

A new antler specimen from the 1936 Perning hominid site, East Jawa, Indonesia, attributable to *Axis lydekkeri* (MARTIN, 1886)

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SARI

Sebuah fosil tanduk (antler) rusa sebelah kiri telah ditemukan pada penelitian lapangan tahun 2001 di daerah Perning, Mojokerto, dalam lapisan batuan yang mengandung fosil *Homo modjokertensis*, yang pernah ditemukan tahun 1936. Fosil tanduk tersebut telah dibandingkan dengan fosil tanduk Cervidae lainnya yang telah dikenal di Jawa, dan berdasarkan hal tersebut maka fosil tanduk yang ditemukan di Perning kali ini diyakini sebagai fosil milik dari *Axis lydekkeri* (Martin, 1886) dan merupakan fosil *Axis lydekkeri* pertama yang ditemukan dalam lapisan pengandung *Homo modjokertensis*, karena selama ini spesies tersebut belum pernah dilaporkan keterdapatannya dalam lapisan pengandung hominid di daerah Perning, Mojokerto.

Katakunci: Cervidae, *Axis lydekkeri*, Perning, Mojokerto, Jawa

ABSTRACT

A nearly complete left shed antler was unearthed in 2001 from an excavation located immediately east of the relocated site and in the same bed that produced *Homo modjokertensis* in 1936. The fossil antler is compared with other known fossil Cervidae from Java, on which basis it can be attributed with confidence to *Axis lydekkeri* (Martin, 1886). This species has not been reported previously from the hominid-bearing bed.

Keywords: Cervidae, *Axis lydekkeri*, Perning, Mojokerto, Jawa

INTRODUCTION

Fieldwork that was conducted jointly by the Institute Technology Bandung (ITB) and the University of Texas at Austin (UT) during September 2001 succeeded in relocating the site of the 1936 hominid discovery near Perning village, East Jawa (Huffman, 2001; Huffman et al., 2002; Huffman & Zaim, this volume). Because Perning lies only about 10 km north of the city of Mojokerto, which previously was spelled Modjokerto, the hominid was originally named *Homo modjokertensis* by G. H. R. Von Koenigswald (1936a-b), and the Perning discovery is often called "Mojokerto".

Seventy-four vertebrate specimens were unearthed in 2001 from an excavation located immediately east of the relocated site in the same bed that produced the hominid. The excavation was dug laterally into the 40m-long wall of an agricultural terrace where conglomeratic sandstone is exposed above tuffaceous mudstone. The best-preserved specimen among those recovered from the excavation during 2001 is a nearly complete left shed cervid antler, specimen number PV01-004.56. Its location along the excavation wall is shown in Figure 1.

This article describes the morphology and taxonomic attribution of the cervid specimen. The report should be of interest because the antler represents a faunal element of the same age and from the same bed as the hominid. This specimen was chosen for description because it is referable to *Axis lydekkeri*, a taxon not previously described from the formation containing the hominid near Perning. Other well-preserved specimens from the site that are of special taxonomic interest will be described in separate publications.

BACKGROUND

The Perning hominid, a fossil skull of an infant, is now attributed to *Homo erectus* (Storm, 1994; Anton, 1997). It was found on February 13, 1936, by Andoyo, a young geological assistant with the Geological Survey of the Netherland Indies (part of the “Dienst van den Mijnbouw” of the Nederlandshe Indie). At the time, Andoyo was collecting vertebrate fossils under instructions from Survey geologist Johan Duyfjes (Duyfjes, 1936; Aziz, 2001; Huffman, 2001).

Duyfjes’ objective for Andoyo was to obtain more vertebrate control in the formation overlying the hominid-producing unit and secondarily to collect material from the unit in which Andoyo fortuitously found the hominid (Pucangan Formation; Duyfjes, 1936). The vertebrate material collected at the hominid site was given the sample number 173 by Andoyo, and a second sample, No. 174, was collected at the same site; the geographic and stratigraphic difference between the two samples is not known.

G. H. Ralph Von Koenigswald, who was a consultant for the Survey in early 1936, identified the material collected by Andoyo, and described and named the hominid specimen (Von Koenigswald, 1936a-c). Unfortunately, he did not publish a description of the fauna or even a faunal list from the hominid site. We are therefore left to piece together what little information exists for the faunal elements found at the site in the 1930s.

On March 3rd, 1936, Von Koenigswald wrote a internal report to the survey providing his identifications of Andoyo’s latest finds (the report does not include any anatomical descriptions). For sample No. 173, Von Koenigswald refers to a “special report” that has not yet been found, so that we lack the very faunal data from Von Koenigswald that we would most like to know. Since Andoyo noticed the site on the basis of “splinters” of bone at the surface (Duyfjes, 1936), and was encouraged enough by these discoveries to excavate to the depth of a meter before finding the hominid, we can assume that other fossils were collected at the same time. Also, in a letter written on February 19th, Andoyo refers to the hominid as No. 173A, suggesting that other fossils collected with it were numbered B, C, etc. With regard to sample No. 174, Von Koenigswald lists “Hippopotamus, Cervus, rund.”

He took Helmut de Terra and Hallam Movius to the site in 1938, and de Terra found fossil cervid teeth *in situ* at the site that Von Koenigswald identified as *Cervus zwaani* (de Terra, 1938, 1943). In a book he published twenty years later Von Koenigswald also mentions “*Leptobos*” (Von Koenigswald, 1956). In sum, we conclude that besides the hominid, the fauna collected in 1936-1938 from the site made up of *Hippopotamus* (= *Hexaprotodon*), *Cervus zwaani*, and the bovid (the “rund”) *Leptobos*, according to Von Koenigswald’s identifications.

Axis lydekkeri is not mentioned in the documents from the 1930s.

MORPHOLOGICAL AND BIOMETRICAL DESCRIPTION

The newly discovered specimen (PV01-004.56) is nearly a complete shed left antler. Only a tiny part of distal tip of brow-tine (a_1) is missing, having been broken off during recovery. Photographs of the specimen are given in Figure 2. The antler is housed in the Laboratory of Paleontology, Department of Geology, Institut Teknologi Bandung, Indonesia. Measurements of the antler were taken according to the method described by De Vos (1984) with a Dial Caliper *Mitutoyo no. 506.634.509, Japan).

The fossil is well-mineralized, dark brown in color, and cemented by a yellowish brown matrix of coarse-grained sandstone. The beam is lyre-shaped, and turns backwards, then anteriorly and then to the inner side. The surface of the beam is rather smooth, and not heavily pearly. The antler consists of the burr, a base, a P₁ and P₂ and two branches, the brow tine (a₁) pointing to the anterior and an a₂ pointing to the innerside. The length of the base from the burr to the angle in straight line is 4.73 cm.

The length of P₁ from the angle between P₁ and a₁ to a₂ is 30.30 cm. Length of P₂ is 22.20 cm; the length of the brow-tine (a₁) is 12.80 cm; length of a₂ is 7.80 cm. Diameter maximum of the body is 3.50 cm in anterior - posteriorly (DAP) and 3.63 cm transversally (DT). The angle [(P₁) – brow tine (a₁)] is 85° (measured with a Shinuya Measuring Instrument Co. Inc., Japan, no.19).

COMPARISONS WITH DESCRIBED TAXA

Several species of fossil cervids from Java have been described by Von Koenigswald (1933). These taxa are discussed individually, and compared with the new Perning specimen.

Cervus zwaani Von Koenigswald, 1933

This species was named by Von Koenigswald (1933: 81) based on four hemi-mandibles and an isolated upper M3 collected along Kali Saät (locality No. 248), Bumiaju (formerly spelled Boemiajoe). There are no antlers with these fossils. Nor was a type specimen was designated by Von Koenigswald. The species is named for Mr. N. de Zwaan, who first found vertebrae fossils in the Bumiaju district, West Java.

According to Von Koenigswald's (1933) description, *Cervus zwaani* is only slightly larger than *Cervus lydekkeri*. The lower premolars of *C. zwaani*, two of which are preserved in the described specimens, are robust according to Von Koenigswald. However, the degree of robustness of these specimens fall within the range of variation of *Axis lydekkeri*. The molars of *C. zwaani* have pillars, and can only be distinguished with difficulty from those of *C. lydekkeri* by their larger size. Von Koenigswald (1933) figures two of the hemi-mandibles. The following measurements made from the figures by John De Vos:

	M3	
	length	width
a) K1040, K74: Plate XX, fig. 4; Plate XXI, fig. 2:	19.4	9.5
b) K 78: Plate XXI, fig. 1:	19.3	10.5

These measurements fall within the range of those made on *Axis lydekkeri* specimens in the Dubois collection, Naturalis, Leiden, The Netherlands:

		M3									
		length					width				
N		min	mean	max	std. dev.	N	min	mean	max	std. Dev.	
57		16.5		21.7		56	8.1		10.3		

Size differences notwithstanding, the molars of *Axis lydekkeri* available from the Dubois collection and *Cervus zwaani* as described by Von Koenigswald from Bumiaju cannot be distinguished from one another morphologically.

Von Koenigswald (1933) did not attribute with certainty any antlers to *Cervus zwaani*. He did indicate that a small antler that he had already attributed to *Cervus cf. stehlini* is a possible candidate.

In 1934, Von Koenigswald attributed two antler fragments from Baringinan and Sangiran to *Cervus (Rusa) cf. zwaani*, stating: "These fragments are probably from the Bumiaju species, but this cannot be proved without having molars".

The *Cervus zwaani* specimens mentioned above are the only ones that have ever been described. However, many specimens are attributed to the species without description or comment (e.g., Aimi & Aziz, 1985). How many of these specimens are/have antlers is unknown.

According to Von Koenigswald (1933), the vertebrate fossils from Bumiaju occur in two units. The older one, the so-called "unterer Wirbeltier Horizont," contains his Kali Glagah fauna and is a marine deposit. The younger unit, the "oberer Wirbeltier Horizont," is a non-marine deposit described by Stehlin (1925) as containing the Limbangan fauna. *Cervus zwaani* is a guide fossil of Von Koenigswald's Jetis fauna, and was common among Andoyo's collections from the Pucangan Formation of Jetis/Perning district (Von Koenigswald, 1936c). Despite these facts, Von Koenigswald (1934) does not correlate the portion of the Bumiaju section that contains *Cervus zwaani* with the Pucangan Formation at Perning, nor recognize the Jetis fauna at Bumiaju.

Since no antlers are included in the type *Cervus zwaani*, and no one has described antlers from other specimens that have mandibles like the type, we cannot know how the antlers of the specimens assigned to this species by Von Koenigswald might compare to the new Perning specimen. Because the size of the molars of the type *C. zwaani* falls within the range of *Axis lydekkeri* from the Dubois collection, and the morphology is similar, it appears that *C. zwaani* is a junior synonym of *A. lydekkeri*.

In light of these conclusions, our specimen should not be attributed to *C. zwaani*, and we urge caution in attributing any other cervid material from Java to *Cervus zwaani*.

***Cervus (Rusa) stehlini* Von Koenigswald, 1933**

Von Koenigswald (1933: 78-80) recognized this species from four hemi-mandibles, two of which he described and figured. He also attributed, described, and figured three antlers to the species:

- a) K95, *Cervus cf. stehlini* (Wetenschappelijke Mededelingen 23, Plate XXIII, fig. 3). However, according to Von Koenigswald (1933), this specimen can also be attributed to *Cervus zwaani*.
- b) K96 BA 19, *Cervus stehlini* (Wetenschappelijke Mededelingen 23, Plate XXIII, fig. 4)
- c) K97 BA 20, *Cervus stehlini* (Wetenschappelijke Mededelingen 23, Plate XXIII, fig. 5)

All of these specimens are from the Bumiaju District.

According to Von Koenigswald (1933: 78), this species more or less has the same form and size of the extant *Cervus hippelaphus* (= *Rusa hippelaphus*). He describes the modern antlers in the following way: "The beam is rather straight, brow-tine short in the ontogenetic young antler, large in the older specimen; the posterior tine is short and the angle is small, as is the angle between the brow tine and the beam." Knowledge of the modern species presumably helped Von Koenigswald attribute the fossil antlers to his new extinct species based on the morphology of the four hemi-mandibles.

We can exclude the new Perning specimen from *Cervus (Rusa) stehlini* because, unlike the straight beam and long brow-tine of the antler of *C. stehlini*, the beam of the newly discovered specimen is lyre shaped, the brow-tine is short, and the angle between the brow-tine and the beam is large.

***Axis lydekkeri* (Martin, 1886)**

Synonyms

Cervus lydekkeri: Martin, 1886: 63 (see Martin 1888)

Cervus liriocerus: Dubois, 1907: 454

Cervus (Axis) lydekkeri: Stremme, 1911

This species is based on an antler described and figured by Martin (1886). The type specimen is St 18501, which is stored at Naturalis, Leiden, The Netherlands. The type locality is not known. The specimen is from an ontogenetic young individual, but many adult specimens of *Axis lydekkeri* are described and figured by Stremme (1911) and Von Koenigswald (1933). Additionally, hundreds of specimens attributed to this species were collected by Eugene Dubois at the Trinil hominid site and are now in the Dubois Collection, Naturalis.

Axis lydekkeri is somewhat smaller than *Axis axis* (Erxleben, 1777), but similar in size to *Axis (Hyelaphus) porcinus* (Zimmermann, 1777).

The morphology of the antler beam of *Axis lydekkeri* is lyre-shaped. The antler consists of the following elements: a burr; a base, which is rather short; brow-tine (a1) that makes an angle with the beam of about 90 °; an a2, which is short, points to the inside, and also makes an angle of about 90 °; and an p2 which is long. The surface of the beam is rather smooth; that is, not heavily pearly.

This description matches the description of the new Perning antler. Additionally, the new specimen has been carefully compared with antlers of *Axis lydekkeri* that are stored at the Quaternary Geological Laboratory (QGL), Geological Research and Development Center (GRDC), Bandung, Indonesia. The morphology and dimensions are close to those of two *Axis lydekkeri* (Martin, 1886) antlers at QGL/GRDC, collection numbers K98 and K105 from Trinil (Von Koenigswald, 1933: Plate XXIV, fig. 1 and 8).

TABLE 1

	<u>Base</u>	<u>P1</u>	<u>P2</u>	<u>a1</u>	<u>a2</u>
PV01-004.56	4.73	30.3	22.2	12.8	7.8
K98	4.46	29	23	12	8
K105	2.95	23			

K98 is from an excavation at Trinil, Ingrading I, blok 6, Layer III, 28-7-32.

K105 is from an excavation at Trinil, Ingrading I, blok 6, Layer III, 5-8-32

Specimen PV01-004.56 therefore can be attributed to *Axis lydekkeri* (Martin, 1886).

***Axis javanicus* (Von Koenigswald, 1933)**

This species was originally described as *Cervus (Axis) axis javanicus* by Von Koenigswald (1933). Many antlers of the species are described and figured by him are from collections made by the Geological Survey of the Netherland Indies at Ngandong, Pandejan, Watualang and Pitu sites, East Java (late Quaternary contexts, except possibly Pitu). *Axis javanicus* is the size of the recent *Axis axis*. Antlers of *Axis javanicus* resemble those of *Axis lydekkeri*, and therefore PV01-004.56. However, the angle between the brow tine and the beam is 90° or more in *Axis javanicus*, whereas the Perning specimen has an angle of 85°. Also, *Axis javanicus* almost always has an accessory tine within this angle. Since it lacks an accessory tine, the Perning specimen almost certainly not *Axis javanicus* (Von Koenigswald, 1933).

***Cervus (Rusa) problematicus* Von Koenigswald, 1933**

Von Koenigswald (1933: 80) named *Cervus problematicus* on the basis of two specimens from Bumiaju, Central Java. He described and figured the two fossils, which are a partial cranium

(Plate XXIII, fig. 2) and a right lower M1 from the "unter Wirbeltierschiechten Bumiaju", nr 248 (Plate XIX, fig. 17). In 1934, Von Koenigswald attributed a right lower M3 (K137) from Jetis locality (and therefore is presumably from the upper Pucangan Formation of the Perning district) to this species (Von Koenigswald, 1934, Plate III, fig. 3). He considered this taxon to be a subgenus of *Rusa*, naming it *Cervus (Rusa) problematicus*.

However, the cranium from Bumiaju is not a cervid; rather it is a hornless cranial fragment of a female 'Boselaphini' (Van den Bergh, pers. com.). As such, it is closely related to the living *Boselaphus tragocamelus* from the Indian subcontinent, and is probably the ancestor of the endemic *Duboisia santeng* known from the younger Javanese faunas. The skull therefore has to be excluded for comparative purposes.

The lower M1 from Bumiaju has a length of 20 mm and a width of 15.5 mm (measurements reported by Von Koenigswald), while the lower M3 from Jetis has the length of 32.5 mm and a width of 16.6 mm (measurements by J. de Vos). These molars are about the same size as those of *Rusa equina*, which is much larger than *Axis lydekkeri*. *Rusa equina* antlers are also larger and more heavily pearly than *Axis lydekkeri*.

Although no antlers have been attributed to *Cervus problematicus*, the new Perning antler PV01-004.56 is smaller than and therefore not attributable to *Cervus problematicus*.

***Rusa timorensis* (Blainville, 1822)**

A large number of specimens from various Pleistocene localities in Java have been attributed to the genus *Cervus* in the sense of *Rusa* (Martin 1888; Dubois 1892, 1907, 1908; Stehn & Umgrove 1926; Von Koenigswald 1933, 1934; Aziz & De Vos, 1999). *Rusa* was described by Smith (1827) as a subgenus of *Cervus* Linnaeus, and is considered by others to be a valid genus. We follow this practice. According to unpublished work by John de Vos, Pleistocene specimens from Java that are attributable to *Rusa* include:

Cervus sp.: Martin, 1888: 114
Cervus (incl. *Rusa*) sp. indet.: Dubois, 1892: 94
Cervus: Dubois, 1907: 454
Cervus kendengensis: Dubois, 1908: 1259
Cervus palaeomendjangan: Dubois, 1908: 1260
Cervus sp.: Stehn & Umgrove, 1926
Cervus (Rusa) hippelaphus: Von Koenigswald, 1933
Cervus (Rusa) sp.: Von Koenigswald, 1933: 83
Cervus sp.: Von Koenigswald, 1933: 83
Cervus (Rusa) oppenoorthi: Von Koenigswald, 1933: 76-77
Cervus hippelaphus: Von Koenigswald, 1934: 194
Cervus (Rusa) problematicus: Von Koenigswald, 1934
Rusa sp.: Aziz & De Vos, 1999

It is not clear whether the Pleistocene *Rusa* specimens should be placed in a separate species (one smaller than *Rusa equina*) or should be included in the modern species *Rusa timorensis*. *Rusa* antlers are much larger, more pearly than PV01-004.56, so the new Perning specimen cannot be included in *Rusa*.

CONCLUSION

Specimen No. PV01-004.56 from the Perning hominid site is attributed to the species *Axis lydekkeri* (Martin, 1886) because it is morphologically similar to the type specimen figured by Martin (1886), and to specimens at Naturalis and GRDC that have been identified as *Axis lydekkeri*.

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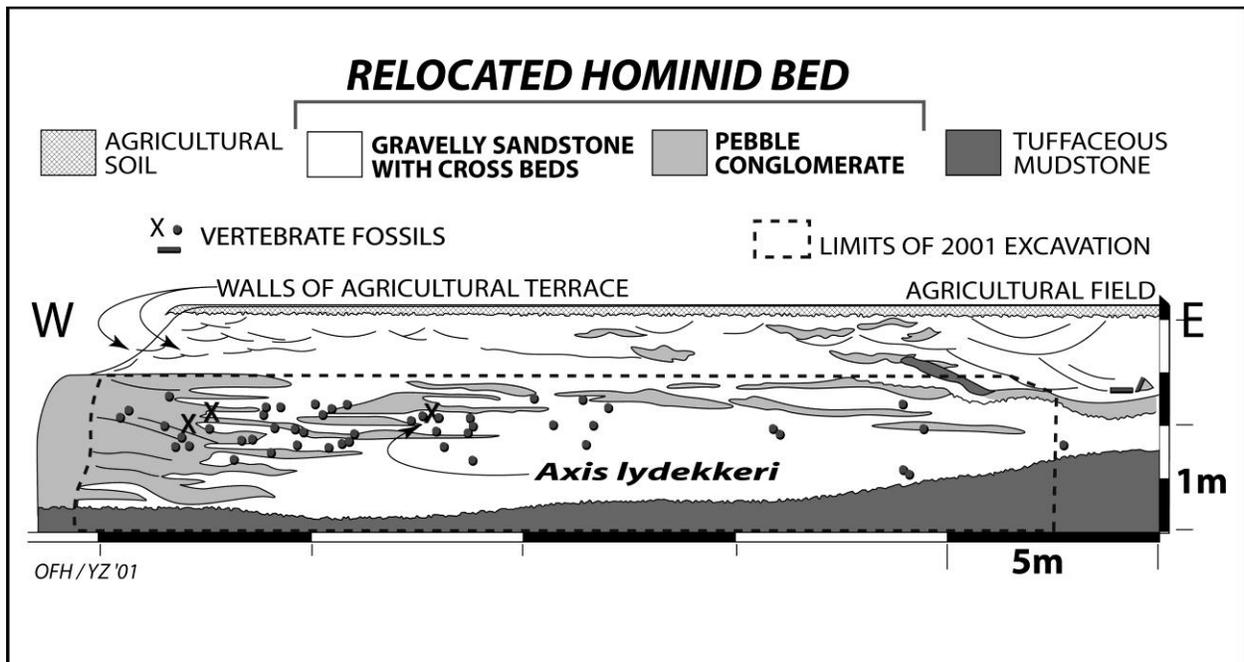


Figure 1: Geological profile of the excavation face in which the antler was discovered.

Zaim, Y., et al. (2003). A new antler specimen from the 1936 Perring hominid site, East Jawa, Indonesia, attributable to *Axis lydekkeri* (MARTIN, 1886). Submitted to Journal of Mineral Technology, v.10, n. 2. The Faculty of Earth Sciences and Mineral Technology, Institute Technology, Bandung.



Figure 2: Photographs from two perspectives of the antler specimen identified as *Axis lydekkeri* (Martin, 1886).

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