

**SHORT COMMUNICATION:
THE JAVAN RHINOCEROS *RHINOCEROS SONDAICUS* IN BORNEO**

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There is a clear case for the use of palaeozoological data in the service of biogeography and conservation biology (Lyman, 2006). The role of such information is demonstrated in the instance of the Javan rhinoceros *Rhinoceros sondaicus* Desmarest in Borneo. While our zooarchaeological studies resolve a biogeographical anomaly, they also leave unanswered questions on the timing and possible causes of extinction of this large ungulate in post-Pleistocene times.

The Javan rhinoceros is a survivor of the South-east Asian regional mid-Pleistocene megafauna, being known as a fossil at sites in Java dating from 0.9 Ma (million years ago) at Trinil, 0.8–0.7 Ma at Kedung Brubus, 125–60 ka (thousands of years ago) at Punung and 10–6 ka in Holocene caves (van den Bergh et al., 2001). Corbet & Hill (1992) summarised the species' known occurrence in historic times, i.e., on the Asian continent from Bhutan and West Bengal, through Myanmar, Laos, Viêtnam, Thailand and Peninsular Malaysia, and on the islands of Sumatra and Java, but not on Borneo. The species has been exterminated over most of this range and is now believed to remain only in reserves at Cat Thien, Vietnam, and Ujong Kulon, Java (IUCN, 2006). In this note, we reconfirm the past existence of the Javan rhinoceros in Borneo on archaeological evidence, and discuss the possible dates and reasons for its extinction on the island.

Early zoological explorers found evidence of rhinoceroses in Borneo, but were uncertain of their identity. In Dutch territory in 1836, S. Müller failed to collect a specimen, but was told by a local hunter that a male killed in the Kahayan river area (now Central Kalimantan) had a single horn. On this evidence, Müller (1839–40) listed an unspecified '*Rhinoceros*', explaining later (Müller & Schlegel 1845: 183–184) that '[*R. sondaicus*] inhabits Java, perhaps also Borneo, though its presence in this large island needs further

confirmation, since the rhinoceros indigenous here, about which we have only learnt that it has not more than one horn, could as well be a separate species, or conspecific with *R. indicus* from the Indian mainland ..." (Translation courtesy of Dr C. Smeenk).

Two specimens of *R. sondaicus* were supposedly obtained from Borneo, but the provenance of both is unreliable: (1) A skeleton of *R. sondaicus* in the zoological museum of the Royal Belgian Institute of Natural Sciences, Brussels (IRSNB 1207), was acquired in 1838 with the A. H. von Henrici collection of Borneo mammals. The documented history of this collection, however, does not support a Bornean provenance for the specimen (Cranbrook, Smeenk & Lenglet, in press); (2) A skull in the Natural History Museum, London (BMNH 1859.8. 16.1), initially identified as *Rhinoceros sondaicus* but later described as *Rhinoceros nasalis*, was obtained in 1859 with a small group of mammal specimens 'purchased of a dealer who said that he received it direct from Borneo' (Gray, 1867). However, among lot 1859.8.16, there were also skulls of a tiger, '*Babyrussa alfurus*' (i.e., babirusa of Buru, Moluccas) and a Javan pig, *Sus verrucosus*. The inclusion of these non-Bornean species undermines the validity of the provenance of the rhinoceros. Both the distinctiveness of the species *R. nasalis* and its Borneo origin were challenged at the time (Murray, 1868).

All other specimens incontestably obtained in Borneo proved to be the Sumatran rhinoceros *Dicerorhinus sumatrensis*, leading to doubt that *R. sondaicus* did in fact inhabit the island (Bartlett, 1891; Everett, 1893; Rookmaaker, 1977). In a regional checklist, Chasen (1940) excluded Borneo from the range of *R. sondaicus* and, in a popular account of the mammals of Borneo, Banks (1949) omitted the species. Groves (1967: 234) reduced *Rhinoceros nasalis* to synonymy

with *R. s. sondaicus*, remarking that ‘the skull of the type fits well into the sample of the typical race. Since this species is not known from Borneo, it seems that the true locality must be Java.’ The anomalous nature of this distribution was noted, but not explained by Darlington (1957: 490).

That the Javan rhinoceros did, however, formerly exist in Borneo was subsequently attested by archaeological finds at Madai caves, Sabah (118°08'E 4°40'N), and Niah caves, Sarawak (113° 48'E 3° 45'N) (Cranbrook, 1986). We are now able to date a previously reported specimen, a left ectocuneiform from Niah cave West mouth, Y3 54–60 inches (see Cranbrook, 1986), to the terminal Pleistocene at $13,745 \pm 55$ years (ABOX-SC OXA15162, uncalibrated: tested 2006). We also report another find, potentially of recent age, recognised during further examination of animal remains originally excavated by Tom Harrison and the Sarawak Museum at the West mouth, Niah caves in 1957–65 (see Barker et al., 2002).

The newly recognised specimen (registered no. 64.3.(1) in the zoological collections of the Sarawak Museum, with a cast deposited in the Palaeontology Department of the Natural History Museum, London, at 1/34H) is a partial terminal phalanx of the mid (3rd) digit of the forefoot, from trench E/D 8. The trench was designated E/D 8, so the end of line, in this case, makes an unsuitable break. Can you do anything about this? at 0–12 inches depth (Table 1, Fig. 1). Harrison did not survey the position of the piece within this large trench. By extrapolation from dated levels in the West Mouth site, and the presence of ceramics and other material culture associated with the later Holocene, the base of this trench (at 12 inches) is unlikely to be older than ca. 4,000 years. If from near-surface, the specimen could be recent and, from its excellent state of preservation, this appears to be possible. The new find therefore extends the time span covered by Bornean specimens of Javan rhinoceros from terminal Pleistocene through early Holocene, potentially to the recent past (Table 2), posing the question of when, and why did the species become extinct.

The remains of Javan rhinoceros at Madai were recovered near the base of a large midden of freshwater shells (Bellwood, 1988). Those at Niah were within an extensive occupation deposit created by intermittent human visitation from the late Upper Pleistocene until present times (Barker et al., 2002). At both sites, the presence of rhinoceros remains undoubtedly reflects human activity.

At Niah, the representation of skeletal remains of rhinoceros, including both Javan and Sumatran rhinoceroses, is trivial: 20 pieces among 10,683 identifiable whole or fragmentary large mammal bones and teeth. By comparison, bearded pig *Sus barbatus* and primates, chiefly macaques *Macacus* spp. and leaf monkeys *Presbytis* spp. are represented by huge quantities of teeth and bone fragments. These groups clearly constituted the principal mammalian quarry of cave visitors (Barker et al., in press). The relative paucity of remains of rhinoceroses shows that the hunting methods of contemporary humans allowed them, very occasionally, to capture these

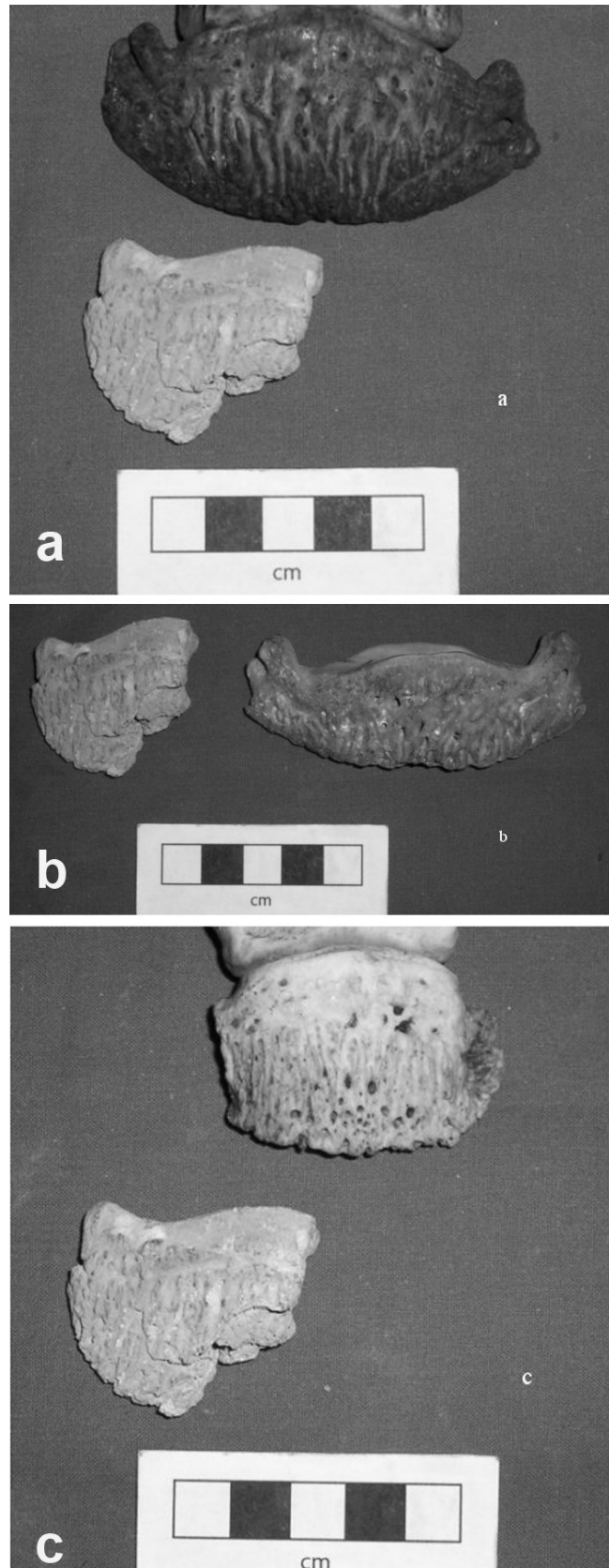


Fig. 1. Comparison of the terminal phalanx fragment from Niah Cave West mouth Trench E/D 8, 0–12 ins with: a, the forefoot of *Rhinoceros sondaicus* (BMNH 1861.3.11.1); b, hindfoot of *R. sondaicus* (BMNH 1861.3.11.1); c, forefoot of *Dicerorhinus sumatrensis* (BMNH 1879.6.14.2)

Table 1. Comparative measurements of the terminal phalanx of the central (3rd) digit of the forefoot of the archaeological specimen from Niah caves, and comparative specimens of rhinoceros species in the osteological collection of the Natural History Museum, London. The measurements are, to nearest 0.1 mm, (1) width (to mid-point in the comparative specimens) and (2) dorso-ventral depth.

Species	Sex	Provenance/ Reg. no.	(1)	(2)
Archaeological specimen		E/D 8, 0-12 inches	26.4	21.0
<i>Dicerorhinus sumatrensis</i>	Male	BMNH 1879.6.14.2	19.2	18.2
<i>Rhinoceros sondaicus</i>	Male	BMNH 1861.3.11.1	25.6	24.9

Table 2. Provenance and calculated / estimated ages (in years before present) of all remains of the Javan rhinoceros from archaeological sites in Borneo.

Item	Location	Context	Identity	Age limits	Age reference
1	Agop Sarapad, Madai	MAD2, L3 15-20 cm	Left DM ⁴	9910 ± 100	ANU 3089 : Bellwood (1986, p125)
2a	“ “	MAD2, H1 10-15 cm	Proximal articulation of right ulna (2 pieces)	9520 ± 100	ANU 2553 : Bellwood (1986, p125)
2b	“ “	MAD2, H1 layer 2 at 15 cm			
3	Niah cave, West mouth	Y/3 54 – 60 inches	Left ectocuneiform	13,745 ± 55	ABOX-SC OXA15162: (uncalibrated): tested 2006.
4	“ “	E/C 2 (C) 48 – 60 inches	Lateral basal phalanx	N/A	Untested
5	“ “	E/D 8 0 – 12 inches	Terminal central phalanx	4000 – recent	This paper

large ungulates in addition to their usual ground quarry of bearded pigs. It is notable that the only specimen of Javan rhinoceros indicating age is a deciduous fourth molar (Agop Sarapad 1, Table 2), i.e., from an animal that was still juvenile, and thereby perhaps more susceptible than an adult rhinoceros to hunting practices targeted on wild pigs (see Rabett et al., 2006).

Even allowing that these remains represent no more than incidental by-catch, their scarcity suggests that, throughout the corresponding time span, Javan rhinoceroses were rare in Borneo. By contrast, in Middle Pleistocene Java, rhinoceroses (*Rhinoceros sondaicus* and 'indet.' together) constituted 1.6% of faunal elements at Trinil (T) and 6.8% at Kedung Brubus (KB), more or less equally as numerous as pigs (T 1.1%, KB 4.8%) (Storm, 2001, Table 2). Storm (2001) has emphasised that open woodland habitat is indicated by the associated fauna, which included several proboscideans (T 12.7%, KB 31.7%), hippopotamus (T 0, KB 4.9%), deer (T 24.1%, KB 5.8%), antelopes and wild cattle or buffalo (T 57.0%, KB 40.5%), with very few monkeys (T 0.3%, KB 0) and lacking altogether characteristic tropical rainforest species such as orangutan, gibbons and Malay bear.

By contrast, arboreal and semi-arboreal mammals, notably orangutan and a variety of monkeys, were present in the early Holocene midden at Madai, and constitute between 45% and 55% of the mammalian fauna identified in late Pleistocene and Holocene contexts at Niah (Barker et al. in press). Adapted to the open terrain of the Middle Pleistocene, Javan rhinoceroses must have been confined to marginal habitats in the forest environments of northern Borneo in the later Quaternary. With the climatic amelioration of the Holocene and consequent resurgence of tall, closed evergreen tropical rainforest, habitat favourable for this rhinoceros would have

been further reduced and its population probably diminished accordingly.

Present information does not conclude the story. Our new find at Niah shows that the species potentially survived in Borneo until the near present. From about the 10th century AD/CE, with the development of trade between Borneo and China where rhinoceros parts were already valued as *materia medica*, human pressure would have intensified. Yet it is not impossible that the Javan rhinoceros was still extant in Borneo in the 19th century, and its presence correctly reported to the Dutch zoologists. The species may even have survived into 20th century Borneo – only to become exterminated by the intensive rhinoceros hunting of the 1930s documented by Medway (1977, p. 145).

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