current low stand estimates of the past million years indicate that global sea levels would have been lowest at around 400 kya and 600 kya (Rohling *et al.* 1998; Waelbroeck *et al.* 2002, Bintanja *et al.* 2005). During these periods, sea levels would have decreased to *ca.*130 metres below present levels, and this would have considerably narrowed the 145 metres-deep gap between Palawan and Borneo.

The early Holocene presence of the stink badger points to the observation that it is a product of spontaneous dispersal into the island and not of recent human translocation. Even so, the question of timing of this dispersal and consequently, of a land bridge connection to Borneo, remains unresolved. Further analysis of other vertebrate fauna from the vast bone assemblage of Ille Cave would undoubtedly shed more light on these important palaeoenvironmental and biogeographic questions

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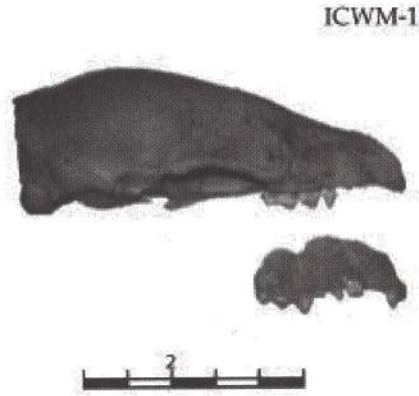

Figure 1. Comparison of the buccal aspect of the right cranium of a modern stink badger with a maxillary fragment (ICWM-1313) recovered from a Holocene context in Ille Cave. Scale in centimetres.

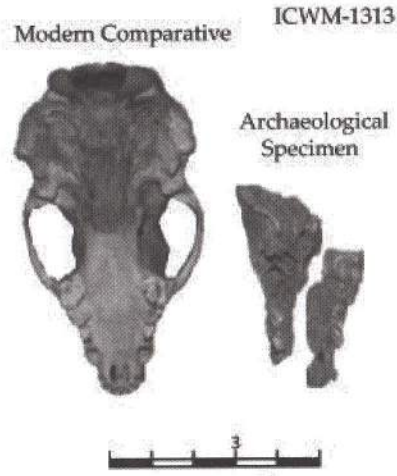

Figure 2. A comparison of the ventral aspect and palate of a modern stink badger with maxillary fragments (ICWM-1313) recovered from a Holocene context in Ille Cave. Scale in centimetres.

Figure 3. Lingual, buccal and occlusal views of a stink badger mandible (ICEM-19600) from a Holocene context in Ille Cave. Only the M_1 and P_4 are preserved in most archaeological specimens.

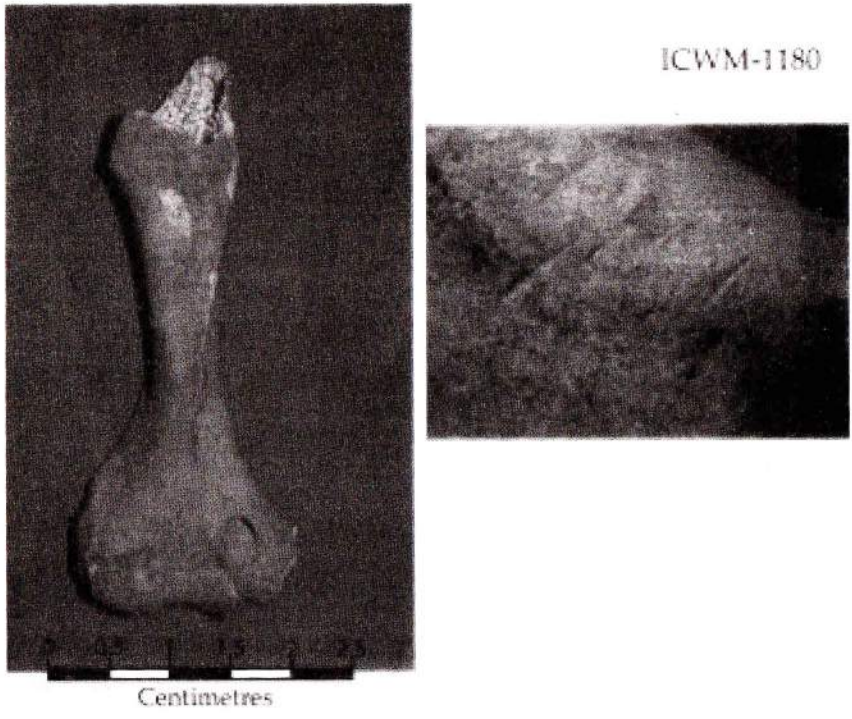

Figure 4. Transverse cutmarks above the supracondylar fossa on the right humerus of a stink badger.

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