Fachroel Aziz[1] & John de Vos[2]
[1] Geological Research and Development Centre (GRDC), Bandung
[2] Naturalis, Leiden

The fossil faunas from the Citarum Area, West Java, Indonesia

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The present paper deals with four fossil faunas that were discovered in the Citarum area, West Java, Indonesia, and with their ages. (1) The fauna from Banuraja, west of Batujajar contains a *Sus* sp., a Bovid sp., a *Rusa* sp., a *Stegodon/Elephas* sp., *Panthera tigris*, *Duboisia santeng* and *Manis palaeoja - vanica*.The presence of *Manis palaeojavanica* indicates a Kedung Brubus fauna, in the sense of De Vos & Sondaar (1982), with has an age of about 800.000 years (Leinders *et al.* 1985). (2) The Cipatik/Cililin contains a fossil fish, probably *Cyprinis carpio*. The age of this fauna is possibly Pleistocene. (3) From the site Ciharuman a fossil snake, probably *Python reticulatus*,is reported. Radiocarbon C^{14} dating suggests an age of 29.6 to 42.3 kyr for this fauna. (4) The fauna from Cipeundeuy consists of *Elephas maxi - mus*, cf. *Rhinoceros sondaicus*, a bovid sp. and *Rusa* sp. From this site the first occurrence of *Elephas maximus* is described. Samples from above and below the fossil bearing layer in Cipeundeuy give an age of 42,360 ±1925 and 36,390 ±2500 years.

Correspondence: Fachroel Aziz, Geological Research and Development Centre (GRDC), Jalan Diponegoro 57, Bandung, 40122, Indonesia, e-mail grdc@melsa.net.id; John de Vos, Naturalis, National Museum of Natural History, P.O. Box 9517, 2300 RA, Leiden, The Netherlands, e-mail vos@naturalis.nnm.nl

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INTRODUCTION

The Citarum River (old spelling Tji Taroem) and its tributaries (Cihaur/Cipeundeuy and Cipatik rivers) are the main drainage system in the Quarternary Bandung Intramountain Basin. This Basin is located about 20 km West of Bandung (Figs. 1 and 2). Stehn & Umbgrove (1929) discovered, mentioned, and figured for the first time fossils from the Citarum area at the bank of Citarum River near Banuraja, west of Batujajar (in this paper the new spelling is used), Preanger, West Java. According to the authors these fossils belong to the genera *Cervus*, *Sus* and *Bos*. However they (Stehn & Umbgrove 1929) gave neither measurements nor full descriptions. The collection is stored as 'Collection Stehn & Umbgrove' in the National Museum of Natural History, Leiden. In 1930, mr Grondijs collected some molars of *Rhinoceros* sp. from the area (Van Es 1931: 15). It is not known where these fossils are stored. March 31, 1984, the Geological Museum of the Geological Research and Development Centre (GM-GRDC) obtained two fossil pieces of a freshwater fish from a villager of Cililin. These fossils were discovered at the bank of Cipatik River, a tributary of the Citarum River near Cililin village (Soewarno 1984). Subsequently, a paleontological team of the GRDC visited the site and confirmed that the fish fossils were coming from the very fine sandstone concretion in the clay bed of the lake deposit (Sudijono, personal communication). The fossils are

housed in the GM-GRDC. In 1988, mr Darwin Siregar of the GRDC, carrying out a field survey in this area, obtained a snake fossil from a villager of Ciharuman and donated this fossil to the Paleontology Section (PS) of the GRDC, where it is now stored. This fossil was discovered in a sandstone bed at the bank of Citarum River, near the Ciharuman village (Siregar 1988, GRDC internal report). During 1986 - 1990 a joint research team of the GRDC and the Free University, Amsterdam (FUA) carried out a quaternary geological survey in Bandung basin area. During the field campaign mr M.A.C. Dam, one of the team members, collected some fossils from the sand quarry, near Cipeundeuy village, South of Padalarang town. These fossils were also donated to the PS-GRDC. Later on, a paleontological team of the GRDC has collected more fossil materials. The elephant material has been described and figured by Van den Bergh (1997). The fossils are stored in the PS-GRDC. This paper will give an overview and a (re)description of the fossils from the mentioned four sites of West Java. Their age will furthermore be discussed.

Abbreviations used

DAP = diameter antero-posterior
Dex. = dextra
Dist. = distal
DT = diameter tranverse
L = length
Max. = maximal
Prox. = proximal
Sin.= sinistra
W = width

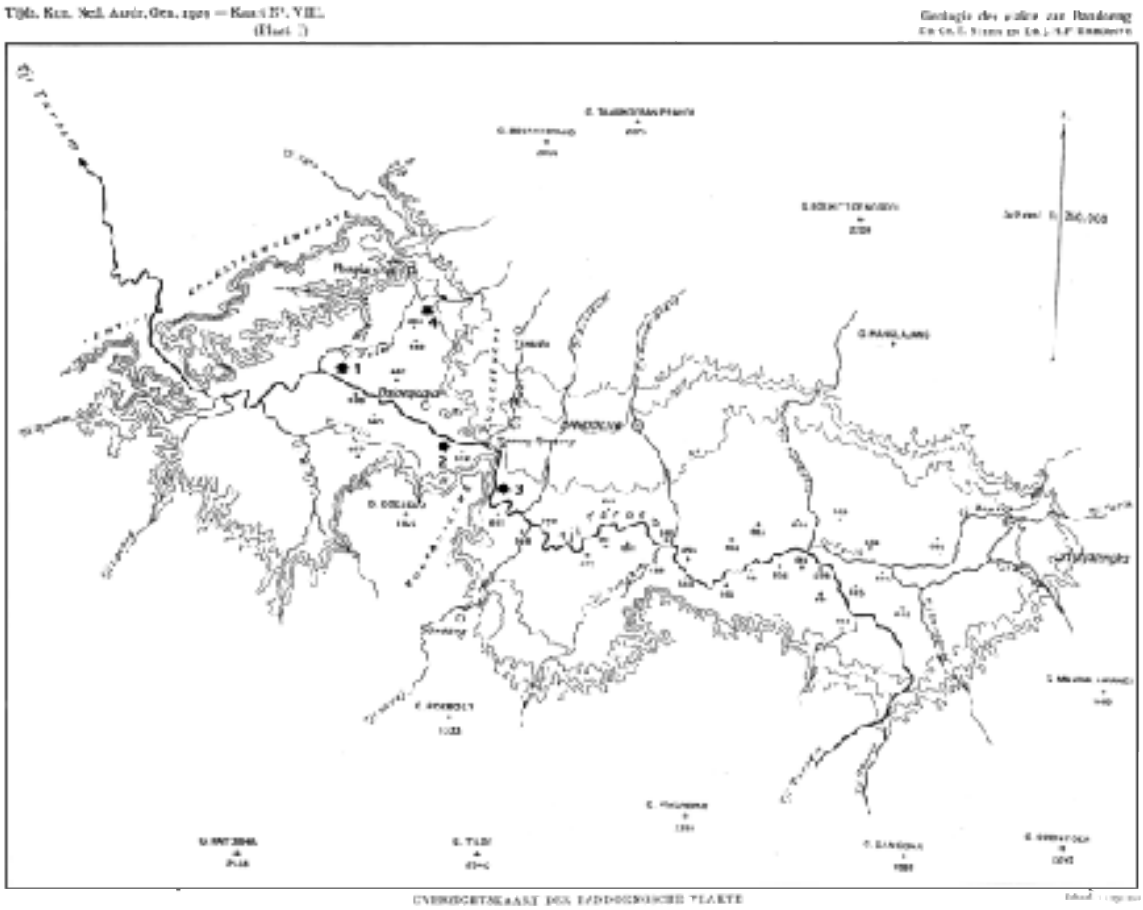

Figure 1 Map of the Bandung Basin, from Stehn & Umbgrove (1929).

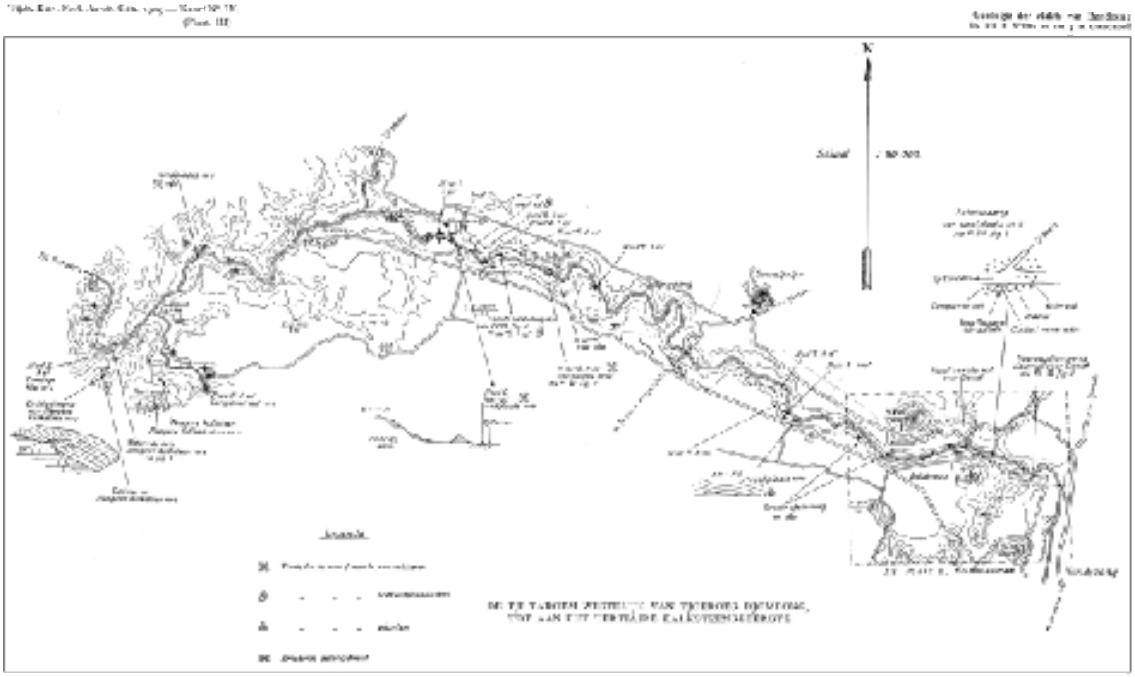

Figure 2 Detailed map of the Citarum area, from Stehn & Umbgrove (1929).

FAUNA

1 Banuraja, west of Batujajar (Fig. 1 no. 1, Fig. 2)

Stehn (Stehn & Umbgrove 1929) found fossil bones of large vertebrates at Banuraja (Banoeradja) in the Citarum (Stehn & Umgrove 1929: Map III, here reproduced as Figure 2, at number 8). They were rolled and found not *in situ*, so that the authors suspected that the fossils were coming from a layer more upstream. They found such a layer at the left bank of the Citarum (Stehn & Umbgrove 1929: map III, here reproduced as Figure 2, at number 10). From this site they reported and figured (ibid., plate VI, fig. 2) some bones, a vertebra of *Bos* and a few costae. A third site where rolled fossils were found was south of Cilutung (Tji Loetoeng) (Stehn & Umbgrove 1929: Map III, here reproduced as Figure 2, at number 7). In this site bones of *Bos*, teeth of *Cervus* and a right mandible fragment of *Sus* were found.

1.1 *Sus* sp.

p3, p4, m1 and m2 are present in the right mandible fragment of *Sus*. It was found south of Cilutung (Stehn & Umbgrove 1929: map III, here reproduced as Figure 2, at number 7) and figured by Stehn & Umbgrove (1929: plate IV figs. 4 and 5). It bears the numbers RGM 401900, T.T. 25 and J. 2021. The teeth are rather worn, so it must be from an old individual. The measurements are: p3: L = 12.5, W = 7.1; p4: L = 14.3, W = 9.2; m1: L = 14.4. W = 11.7; m2: L = 19.3, W = 14.0.

The *Sus* sp. was, according to Stehn & Umbgrove (1929), comparable with *Sus brachygnathus*. Von Koenigswald (1933: 44, 47) identified these fossils as *Sus terhaari*. Later von Koenigswald (1935: 87) identified it, without giving arguments, as *Sus* sp. The validity of Dubois' species, *Sus brachygnathus* and *Sus macrognathus*, was discussed by Badoux (1959). After making some comparisons and analysis based only on the teeth, he came to the conclusion that *Sus brachygnathus* was a synonym of *Sus barbatus* and *Sus macrognathus* was a synonym of *Sus verrucosus*. Hardjasasmita (1987) considered Dubois' species as valid, but the dimensions

Table 1 Measurements in mm of m2 of *Sus* sp. Citarum, *Sus brachygnathus* and *Sus macrognathus* (L = length, W = width).

number	species	L	W
RGM 401900	*Sus* sp. Citarum	19,3	14
DUB 497A	*Sus macrognathus*	21,6	15
DUB 7005A	*Sus macrognathus*	23,1	15
DUB 80	*Sus macrognathus*	22,6	16,2
DUB 1827	*Sus brachygnathus*	19,3	13,2
DUB 1843 DEX.	*Sus brachygnathus*	20,1	14,3
DUB 1843 SIN.	*Sus brachygnathus*	20,3	14,2

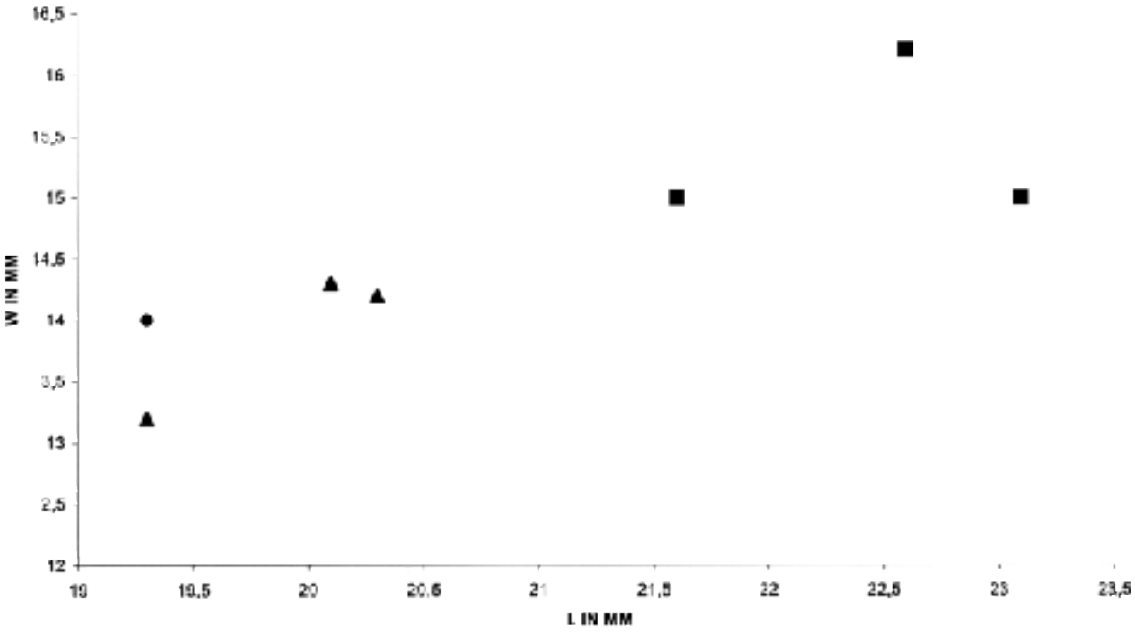

Figure 3 Length and width and DT lower m2 of *Sus* sp. from Citarum (RGM 401900, lozenge), *Sus brachygnathus* (triangles) and *Sus macrognathus* (squares).

of the Citarum specimen are, according to that author, too large for *Sus brachygnathus* (Hardjasasmita 1987: 9). Comparison of the measurements of the Citarum specimen with those of *Sus brachygnathus* and *Sus macrog - nathus* (Table 1 and Fig. 3) shows that the specimen has the size of *Sus brachygnathus*. However, the material is too scanty to give a specific determination.

1.2 *Duboisia santeng* (DUBOIS, 1891)

Stehn & Umbgrove (1929: 7) mentioned and figured (Stehn & Umbgrove 1929: plate IV figs. 1-3) three teeth that they considered as probably originating from the lower jaw and that had the size of *Cervus hippelaphus*. The three molars are a right upper molar, St 28094 A, J 2022 (Plate IV fig. no. 1); a left lower molar, St 28094 B, J 2022 (Plate IV

fig. no. 2); and a right M3 of *Duboisia santeng*, St 28094 C, J 2022, T.T. 24 (Plate IV fig. no. 3).

In revising the identification of Stehn & Umbgrove (1929), Von Koenigswald (1935: 87) refers the specimens figured on Plate IV figs. 2-3 by Stehn & Umbgrove (1929) to his *Antilope modjokertensis*, thereby considering the two figures to represent two views of one and the same molar that agrees in size with an M2. However, they represent two different molars. St 28094 B is a lower molar, while St 28094 C is an upper M3. According to Hooijer (1958), *Antilope modjokertensis* is a junior synonym for *Duboisia santeng*. Restudying and comparing the specimen St 28094 C with *Duboisia santeng* material from the Dubois Collection, Hooijer (1958: 17, table 3) concluded that the specimen is an M3 dex. of *Duboisia santeng*.

1.3 *Rusa* sp.

The other two molars, St. 28094 A and B, indicated by Stehn & Umbgrove (1929: 7) as *Cervus hippelaphus*, are referred by Von Koenigswald (1933, p. 74) to *Cervus unicolor* KERR (=*Cervus hippelaphus* SMITH). *Cervus hippelaphus* is *Rusa hippelaphus*. Afterwards, Von Koenigswald (1935) consi-

Table 2 Measurements in mm of m1-2 of the Citarum specimen and those of *Axis lydekkeri* from the Dubois collection (L = length, W = width).

number	species	L	W
RGM	Citarum specimen	18	14,9
8439A	*Axis lydekkeri*	13,2	12,8
8439A	*Axis lydekkeri*	12,4	11
8439B	*Axis lydekkeri*	13,5	13,7
8439B	*Axis lydekkeri*	13,5	13
8439C	*Axis lydekkeri*	14,4	14,6
8439C	*Axis lydekkeri*	12,7	13,4
8439D	*Axis lydekkeri*	13	12,7
0439E	*Axis lydekkeri*	14	12,7
8439F	*Axis lydekkeri*	15	14,1
8439F	*Axis lydekkeri*	15	13,8
8439G	*Axis lydekkeri*	13,4	12,8
8439I	*Axis lydekkeri*	14,5	12,5
15870	*Axis lydekkeri*	13,4	13,2
15871	*Axis lydekkeri*	13,7	14
15872	*Axis lydekkeri*	15	14,3
15876	*Axis lydekkeri*	15,6	14
15877	*Axis lydekkeri*	14	13,7
15878	*Axis lydekkeri*	14,4	13,2
15879	*Axis lydekkeri*	14,6	13
15880	*Axis lydekkeri*	15	14,4
15881	*Axis lydekkeri*	15	14,5
15882	*Axis lydekkeri*	14,5	13,5
15883	*Axis lydekkeri*	14,3	13,7
15884	*Axis lydekkeri*	14,2	14,5

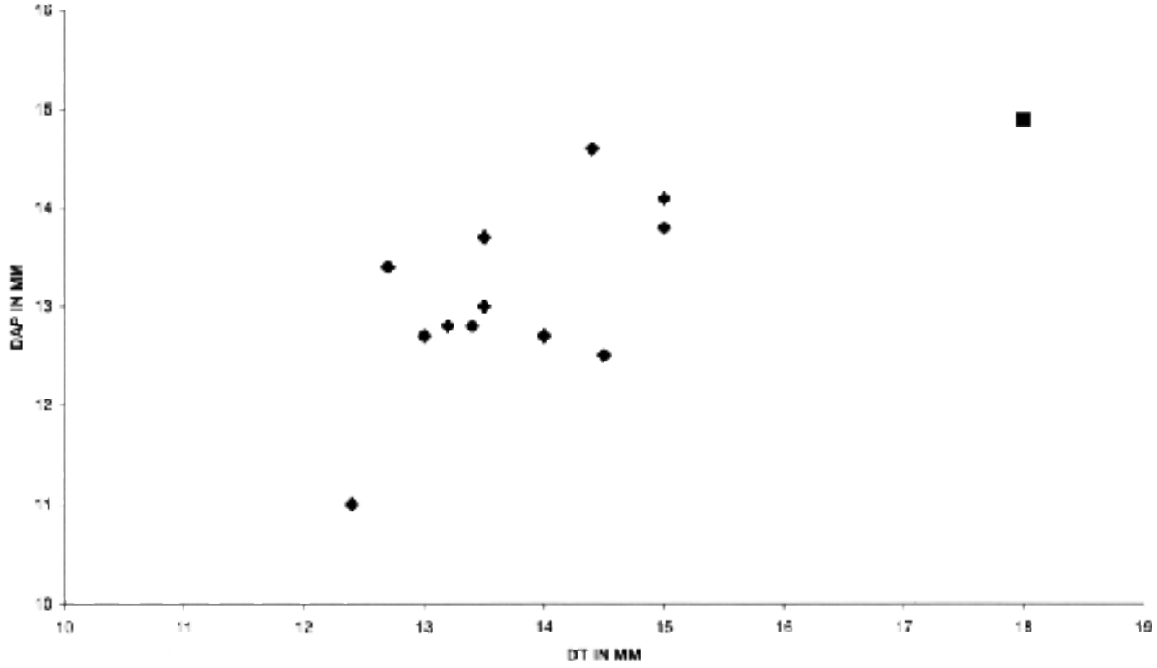

Figure 4 DAP and DT of lower m1/2 of the Citarum specimen (RGM 28094A, square) and those of *Axis lydekkeri* from the Dubois Collection (lozenges).

dered the specimens as *Cervus* (ex aff. *zwaani*). Hooijer (1958) did not give a species name within the genus *Rusa*. The measurements are: M1/2 dex.: St 28094 A (Plate IV no. 1): L = 15.6, W = 18.1; M1/2 sin.: St 28094 B (Plate IV no. 2): L = 17.9, W = 11.7. Comparison of the measurements of the Citarum specimen St. 28094 with those of *Axis lydekkeri* from the Dubois Collection (Table 2 and Fig. 4) shows that the measurements of the Citarum specimens are larger than those of *Axis lydekkeri*. They fall within the lower range of *Rusa* sp.

Other specimens of *Rusa* sp. are: (1) a 7th cervical vertebra no. RGM 401909, J. 2019, T.T. 30; the measurements of the anterior cervical body are: height = 48.2 , width = 33.7. (2) a phalanx I, no. RGM 401936, J. 2046, T.T. 80; the measurements are: length = 72.3, DAP. prox = 33.6, DT. prox = 30.5, DAP. dist = 23.2. DT. dist. = 27.3. (3) a right calcaneum, no. RGM 401923, J.2035, T.T. 26, with length = 91.3, and DAP. max. = 24.3; comparison of the measurements of this calcaneum RGM 401923 with those of *Axis lydekkeri* show that the calcaneum is larger than those from *Axis lydekkeri* (Table 3 and Fig. 5). (4) some very small antler fragments: five fragments bearing the numbers: RGM 401937, J. 2042 and T.T. 19, T.T. 86, T.T. 17, T.T. 26, T.T. 12; one with the numbers: RGM 401938, J. 2042 and T.T. 26; one with the numbers: RGM 401941, J. 2051 and T.T. 18; one with the numbers: RGM 401943, J. 2043 and T.T. 87.

1.4 Bovid sp.

Stehn & Umbgrove (1929: 7, plate IV figs. 6 and 7) mentioned and figured two upper molars from *Bos*. They bear the numbers: RGM 401901 and J. 2020 (fig. 6); and RGM 401902 and J. 2020 (fig. 7). Their measurements are: M3 dex. (no. RGM 401901): L = 29.3, W = 22.7; M3 sin. (no. RGM 401921): L = 29.5, W = 23.9. Other molars in the col-

Table 3 Measurements in mm of calcanea of *Axis lydekkeri* from the Dubois Collection and specimens RGM 401922 and RGM 401923 (L = length).

Number	species	length	DAP at the largest point of the shaft
RGM 401923		91,5	25,7
RGM 401922		156,4	46,3
Col. Dub. 10958	*Axis lydekkeri*	63,2	18,9
Col. Dub. 6880	*Axis lydekkeri*	62,3	17,8
Col. Dub. 6881	*Axis lydekkeri*	56,9	17,2
Col. Dub. 6882	*Axis lydekkeri*	54,4	17,1
Col. Dub. 6984	*Axis lydekkeri*	57,2	21,6
Col. Dub. 5652	*Axis lydekkeri*	69,2	21,6
Col. Dub. 5648	*Axis lydekkeri*	67,4	18,1
Col. Dub. 5649	*Axis lydekkeri*	60,4	20,9
Col. Dub. 6867	*Axis lydekkeri*	63,1	20,7
Col. Dub. 6160	*Axis lydekkeri*	63,2	20,8
Col. Dub. 5651	*Axis lydekkeri*	66,4	19,6
Col. Dub. 5998	*Axis lydekkeri*	63,1	19,7
Col. Dub. 6064	*Axis lydekkeri*	65,4	20,5
Col. Dub. 6049	*Axis lydekkeri*	60,8	19,4
Col. Dub. 5856	*Axis lydekkeri*	65,5	18,8
Col. Dub. 6156	*Axis lydekkeri*	62,2	18,4
Col. Dub. 6150	*Axis lydekkeri*	61,4	19,6
Col. Dub. 5952	*Axis lydekkeri*	57,9	16,9
Col. Dub. 6149	*Axis lydekkeri*	61,7	17,6
Col. Dub. 6045	*Axis lydekkeri*	64,1	18,3

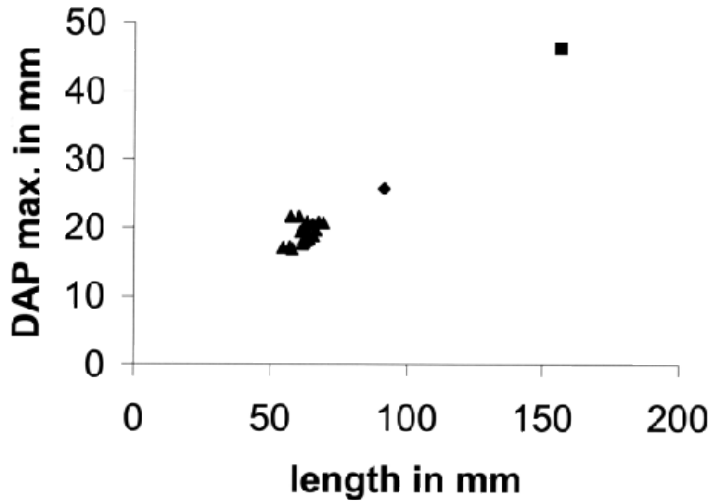

Figure 5 Length and maximum DAP of calcanea of *Axis lydekkeri* from the Dubois Collection (triangles) and specimens St. 401922 (square) and St 401923 (lozenge).

lection of Stehn & Umbgrove are an upper M1/2 fragment (RGM 401903, T.T. 24) of which no measurements could be taken, a lower m1/2 (RGM 401904, T.T. 24) with L = 29.0 and W = 20.5; a left lower m3 (RGM 401905) with L = 44.0 and W = 20.2; and a left lower p2 (RGM 401940, J. 2042) with L = 16.9 and W = 9.9.

Stehn & Umbgrove (1929) mentioned also other material: cervical vertebrae, the 7th, and probably the 4th and 5th. And also a lumbal vertebra, which is figured *in situ* by Stehn & Umbgrove (1929: plate VI, fig. 2). In the collection the following vertebrae are present:
(1) cervical 4 (RGM 401906, J 2017, T.T. 55) with height = 60.6, width = 45.0;
(2) cervical 5 (RGM 401907, J. 2014, T.T. 53), height = 59.6, width = 47.4;
(3) cervical 7 (RGM 401908, J. 2016, T.T. 58), height = 60.6, width = 44.5;
(4) thoracal vertebra 11 (RGM 401910, J. 2015, T.T. 54) height = 50.5, width = 49.3;
(5) a thoracal vertebral fragment (RGM 401912, J. 2064, T.T. 47) of which no measurements could be taken, and
(6) a lumbal vertebra (RGM 401911, J. 2018, T.T. 56), height = 46.4, and width = 71.2 mm.

There are, furthermore, several fragments of costae: four fragments numbered RGM 401927, J. 2027; one T.T. 43; another one T.T. 57; three fragments numbered RGM 401928; two J. 2025, T.T. 57; one J. 2026, T.T. 41; seven fragments numbered RGM 401929, J. 2024, T.T. 49; four fragments numbered RGM 401930, J.2026, T.T. 41; one fragment numbered RGM 401931, J. 2028, T.T. 43; one fragment numbered RGM 401932, J. 2029, T.T. 44; one fragment numbered RGM 401933, J. 2023, T.T. 57.

There is a phalanx I (RGM 401934, J. 2045, T.T. 82), with a length of 88.5 mm, DAP prox. = 45.8, DT prox. = 44.9, DAP dist. = 33.3, and DT dist. = 44.3. From the anterior member Stehn & Umbgrove (1929) mentioned: carpalia, the proximal part of a left humerus, the distal part of a right scapula and another fragment with the crista. In total, the following bones of a bovid are present:
(1) proximal fragment of a right humerus (RGM 401913, J. 2041 and T.T. 46);
(2) the proximal part of a left humerus (RGM 401914, J. 2037 and T.T. 59) with DAP = 133.4 and DT = 132.5;
(3) the distal fragment of a right humerus (RGM 401915, J. 2036 and T.T. 89);
(4) distal fragment of a right humerus (RGM 401921, J. 2047and T.T. 90);
(5) distal part of a right scapula (RGM 401916, J. 2039 and T.T. 15) with DAP = 73.1 and DT = 66.0;
(6) a distal scapular fragment with crista (RGM 401917, J. 2032 and T.T. 45).

There is also a horncore fragment (RGM 401939, J. 2042, T.T. 81).

From the hind foot Stehn & Umbgrove (1929) mentioned: from the tarsus both ends, the proximal part is from a right leg, several specimens of the calcaneum, the distal part of the left tibia, and both ends of a femur (the distal part of a right, and the proximal part of a left). We have in our collections the following hind foot bones of a bovid:
(1) a split metatarsal dist. (RGM 401918, J. 2040 and T.T. 91), DAP = 31.2, DT = 60.2;
(2) a proximal part of metatarsal dex. (RGM 401919, J. 2030 and T.T. 27), DAP = 58.8, DT = 70.2;
(3) Fragment of a metacarpal diaphysis (RGM 401920, J. 2033 and T.T. 33), DAP = 40.5, DT = 56.1;
(4) A calcaneum dex. (RGM 401922, J. 2048 and T.T. 85), length = 156.4, DAP midshaft = 46.3, this calcaneum is much larger than the *Rusa* sp. (Table 3, Figure 4);
(5) Distal part of a large sized tibia dex. (RGM 401924, J. 2061 and T.T. 36), DAP = 68.6, DT = 91.4;
(6) Distal part of middle sized tibia dex. (RGM 401925, J. 2031 and T.T. 83), DAP

= 53.9, DT = 66.4;
(7) Distal part of middle sized tibia dex. (RGM 401926, J. 2034, T.T.16), DAP = 4.2, DT = 70.5.

Four bone fragments RGM 401942 are present, two with the numbers J. 2051 and T.T. 18; two with only the numbers T.T. 19; there is one bone fragment with number J. 2072; two bone fragments with the numbers J. 2060 and T.T. 35; and one bone fragment with the numbers RGM 401944, J.2056, T.T. 28.

According to Stehn & Umbgrove (1929: 8) the specimens of *Bos* sp. mentioned above are comparable with the banteng *Bos sondaicus*, the recent wild ox of Java, also known under the name *Bos banteng*. However, neither of these is the earliest available name. The species should have been called (Hooijer 1956) *Bibos javanicus*. The bovine fossils should belong to *Bubalus palaeokerabau* DUBOIS, according to Von Koenigswald (1935: 87, 88). Also Hooijer (1958: 63) wondered whether the two figured molars belong to *Bubalus palaeokerabau*. Based on the measurements and the morphology it is not possible to tell whether the specimens mentioned above belong to *Bibos*, *Bos* or *Bubalus*.

1.5 *Stegodon/Elephas*
One tusk fragment is present from a *Stegodon* or *Elephas*, bearing the numbers RGM 401945, J. 2055 and T.T. 22.

1.6 *Manis palaeojavanica* DUBOIS, 1907
Hooijer (1947) identified in 'the Stehn and Umbgrove Collection' the distal part of a right femur of *Manis palaeojavanica* DUBOIS. It was catalogued as '*Felis* sp.'. Hooijer (1947) figured the specimen and gave a full description and measurements.

1.7 *Panthera tigris* (LINNAEUS, 1758)
An unidentified specimen in the 'Stehn & Umbgrove Collection' turned out to be the distal part of a left tibia of a *Panthera tigris*. It bears the numbers: RGM 401935, J. 2043 and T.T. 21. The measurements of the distal part are: DAP = 34.2, DT = 46.4. Brongersma (1935: 61) gave the measurement of the width of the distal part of the tibia from recent as well as the fossil tiger of the Dubois Collection. His results were: Cat. ost a: 47.1 mm, Reg. No. 991: 51.1 mm, Coll Dub. 8411: 47. 5 mm, and RGM 401935: 46.4 mm. These measurements fit very well.

2 Cipatik/Cililin
As mentioned before, in March 1984 the GM-GRDC obtained two fish fossils from a villager of Cililin (Tjililin) (Fig. 1 no. 2, Fig. 2). These specimens are housed at the GM-GRDC. According to Soewarno (1984) the length of specimen 1 is about 150 mm and of specimen 2 it is 300 mm. Unfortunately, there is no specific identification. Aziz (1984) speculated that it could belong to a freshwater fish, namely *Cyprinis carpio*, but was unable to study these specimens directly.

3 Ciharuman
The specimen of the fossil snake from Ciharuman (Fig. 1 no. 3) consists of a left mandible, 73 vertebrae and 14 costae. All bones are well fossilised and dark-brown in colour. In the mandible the teeth nos.1, 8, 15 and 16 are preserved, while the others are broken off. The teeth are sharp and directed backwards. The proximal part of the ramus is a little damaged. Its morphology is slender and it becomes wider in the proximal region. A mandible foramen is situated below tooth number 4. The estimated length of ramus is 85 mm, the maximum height 22 mm. The 73 vertebrae fit each other well. The total length is 160 cm. The measurements of the largest vertebra are: length of body is 25 mm; length of articulation cranialis-caudalis 25 mm; width of articulation cranialis 45 mm and width of articulation caudalis 47 mm. All distal ends of the 12 costae are damaged. The estimated length of the largest specimen is 160 mm. The morphology of the mandible is close to a *Python*, which was figured by

Romer (1966: 236). According to Thorne (pers. communication to Aziz) the specimen is a *Python reticulatus*.

4 Cipeundeuy

The fossil specimens from Cipeundeuy (Fig. 1 no. 4) originate from a sand quarry near Padalarang, 20 km west of Bandung. They were discovered by villager of the area during the exploitation of sand for construction material. Most of the specimens were broken as a result of the digging activities. Identifiable specimens indicate that they belong to the genera *Elephas*, *Rhinoceros*, *Bos* and *Rusa*.

4.1 *Elephas maximus* LINNAEUS, 1758

There are five molars: specimen no. CPD 90-1 is a left lower m2; CPD 90-2 a right upper M1 or M2; CPD 90-3 a right upper M1; CPD 90-36 a lower m3; CPD 90-114 a left M3. Furthermore, there are two fragments of proximal tibiae, namely the specimens CPD 56 and CPD 250191/22 and specimen CPD 61 is a proximal metatarsus-IV. The molars from Cipeundeuy have been described by Van den Bergh (1997) and are attributed to *Elephas maximus*.

4.2 cf. *Rhinoceros sondaicus* DESMAREST, 1822

The collection of rhino fossils consist of a premolar (CPD 90-1), twelve vertebrae (CPD 66, 71, 72, 73, 74, 75, 76, 99, 100, 101, 103 and 110); two distal parts of tibiae (CPD 97 and 107); and two fragments of humeri (CPD 53 is a proximal part and CPD 81 is a distal part) and a fragment of ulna (CPD 16 is a proximal part). Specimen CPD 90-1 is an isolated upper left P2, well fossilized, the crown is well preserved but the root is broken off. The occlusal surface is worn. The length is 47 mm and the width is 58 mm. The morphology and size are close to the premolar of *Rhinoceros sondaicus*.

4.3 Bovid sp.

The specimens of *Bos* are two isolated teeth (CPD 92 and 93), a mandible fragment (CPD 50) and some other post-cranial skeletal material. Specimen CPD 50 is a toothless right mandible fragment of the region from p2 to m2, about 115 mm long. Height of ramus is 60 mm. Specimen CPD 92 is an isolated right upper M1 or M2, its length is 23 mm and the width is 26 mm. Specimen CPD 93 is an almost complete metacarpal which has the median groove running from the proximal to the distal as is characteristic for bovids. Length of the metacarpal body 250 mm, proximal width 69 mm and distal width 68 mm. Specimen CPD 51 is a right tibia with the proximal part broken off; width distal part 100 mm and diaphysis 68 mm. CPD 78 is an almost complete right radius; length of the body (diaphysis) is 330 mm, width proximal part 97 mm, distal 90 mm and transversal diaphysis 50 mm. The morphology and size of the molar (specimen CPD 92) are close to *Bibos palaesondaicus*. However, a specific identification is difficult to give.

4.4 *Rusa* sp.

The specimens of *Rusa* consist of two mandible fragments, an isolated molar, some antler fragments, an astragalus and other post-cranial skeletal bones. Specimen CPD 37 is a right mandible fragment with p4-m3 preserved. Length of p4-m3 55 mm, m3 length = 21 mm and width = 9 mm. Specimen CPD 48 is also a right mandible with p2-m3 preserved; length p2-m3 = 75 mm; m3 length 19 mm, width 9 mm. Specimen CPD 49 is an isolated right upper M1 or M2, length: 11 mm and width: 16 mm. Specimen CPD 62 is a right antler fragment, in basal part/burr anterior-posteriorly: 55 mm, transversally: 45 mm, height from burr-branch: 60 mm and angle of branch: 50°. Specimen CPD 112 is an astragalus, with height: 48 mm and proximal width: 31 mm.The morphology and size of the teeth (specimens CPD 37 and CPD 48) suggest its belonging to a *Rusa* sp.

AGES OF THE FAUNAS

Many researchers (e.g. Sudjatmiko 1972, Silitonga 1973, Dam & Suparan 1992) have studied the geology of the Citarum area. The Cipatik, Ciharuman and Cipeundeuy areas are for a part on the geologic maps (scale 1: 100.000) of the Cianjur Quadrangle (Sudjatmiko 1972) and the Bandung Quadrangle (Silitonga 1973). According to these maps the Cipatik, Ciharuman and Cipeundeuy areas were covered by a tuffaceous lake deposit. Palynological studies indicate that the sedimentation process of the lake deposits occurs in a shallow to marshy environment (Polhaupessy 1980). The site Cipatik/Cililin with the fossil fish can only be dated as probably Pleistocene.

Radiocarbon (C14) dating of the samples that were taken from Kandangsapi and Ciharuman villages (Fig. 1) gives an age of 42,360 ± 1925 y and 36,390 ± 2500 y (Siregar 1988, GRDC internal report). Samples from above and below fossil bearing layer in Cipeundeuy area are 29,600 + 450/-420 y and 35,500 + 4600/-2900 y (Dam & Suparan 1992). This is in accordance with the presence of the *Elephas maximus*, the recent Indian elephant. It is more difficult to give an age interpretation for sites in the neighbourhood of Banuraja, west of Batujajar. Stehn & Umgrove (1929) were very careful. They wondered whether the fossils were really collected *in situ*, because some of the fossils were rolled, indicating transportation. However, the molars of *Duboisia santeng* and the femur of the *Manis palaeojavanica* are sharp and not rolled. Dubois' type specimen of *Manis palaeojavanica* is an element of the Kedung Brubus fauna. Von Koenigswald (1934: 190) and Hooijer (1947: 417) considered the age of the Kedung Brubus fauna to be Early Pleistocene, and because of the presence of *Manis palaeojavanica* in the Citarum fauna we may also consider this fauna to have that age. According to Leinders *et al.* (1985) the age of the Kedung Brubus fauna is about 800.000 years. This means that also the Citarum fauna could have an age of about 800.000 years.

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P.O.Box 23452, NL-3001 KL Rotterdam The Netherlands