

THE FAUNA FROM TRINIL, TYPE LOCALITY OF *Homo erectus*; A REINTERPRETATION¹

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ABSTRACT

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A reinvestigation of the Pleistocene mammals of Java from the Dubois collection at Leiden sheds new light on the relative age of the *Homo erectus* localities. The fauna of the type locality of *Homo erectus* Trinil is older in age than the 'Jetis fauna' of VON KOENIGSWALD, 1934. The latter is similar to the fauna of Kedung Brubus.

The Trinil fauna is poor in species with many endemics, which points to little or no faunal exchange with the Asian mainland; it cannot be excluded that during the Pleistocene Trinil was situated on an island. The Kedung Brubus and Jetis faunas are characterized by the presence of new Asiatic elements absent in Trinil. The fauna from the same level as the type locality of *Homo modjokertensis* is of the Kedung Brubus type and there are no arguments to suppose that this *Homo modjokertensis* antedates *Homo erectus* from Trinil.

INTRODUCTION

It is ninety years since E. Dubois made his spectacular discovery of *Homo erectus* at Trinil (Central Java). This was the climax of his extensive search and excavations not only at Trinil, but also in other Pleistocene mammal-bearing deposits on the isle of Java (Fig. 1). Kedung Brubus was the only other locality that yielded another fossil of *Homo erectus*. DUBOIS (1908) noticed differences in the faunal composition between Trinil and Kedung Brubus (Kendeng Hills), the fauna from Trinil was much poorer in species than that from Kedung Brubus. According to DUBOIS (1908) this was caused by differences in the paleoenvironment. He considered the age of the faunas to be equivalent; a view that was reflected in the title of

his 1908 paper 'Das geologische Alter der Kendeng – oder Trinil Fauna'. Later authors also considered the fossils from the localities at which Dubois excavated to be of the same age and referred to these as the Trinil fauna (STREME 1911 a, b, VON KOENIGSWALD 1934, HOOIJER 1952). The Selenka expedition 1907-1908 again excavated mainly at Trinil; once more the relative scarcity of species in this locality was noted (STREME 1911 a, b, DE VOS & SONDAAR, in press). In the nineteen thirties more systematic collecting was carried out by the 'Dienst v. d. Mijnbouw' (Geological Survey) and a biostratigraphy for the Pleistocene of Java was proposed (VON KOENIGSWALD 1934,

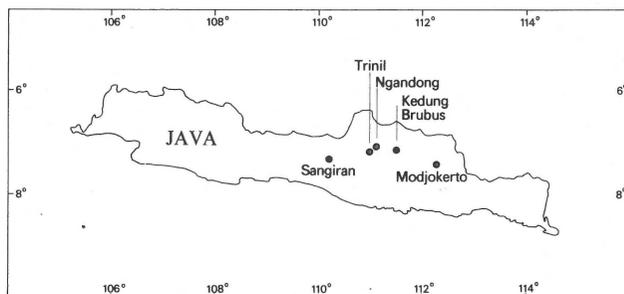


Fig. 1
Locality diagram.

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1935). Three faunas were distinguished for the Pleistocene: Jetis (Lower-), Trinil (Middle-) and Ngandong (Upper-Pleistocene).

VON KOENIGSWALD (1934, 1935) used locality names for his faunal succession, but his faunal assemblages from the Pleistocene units differ in composition from the fauna actually collected at those 'type' localities. According to VON KOENIGSWALD the 'Jetis fauna' was an assemblage of fossils from localities N. of Jetis and Pening (COSIEN, 1931; 1932), Sangiran I. Gunung Butak and Kali Saät in the Bumiaju district, whereas the 'Trinil fauna' was an assemblage of fossils from Trinil, Kedung Brubus, Sangiran II and Pitu; the 'Ngandong fauna' was an assemblage of fossils from Ngandong, Kuwungkulon, Watulang and Pandojan. According to VON KOENIGSWALD (1935, p. 193-194) the difference between the faunas was that *Leptobos* (= *Epileptobos*) and *Epimachairodus* were only present in the 'Jetis fauna', whereas the specialised *Elephas* ex. aff. *namadicus* was only present in the 'Trinil' association. Besides lumping faunas together, VON KOENIGSWALD also changed the fauna lists compiled by previous authors without producing clear reasons for doing so. He (VON KOENIGSWALD, 1934) followed DUBOIS (1908) in stating that Trinil and Kedung Brubus were of the same age. However, his 'Trinil fauna' does not include *Tapirus*, *Manis* and *Epileptobos*, which were present in Kedung Brubus according to DUBOIS (1908). The presence of *Epileptobos* at Kedung Brubus was also confirmed by HOOIJER (1958), who stated that the 'Jetis fauna' and the 'Kedung Brubus fauna' were identical (HOOIJER, 1975). However, Hooijer did not draw the logical conclusion that – we accept Von Koenigswald's concept that Kedung Brubus is a Trinil fauna – there is no difference whatsoever between his Trinil and his Jetis fauna.

VAN ES (1931) and DUYFJES (1938) made extensive studies of the geology and stratigraphy of the Javanese Pleistocene mammal bearing deposits. DUYFJES (1936) established a lithostratigraphy, but as was common practice in those days, he gave it a chronostratigraphic value, and his Pucangan (Putjangan of DUYFJES, 1936) Formation and Kabuh Formation have since been regarded as being equivalent in age to the 'Jetis' and the 'Trinil fauna', respectively.

The Sumberingin section was designated as type section for the Kabuh Formation (MARKS, 1957) and the boundary between the Pucangan Formation and Kabuh Formation in this section is based on the fossil content (DUYFJES, 1938; p. 21 and p. 43). In lithology there is no appreciable difference between the two formations. To make things even more confusing the name Kabuh beds had been used previously with another meaning (VAN ES, 1931; p. 109: 'Beds of Kabuh, a marine marl').

To summarize, we see on the one hand a 'Biostratigraphy' which is based on composite faunal lists and on the other hand a 'Lithostratigraphy' in part defined by the faunal content. Clearly both stratigraphies need to be revised. The starting point for biostratigraphy is the study of the real fossil faunas from which a sequence of faunal events can be deduced.

DIFERENCES BETWEEN DE FAUNA'S FOUND AT TRINIL AND KEDUNG BRUBUS

Fortunately the bulk of the material of the Dubois Collection (Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands) is accompanied by good field descriptions. The material was excavated in a proper way (DE VOS & SONDAAR, in press). The fossils were found mainly *in situ*. To be sure that materials come from one locality and one level, only those specimens were used of which the provenance could be traced. The main localities in the Dubois Collection are Trinil and Kedung Brubus and we shall concentrate on these localities. Table I consists of a faunal list of these localities. A few comments on the lists are given below:

a. At Trinil the number of species is small. The list is based on material available in the Dubois Collection. HOOIJER (1946, 1950, 1955 and 1958) erroneously mentioned that the following species originated from Trinil:

Elephas hysudrindicus: According to DUBOIS (1908) no *Elephas* remains were found at Trinil. One of these (Coll. Dub. no. 2226) is not from Trinil, but from Ngandjar (± 1 km S.E. of Trinil). The provenance of the other specimen (Coll. Dub. no. 3527) is unknown.

TABLE I

The fauna list of Trinil (from Dubois and Stremme) compared with the fauna list of Kedung Brubus from Dubois Coll.

	TRINIL Coll. Dub.	TRINIL Selenka	KEDUNG BRUBUS Coll. Dub.
<i>Manis palaeojavanica</i> Dubois	–	–	+
<i>Acanthion brachyurus</i> (L.)	+	+	–
<i>Panthera trinilensis</i>	+	+	–
<i>Panthera oxygnatha</i>	–	–	+
<i>Prionailurus bengalensis</i> (Kerr)	+	–	–
<i>Lutra palaeoleptonys</i> Dubois	–	–	+
<i>Hyaena brevirostris bathygnatha</i> D.	–	–	+
<i>Mececyon trinilensis</i> Stremme	–	+	–
<i>Stegodon trigonocephalus</i> Martin	+	+	+
<i>Elephas hysudrindicus</i> Dubois	–	–	+
<i>Rhinoceros sondaicus</i> Desmarest	+	+	+
<i>Rhinoceros kendengindicus</i> Dubois	–	–	+
<i>Tapirus indicus</i> Desmarest	–	–	+
<i>Hexaprotodon sivalensis</i>			
Falc. et Cautley.	–	+*	+
<i>Muntiacus</i> sp.	+	+	+
<i>Rusa</i> sp.	–	–	+
<i>Axis lydekkeri</i> Martin	+	+	+
<i>Duboisia santeng</i> (Dubois)	+	+	+
<i>Epileptobos groeneveldtii</i> (Dubois)	–	–	+
<i>Bubalus palaeokerabau</i> Dubois	+	+	+
<i>Bibos palaeosondaicus</i> Dubois	+	+	+
<i>Sus brachygnathus</i> Dubois	+	+	–
<i>Sus macrognathus</i> Dubois	–	–	+
<i>Trachypithecus cristatus</i> Raffles	+	–	–
<i>Macaca</i> sp.	+	+	–
<i>Meganthropus</i>	+	–	–
<i>Homo erectus</i> (Dubois)	+	–	+

* not from the main layer of Trinil (Hauptknochenschicht).

Rhinoceros kendengindicus: HOOIJER (1946) attributed a damaged distal part of a femur (Coll. Dub. no. 9233) to this species. This fragment is not very characteristic for species determination and falls within the range of variation of *Rh. sondaicus*, teeth of which were found at Trinil. *Epileptobos groeneveldtii*: The only specimen is that by HOOIJER (1958) to come from Trinil (Coll. Dub. no. 2746), in fact came from Tawang (2 km S.W. of Trinil).

The above mentioned species are also absent from the Trinil Collection excavated by the Selenka expedition (STREMME, 1911a, b). The fauna list based on the Dubois Collection and the Selenka Collection differs only in a few respects (see Table I). In the Dubois Collection *Prionailurus*, *Trachypithecus*, *Meganthropus* and *Homo erectus* are present, but *Mececyon trinilensis* is absent. The presence of *Sus macrognathus* in the Collection of the Selenka expedition is based upon three specimens, viz. a M₂, a M₃, and a tibia. The measurements of the teeth indicate that they may belong to *Sus brachygnathus* and the tibia is not very indicative for specific identification.

Another matter for dispute is the presence or absence of *Hexaprotodon* in Trinil. DUBOIS (1908) stated that he did not find *Hexaprotodon* in Trinil. However, HOOIJER (1950) described six specimens for Trinil, which he attributed to this genus. One mandible fragment (Coll. Dub. no. 2903) came from the Solo Valley, and the localities of the other five specimens are unknown. In the register of the Dubois Collection these specimens were attributed to Trinil on the basis of their state of fossilization.

There is therefore no valid reason to doubt Dubois' statement that there was no *Hexaprotodon* in Trinil. STREMME (1911, a, b) mentioned a *Hexaprotodon* from Trinil, but this specimen was not from the main fossiliferous level (Hauptknöchenschicht), but from a level five metres above it (OPPEN-OORTH, 1911).

b. At the Kedung Brubus locality *Epileptobos*, *Tapirus*, *Elephas*, *Rhinoceros kendengindicus*, *Hyaena*, *Manis* and a big *Rusa* are clearly represented by specimens with good locality data. These forms are not present at Trinil. Apart from *Elephas*, VON KOENIGSWALD (1934) does not mention the above forms in his fauna list for the Kedung Brubus locality.

c. In Trinil *Duboisia santeng* and *Axis lydekkeri* are the most common elements in the fauna.

d. The genera which are common to the localities often differ on the specific level. In Trinil *Sus brachygnathus* is present, in Kedung Brubus *Sus macrognathus*. The carnivores differ too; the tigers, according to DUBOIS (1908) differ on the species level (*Felis trinilensis* from Trinil; *Felis oxygnatha* from Kedung Brubus); according to HEMMER (1971) the tigers differ on the subspecies level (*Panthera tigris trinilensis* and *Panthera tigris oxygnatha*).

e. The 'Jetis fauna', sensu Von Koenigswald, resembles the Kedung Brubus in most respects, as observed already by HOOIJER (1975).

REVISED BIOSTRATIGRAPHY

The differences in the faunal composition of Trinil and Kedung Brubus are clear (see Table I). Up till now the faunas have been considered to be coeval, which means that the difference in composition must have been caused by a difference in environment, as DUBOIS (1908) suggested. However, a critical evaluation of these differences does not logically lead to the conclusion that the differences were environmentally induced. How are we to explain:

- (1) the specific differences between pigs, and between carnivores?
- (2) that we do not find *Hexaprotodon* in fluvial deposits (DUBOIS, 1907, p. 452) at the locality Trinil?
- (3) the differences in taphonomy on the basis of palaeoecology only (since the locality Ngandjar, where typical Kedung Brubus fauna is found, is situated not far from Trinil)?

We do not accept that palaeoenvironmental reasons alone are sufficient to explain the differences between the faunas; we are convinced that there must be a difference in age. In the Kedung Brubus fauna we find *Hyaena*, *Elephas*, *Tapirus*, *Rhinoceros kendengindicus* and *Epileptobos*. These taxa point to a new migration wave from Asia, as they are missing from older faunas of Java, such as the Kali Glagah Fauna. The *Elephas* is an 'advanced' form. The *Epileptobos* is very 'advanced' (HOOIJER, 1958, p. 5). *Leptobos* was still present on the Indian Subcontinent during the Middle Pleistocene (VON KOENIGSWALD, 1934). *Rhinoceros kendengindicus* can be related to forms known from the Upper Siwaliks. Once the chronological difference is accepted, there are two possible conclusions:

- (1) The Kedung Brubus fauna is older than the Trinil fauna;
- (2) The Trinil fauna is older than the Kedung Brubus fauna.

The first possibility can be rejected as it is difficult to explain the absence of the advanced *Elephas*, *Rhinoceros kendengindicus* and *Epileptobos* and *Tapirus* in Trinil.

If we take into account that there was a general regression of the sea from West to East during the Pleistocene (VAN BEMMELEN, 1949), then we may assume that landbridges could have been formed, which promoted migrations of mammals from Asia towards the East. In consequence, the faunal evolution of Pleistocene Java is characterized by an increase of Asiatic mammals (SONDAAR, 1981).

Seen in the light of this pattern the second possibility is much more logical. The Trinil fauna is poor in species and has

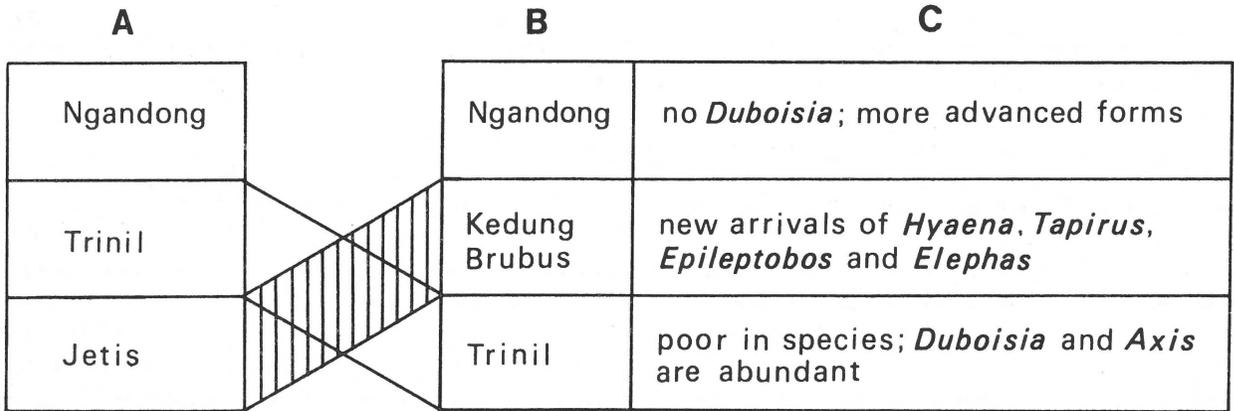


Fig. 2
Faunal succession in Pleistocene Java.

A. after Von Koenigswald, 1934
B. proposed in this paper
C. the main faunal composition

an endemic character: *Duboisia* is a clear example of such endemism. A fresh influx of Asiatic mammals, such as *Tapirus*, *Elephas*, *Hyaena*, *Rhinoceros kendengindicus* and *Epileptobos* is therefore reflected in the Kedung Brubus fauna. In Fig. 2 the faunal succession is given as proposed in this paper and compared with that of VON KOENIGSWALD, 1934. The endemic character of the Trinil fauna makes a direct correlation difficult with other Asiatic faunas from China and the Siwaliks. It is therefore impossible at the moment to decide whether the Trinil-Kedung Brubus-Ngandong interval discussed above represents the whole Pleistocene or only a part of it. As the Kedung Brubus fauna is similar to the 'Jetis fauna', we may assume that the latter is younger than the 'Trinil fauna'. We must be a little cautious, however, about interpreting the 'Sangiran fauna', because the fossils on which it is based were mainly surface finds. Our conclusions are in agreement with the new information on the age of the Modjokerto locality (SARTONO ET AL., 1981). A further reinvestigation of the Pleistocene mammal faunas of Indonesia and fieldwork is necessary to decide how the new data fit into the absolute dates so far obtained from Pleistocene rocks from Java.

CONCLUSIONS

1. *Homo erectus* in the Dubois Collection from Java is associated with two different assemblages, an older Trinil fauna, which is poor in species and a younger fauna from the Kedung Brubus locality.
2. The fauna of Jetis (*sensu* VON KOENIGSWALD, 1934) is similar to the Kedung Brubus fauna and younger than that of the Trinil type locality.
3. During the period when the Trinil layers were deposited, Java must have been isolated from Asia and endemics like *Duboisia* could develop. The relatively low number of species suggests that the area was isolated and that there was little faunal interchange with the mainland. Pleistocene Trinil was probably situated on an island.

A wave of Asiatic mammals entered the region, probably during a glacial period with a low sea level stand which resulted in better land connections with Asia. This is reflected in the Kedung Brubus fauna.

4. The faunal subdivisions for the Pleistocene of Java: Jetis-Trinil-Ngandong must be abandoned, since the 'Jetis s.l.' localities are younger than 'Trinil s.s.'. Instead, a faunal succession of Trinil, Kedung Brubus and Ngandong should be used. In this subdivision the Trinil fauna means the fauna from the type locality with *Homo erectus* (Dubois).

5. Since a Kedung Brubus fauna was found near the type locality of *Homo modjokertensis*, and in the same stratigraphic level, we can assume a younger age for it than that of the Trinil type locality.

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