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Catalogue of the Late Cenozoic Proboscidea in the Kinki District, Japan.*

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(With 1 Table, 1 Textfigure & 8 Plates)

Introduction

The late Cenozoic formations (Pliocene-Pleistocene) distributed in the Kinki District, Central Honshu, Japan have attracted attentions of Japanese geologists with bearing many fossil elephants and plant remains. The fossil elephants are frequently found also from the bottom sediments of Osaka Bay, the Setouchi Inland Sea (Setonaikai) and their vicinities.

In the present work, all localities of these fossil elephants hitherto been known in the Kinki district are examined and the stratigraphic succession of these elephant-bearing horizons are summarized.

The writers wish to express their sincere thanks to Professor Emeritus J. MAKIYAMA and Assistant Professor T. KAMEI of the University of Kyoto for their valuable suggestions. Thanks are also due to Mr. Y. TSUTSUI, the ex-director of Osaka Museum of Natural History for his kind encouragements to this study.

Standard stratigraphy of the late Cenozoic in the Kinki District

The late Cenozoic formation in the area around Osaka Bay may provide the standard stratigraphic column in the Kinki district.

The late Cenozoic formations are well exposed at cliffs and road-cuttings in the hilly lands surrounding Osaka Bay. These formations comprise the Osaka group (Late Pliocene-Pleistocene), the Manchidani formation and the terrace deposits (Pleistocene), in ascending order (IYAHARA, 1961). The Miocene formations are exposed in the western part (Kôbe area) and some small areas of the eastern part. The Miocene formation of the western part is called the Kôbe group and those of the eastern part, the Nijô group. The Miocene formations are unconformably overlain by the Osaka group. In the area of Osaka City and its vicinity, where the alluvial delta deposits are widely distributed, the existence of the above mentioned Miocene-Pleistocene formations below the alluvium was ascertained by several boring wells (maximum depth of these borings is 907m).

The Kôbe and the Nijô Group :- These formations are considered as the base-

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ment for the late Cenozoic formations in the Osaka sedimentary basin. The Osaka group, however, covers pre-Tertiary rocks directly in almost all part of the marginal areas of the basin.

The Kôbe group is exposed in the vicinity of Kôbe City and in the northern part of the Awaji Island. The group consists of conglomerates, sandstones, mudstones and vitric tuffs, the last of which yield abundant plant fossils showing the late Miocene age.

The Nijô group is mainly exposed in the small area around Mt. Nijô located at the south-eastern border of Osaka Prefecture. This group consists of lavas and pyroclastics of many kinds of andesite, and sedimentaries, such as conglomerate, sandstone and mudstone. The Ishikiriba andesite (biotite andesite), one of the lower members of this group was dated as 21 ± 1 million years by the K-A method.

The upper part of the Nijô group, though not well developed in the Mt. Nijô area, may widely distributed as well as the Kôbe group below the Osaka group at Osaka City, as suggested by boring wells.

The Osaka Group:- The Osaka group consists of gravel, sand, silt, clay and their alternations, and is intercalated with some thin tuff beds in various horizons. Generally, the lower part is more predominated with coarse sediments than the upper part. Eight conspicuous marine clay beds in which contain marine diatoms and, in places, marine molluscs are intercalated in this group (especially in the upper part), in the marginal area of the sedimentary basin. These marine clay beds mentioned above are named "Ma 1, Ma 2, Ma 3,, Ma 7 and Ma 8" respectively, in ascending order (ITIHARA, 1961). In Osaka City, Ma 9 and Ma 10 clays are recognized in the uppermost part of the Osaka group, in the boring well. The group, in general, is divided into two parts, the Upper and the Lower part, by the remarkable tuff bed, called the Azuki tuff, intercalated in the Ma 3 clay. In the Senriyama Hill, north of Osaka City (the type locality of the group), this group consists of the Senriyama formation (lower) and the Ibaragi formation (upper). These two formations are bounded with the Yamada tuff intercalated in the Ma 2 clay, about 20m below the Azuki tuff.

The Manchidani Formation and the terrace deposits:- The Manchidani formation overlies the Osaka group unconformably or with diastem at the type area. This formation consists of poorly sorted gravelly sediments which rarely intercalating silt and clay beds. At Manchidani, Nishinomiya City (the type locality), this is divided into three members. The middle member includes the "*Larix* bed" regarded by MIKI as indicating the past cooler climate. The distribution of this formation is uncertain except in the type area.

In the area around Osaka Bay, the terraces are distributed at three different levels. The height of the High, Middle and Low terraces are 30-200m, 0-100m and 0-50m, respectively. The High terrace deposits are divided into the older the Harima formation and the younger the Kiyotani formation. The deposits forming the Middle terrace is called the Uemachi formation and considered to have been deposited in the convalescence of climate in a interglacial age. In places, the plant remains showing the cold climate are found from the lowest part of this

formation. The warm marine molluscan fauna, contrary, are contained in the upper parts of this formation. The Low terrace deposits are called the Itami formation. The plant remains indicating the slightly cold climate, contained in this formation were reported from the southern area of Osaka Prefecture.

Distribution of fossil elephants

Akashi Area :- In the bluff of a coastal terrace of 10-15m in height, facing Harimanada, west of Akashi City, the upper part of the Akashi formation is exposed covered unconformably by the Nishiyagi bed (Middle terrace). The Akashi formation belonging to the Lower part of the Osaka group is composed of the

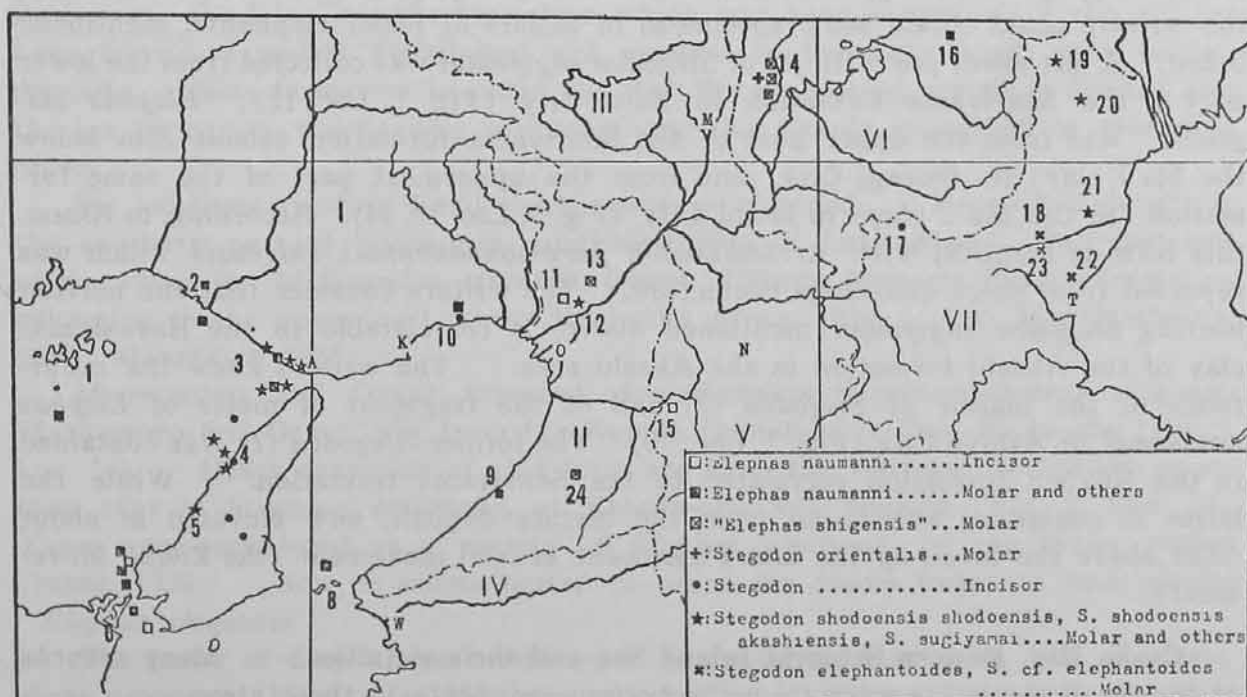


Fig. 1 ; Distribution of fossil elephants in the Kinki District.

- I : Hyōgo Pref. II : Osaka Pref. III : Kyoto Pref. IV : Wakayama Pref.
 V : Nara Pref. VI : Shiga Pref. VII : Mie Pref.
 A : Akashi City, K : Kōbe City, M : Kyoto City, N : Nara City,
 O : Osaka City, T : Tsu City, W : Wakayama City
 1 : Ejima Is. 2 : Takasago City, 3 : Harima-nada, 4 : Ichimiya,
 5 : Goshiki, 6 : Naruto City, 7 : Sumoto City, 8 : Tomogashima Is.
 9 : Kishiwada City, 10 Ashiya City & Nishinomiya City.
 11 : Toyonaka City, 12 : Suita City, 13 : Ibaragi City, 14 ; Katada,
 15 : Kawai, 16 : Taga, 17 : Ayama, 18 : Kameyama, 19 : Fujiwara,
 20 : Kasada, 21 : Suzuka City, 22 : Kawage, 23 : Geinō, 24 : Kōmyō-ike.

Tarumi gravel, the Hayashizaki clay, the Taniyagi gravel or the Fujie sand, the Byōbugaura clay and the Higashifutami sand in ascending order. Molars of *Stegodon shodoensis akashiensis* (TAKAI, 1936) (*Parastegodon akashiensis* TAKAI) were recorded from the Byōbugaura clay. Molars and incisors of "*Parastegodon akashiensis*" and the molars, spinal columns, limbs, ribs and other bones of *Stegodon*

sugiyamai (TOKUNAGA, 1936) were recorded from the Hayashizaki clay. On the other hand, molars of *Elephas naumanni* MAKIYAMA, 1924 were collected from the Nishiyagi bed belonging to the Middle terrace deposits in this bluff (Fig. 1, Loc. A).

Awaji Island:— In Awaji Island, the late Cenozoic formations consist of the Awaji formation and terrace deposits. The Awaji formation belonging to the Lower part of the Osaka group yields some specimens of *Stegodon shodoensis*, *S. shodoensis akashiensis* or *S. sugiyamai* in this island.

Osaka Area:— In this area, no record of the fossil elephant had been known until the recent years, except the incisor of *Elephas* (?) from the Ibaragi formation belonging to the Upper part of the Osaka group (Fig. 1, Loc. 11). Recently, the writers could obtain some specimens of molars of fossil elephants, mentioned below. A left lower jaw with $\frac{3}{4}$ M of *Stegodon sugiyamai* was collected from the lower part of the Senriyama formation in Suita City (Fig. 1, Loc. 12); "*Elephas shigensis*" was from the upper part of the Senriyama formation (about 25m below the Ma 1 clay) in Ibaragi City, and from the uppermost part of the same formation (in the Ma 2 clay) in Izumi City (Fig. 1, Loc. 13, 24). According to KAMEI, this form is identical with *Archidiskodon paramanmmonteus shigensis* which was reported from Shiga-cho, Shiga Prefecture. The writers consider that the horizon bearing *Stegodon sugiyamai* mentioned above, is correlatable to the Hayashizaki clay of the Akashi formation in the Akashi area. The writers knew the occurrence of the insisor of *Stegodon* (?) and of the fragment of molar of *Elephas naumanni* in Ashiya City (Fig. 1, Loc. 10). The former *Stegodon* (?) was contained in the Kôyôden formation correlated to the Senriyama formation. While the latter *E. naumanni* was found from the terrace deposit, now elevated at about 400m above sea-level, by the late Pleistocene crustal movement (the Rokkô Movement).

Osaka Bay, Eastern Setouchi Inland Sea and their vicinities:— Many records of the fossil elephants were from the bottom sediments in these areas.

About 250 specimens of lower jaws, upper jaws, molars, incisors, spinal columns, limbs, ribs, etc. of *Elephas naumanni* have been collected from the sea-bottom, about 1.5km north of Tomogashima Islands located on the mouth of Osaka Bay, at depth of 70m (Fig. 1, Loc. 8). From data obtained by the Geological Survey of Japan and Osaka City University with the Continuous Seismic Profiler method, HUZITA considered that this elephant-bearing formation may belong to the Manchidani formation (HUZITA & KAMATA, 1964). On the other hand, ITIHARA presumed that the Pleistocene deposit contain these fossils is included in the Uemati formation, considering the geological structure of the Pleistocene deposits in the surrounding land area (ITIHARA, 1961 b).

The sea-bottom of the Naruto Strait between Awaji and Shikoku Island and its vicinity are well known localities yielding fossil elephants. Many specimens of the lower jaws, molars, incisors, ribs, limbs and other bones of *Elephas naumanni* have been recorded (Fig. 1, Loc. 6). These fossils have been eroded out from the drowned terraces, exposed in the sea-bottom.

Many specimens of *Stegodon shodoensis*, *Stegodon shodoensis akashiensis* and

Elephas naumanni were collected from the sea-bottom of Harimanada (Eastern Setouchi Inland Sea).

Off Akashi, many specimens of molars, incisors, lower jaws, cranium and other bones of *Stegodon shodoensis akashiensis* and *Stegodon sugiyamai*, together with some molars and incisors of *Elephas naumanni*, were collected from the sea-bottom (Fig. 1, Loc. 3). The upper jaw with both molars of *Elephas naumanni* was found from the sea-bottom, off Takasago City (Fig. 1, Loc. 2). A molar of *Elephas naumanni* was also from the sea-bottom, south of Ejima Island (Fig. 1, Loc. 1). Molars and incisors of *Stegodon shodoensis* were obtained from the sea-bottom off northern Awaji Island (Fig. 1, Loc. 4).

Shiga Area:— In the southern part of Shiga Prefecture and a part of Mie Prefecture, the late Cenozoic formation which had been deposited in the ancient Lake Biwa are widely distributed and exposed in the hilly lands, with terrace deposits. This formation is called the Ko*-Biwako Group, which is divided into the Iga formation, the Sayama formation and the Katada formation in ascending order.

Six localities yielding fossil elephants were recorded. Four of these are in the southern part of Shiga-gun, southwest side of Lake Biwa. One specimen of the lower jaw of *Stegodon orientalis* OWEN 1870 was from the Katada formation belonging to the upper part of the Kobiwako group (Fig. 1, Loc. 14) (NAUMANN, 1882; MAKIYAMA, 1938).

MATSUMOTO and OZAKI reported *Archidiskodon paramammonteus shigensis* MATSUMOTO and OZAKI 1959, from the Katada formation at Ono, Shiga-cho (Fig. 2, Loc. 14). Other examples of this form are from the horizons somewhat upper than that of *Stegodon orientalis*, at Katada-cho and Sagawa (Fig. 2, Loc. 14). These were considered as a variety of *Elephas naumanni* by the senior author (IKEBE, 1959). Now, it seems better to unite the above forms in one species "*Elephas shigensis*".

The molar of *Elephas naumanni* (= *E. trogontherii*, MAKIYAMA 1924, *E. namadicus naumanni*, MAKIYAMA 1938) was reported by MAKIYAMA, from Kyûtoku, near Hikone City (Fig. 1, Loc. 16). As the specimen were said to be collected from Recent river gravels, it is difficult to know its primary occurrence.

In Ayama-mura, Mie Prefecture, the incisor of *Stegodon* (?) was collected from the Iga Formation, the lower part of the Kobiwako group (Fig. 1, Loc. 17).

Mie area:— In this area, the late Cenozoic formations yielding fossil elephants are named the Ange Group (formerly known as Agé group). The lower part of this Ange group is intercalated by many tuff beds and is correlated to the Quartz andesite member of the upper part of the Nijô group of the Osaka area. We have no record of fossil elephants from this horizon which considered to be the late Miocene (or early Pliocene).

Stegodon cf. elephantoides (CLIFT 1828) was reported from three localities in the Kameyama formation which occupies the middle part of the Ange group

* "Ko-" means paleo or ancient.

Table 1 Late Cenozoic stratigraphy and occurrences of fossil elephant in Kinki District, Japan.

| Miocene | | Pliocene | | Pleistocene | | | | Recent | AGE |
|---|------------------|--------------------|------------------|-------------|--------------|---------------------|---------------|-----------------|---|
| Miocene | Pliocene | Osaka Group | | | | | | Recent Deposits | STANDARD STRATIGRAPHY |
| | | Lower | | Upper | | Mantidant Formation | High Terrace | Middle Terrace | Lower Terrace |
| Kôbe Group | Akashi Formation | | Ibaragi F. | | Mantidant F. | shinoda-yama B. Bed | Uemati Bed | Itami B. | AKASHI AREA AWAJI ISLAND OSAKA AREA |
| | Awaji F. | | Kobiwako Group | | | Old Terrace | Young Terrace | | Recent Deposits |
| Niyo G. Tsuwaki G. | Senriyama F. | | Katada Formation | | | High Terrace | Low Terrace | | SHIGA AREA |
| | Koga Formation | | Iga F. | | | High Terrace | Middle T. | Lower Terrace | |
| Ichisaki G. | Ange Group | | | | | | | | MIE AREA |
| | Koyama F. | Kushihara F. | Kameyama F. | Kuregari F. | Oizumi F. | Koneno Formation | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| <p>---?--- Stegodon cf. elephantoides</p> <p>-----?--- Stegodon sugiyamai</p> <p>---?--- Stegodon shodoensis S. shodoensis akashiensis</p> <p>X Stegodon orientalis</p> <p>"Elephas shigensis"-----</p> <p>Elephas naumanni ---?---</p> | | | | | | | | | Range of Fossil Elephants |
| Mio. | Pliocene | Plio - Pleistocene | Pleistocene | | | | Recent | AGE | |

(Fig. 1, Loc. 18, 22, 23). Among these localities, Kawage-cho, Ange-gun, near Kameyama City (Fig. 1, Loc. 23) is especially noted in yielding many specimens of *Stegodon* cf. *elephantoides*.

Stegodon shodoensis akashiensis was found at two localities in Inabe-gun, north of Mie Prefecture (Fig. 1, Loc. 19, 20). These fossils were contained in the Oizumi formation, the upper part of the Ange Group. In these, a lot of specimens were found at Fujiwara-mura, Inabe-gun (Fig. 1, Loc. 19). The specimens are well preserved ones and consist of the cranium, lower jaw, ribs, spinal columns, limbs etc. These specimens are preserved in the Mie Prefectural Museum, Tsu City.

A fragment of molar of *Stegodon* sp. was recorded from the formation corresponded to the Oizumi formation, in Suzuka City (Fig. 1, Loc. 21).

Stratigraphic succession

By checking these fossils and their geological occurrences (Table 1), the writers obtained the following stratigraphic succession of the elephant-bearing horizons in the Kinki District.

- | | | |
|--------------|--|----------------------------|
| Horizon V— | <i>Elephas naumanni</i> | (Upper Pleistocene) |
| Horizon IV— | “ <i>Elephas shigensis</i> ”? | (Middle Pleistocene) |
| Horizon III— | { “ <i>Elephas shigensis</i> ” | (Middle~Lower Pleistocene) |
| | { <i>Stegodon orientalis</i> | |
| Horizon II— | { <i>Stegodon shodoensis</i> | |
| | { <i>S. shodoensis akashiensis</i> | (Plio-Pleistocene) |
| | { (<i>Parastegodon akashiensis</i>) | |
| | { <i>S. sugiyamai</i> | |
| Horizon I— | <i>Stegodon</i> cf. <i>elephantoides</i> | (Pliocene) |

The occurrences of *Stegodon* and *Elephas* from Harimanada and those of other parts of Setouchi Inland Sea suggest the wide distribution of the above mentioned formations comprising Horizon II-V in the sea-bottom.

It seems that the Pliocene-Pleistocene boundary is comprised in the Horizon II. Because the appearance of the floral change from warm to cool or cold climate is recognized in this horizon. We have some possibilities that the Plio-Pleistocene boundary will be settled at the base of this horizon.

List of species

Elephas naumanni MAKIYAMA 1924 (Plates VI, VII & VIII)

E. namadicus naumanni MAKIYAMA 1924 ; *E. namadicus naumanni*, MAKIYAMA 1938 ; *E. trogontherii*, MAKIYAMA 1924.

- 1) Kyutoku, Taga-cho, Inukami-gun, Shiga Pref. a : Formation unknown, b : M₂
- 2) Kishiki-cho, Kishiwada City, Osaka Pref., a : Uemachi formation, b : right upper molar (fragment),
- 3) Off Tomogashima Is., Kaiso-gun, Wakayama Pref., a : bottom sediment (Manchidani formation?), b : upper and lower jaws with molars, ³M³, ₃M₃, ²M², ₂M₂, incisors, spinal ribs, limbs, etc.
- 4) Okuyama-cho, Ashiya City, Hyogo Pref., a : High terrace deposit?, b : M₃

- 5) Bluff, Nishiyagi, Okubo, Akashi City, Hyogo Pref., a : Nishiyagi bed, b : molar.
- 6) Harima-nada, west of Akashi City, a : bottom sediment (Nishiyagi bed), b : molars, incisors, ribs, etc.,
- 7) Chôkei, Nishi-kamiyoshi-cho, Kakogawa City, Hyogo Pref., a : Nishiyagi bed, b : ¹M. fragment of molar.
- 8) Off Takasago City, Hyogo Pref., a : bottom sediment (Nishiyagi bed), b : upper jaw with ²M².
- 9) Off Seitan-cho, Mihara-gun, Hyogo Pref. (Naruto Strait), a : bottom sediment (Nishiyagi bed ?), b : lower jaw, molar, incisor, spinals, ribs, etc.
- 10) Off Shiozaki, Nantan-cho, Mihara-gun, Hyogo Pref., a : bottom sediment (Harima group ?), b : molar.
- 11) South of Matsushima, Ejima Is., Shikama-gun, Hyogo Pref., a : bottom sediment (Harima group ?), b : M₃
- 12) Off Kuroyama, Ookezima Is., Naruto City, Tokushima Pref., (Naruto Strait), a : bottom sediment (Harima group ?), b : lower jaw with ₃M₃, c :

“*Elephas shigensis* (MATSUMOTO & OZAKI 1959) (Plate V)

E. namadicus naumanni, MAKIYAMA 1938 ; *Archidiskodon paramammonteus shigensis* MATSUMOTO & OZAKI 1959.

- 13) Ono, Shiga-cho, Shiga-gun, Shiga Pref., a : Katada formation, b : M₂.
- 14) Mano, Katada-cho, Shiga-gun, Shiga Pref., a : Katada formation, b : lower jaw with ₂M.
- 15) Oogi, Katada-cho, Shiga-gun, Shiga Pref., a : Katada formation, b : M².
- 16) Kômyo-ike, Izumi City, Osaka Pref., a : Osaka group (Lower), b : lower jaw with molar.
- 17) Kamimura, Fukui, Ibaragi City, Osaka Pref., a : Osaka group (Lower), b : lower molar (fragment).

Stegodon orientalis OWEN 1870 (Plate IV)

S. insignis, NAUMANN 1882 ; *S. orientalis*, MATSUMOTO 1924 ; *S. orientalis*, MAKIYAMA 1938.

- 18) Minamisho, Katada-cho, Shiga-gun, Shiga Pref., a : Katada formation, b : lower jaw with molars.

Stegodon shodoensis MATSUMOTO 1924

S. orientalis shodoensis MATSUMOTO 1924 ; *S. shodoensis*, MAKIYAMA 1938.

- 19) Off Gunke, Ichimiya-cho, Tsuna-gun, Hyogo Pref., a : bottom sediment (Awaji formation ?), b : lower jaw with M₂.

Stegodon shodoensis akashiensis (TAKAI 1936) (Plate III)

Parastegodon akashiensis TAKAI 1936 ; *Stegodon shodoensis akashiensis*, MAKIYAMA 1938.

- 20) Bluff from Fujie to Taniyagi, Akashi City, Hyogo Pref., a : Hayashizaki clay, Akashi formation, b : molars, incisors.
- 21) Nakayagi ; Nishiyagi·Byobugaura·Eijima, Okudo, Akashi City, Hyogo Pref., a : Byobugaura clay, Akashi formation, b : molars.
- 22) Harima-nada, west of Akashi City, Hyogo Pref., a : bottom sediment (Akashi formation ?), b : cranium, lower jaw, molars, etc.
- 23) Shinzaike, Goshiki-cho, Tsuna-gun Hyogo Pref., a : Awaji formation, b : M₂, molar (fragment), incisor (fragment), rib (fragment).

- 24) Kasada Ooike, Inabe-cho, Inabe-gun, Mie Pref., a : Oizumi formation, b : upper left molar.
- 25) Kaminoyamada, Fujiwara-mura, Inabe-gun, Mie Pref., a : Oizumi formation, b : right and left lower jaw with molars, incisors ribs, etc.

***Stegodon sugiyamai* (TOKUNAGA 1936)** (Plate II, Fig. 2)

Parastegodon sugiyamai TOKUNAGA 1936 ; *Stegodon insignis sugiyamai*, MAKIYAMA 1938 ; *Parastegodon infrequens* SHIKAMA 1937.

- 26) Katayama Park, Suita City, Osaka Pref., a : Osaka group (Lower), b : lower jaw with $\text{}_3\text{M}$.
- 27) Bluff of Shitamizo, Hayashizaki, Akashi City, Hyogo Pref., a : Hayashizaki clay, Akashi formation, b : $\text{}_3\text{M}$, molars, spinals, limbs, ribs, etc.
- 28) Harima-nada, west of Akashi City, Hyogo Pref., a : bottom sediment (Akashi formation ?), b : craniums, lower jaws, molars, etc.

***Stegodon cf. elephantoides* (CLIFT 1828)** (Plate I & II, Fig. 1)

S. cliftii, MATSUMOTO 1924 ; *S. cf. elephantoides*, MAKIYAMA 1938.

- 29) Kusubara, Geino-cho, Ange-gun, Mie Pref., a : Kameyama formation, b : left lower jaw with $\text{}_3\text{M}$.
- 30) Kurodani, Nomura, Kameyama City, Mie Pref., a : Kameyama formation, b : lower jaw with molar.
- 31) Kitakuroda, Kawage-cho, Ange-gun, Mie Pref., a : Kameyama formation, b : cranium, lower jaw with molars, ribs, etc.

***Stegodon* sp.**

- 32) Nishimomokawa, Ichinomiya-cho, Tsuna-gun, Hyogo pref., a : Awaji formation, b : molar.
- 33) Yamabe, Suzuka City, Mie Pref., a : Tomari formation, b : molar (fragment).

Indeterminable specimens

- 34) Samida, Kawai-mura, Kitakatsuragi-gun, Nara Pref., a : Osaka group (Lower), b : incisor.
- 35) Hotarugaike, Toyonaka City, Osaka Pref., a : Osaka group (Upper), b : incisor.
- 36) Asahigaoko-cho, Ashiya City, Hyogo Pref., a : Osaka group (Lower), b : incisor.
- 37) Ei, Ichimiya-cho, Tsuna-gun, Hyogo Pref., a : Awaji formation, b : incisor.
- 38) Off Murotsu, Hokutan-cho, Tsuna-gun, Hyogo Pref., a : bottom sediment b : incisor.
- 39) Aihara, Goshiki-cho, Tsuna-gun, Hyogy Pref., a : Awaji formation, b : fragment of incisor.
- 40) Kamosenzan, Sumoto City, Hyogo Pref., a : Awaji formation, b : incisor.
- 41) Kosugi-okudani, Ayama-mura, Ayama-gun, Mie Pref., a : Iga formation, b : incisor.

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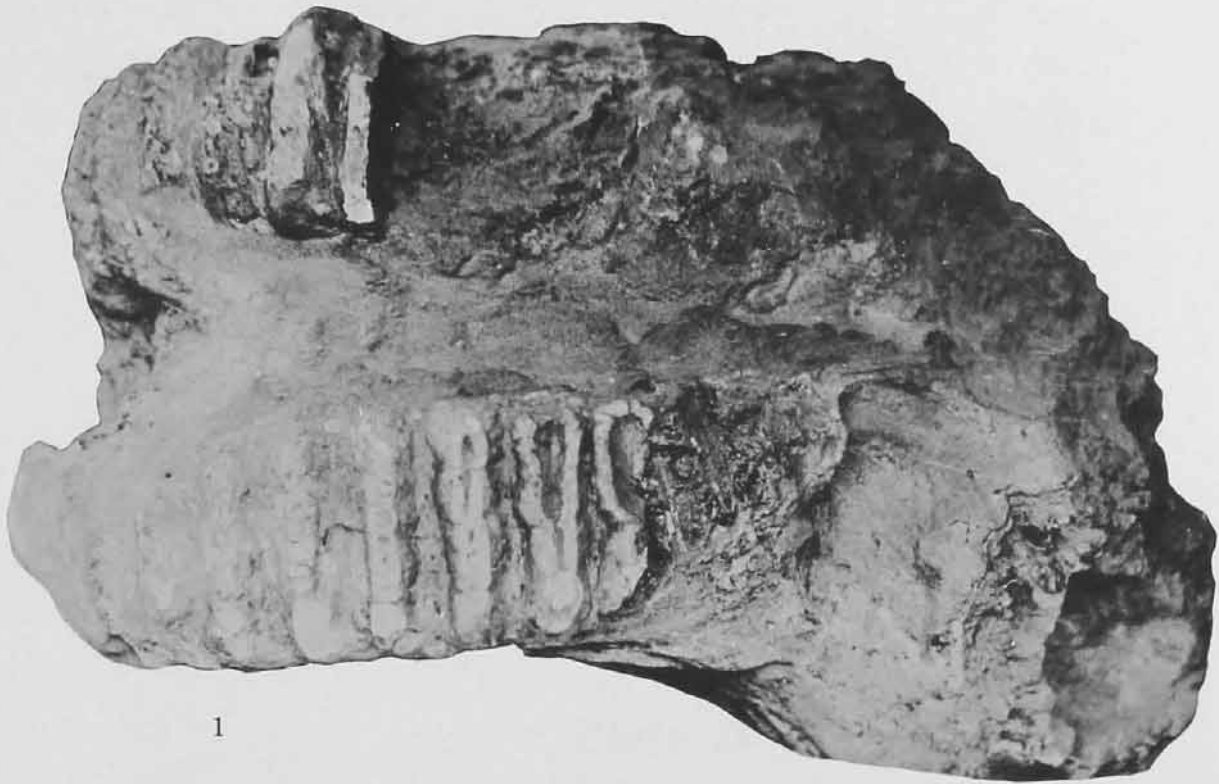
Plate I

Explanation of Plate I

Stegodon cf. elephantoides CLIFT

Fig. 1, Upper jaw with $^3M^3$; palatal side ; Loc. List. no. 31 ; Mie Prefectural Museum. $\times 1/4$

Fig. 2a, b, Right lower jaw with M_3 ; a : upper side, b : buccal side ; Loc. List. no. 31 ; Mie Prefectural Museum. $\times 1/4$



1



2a



2b

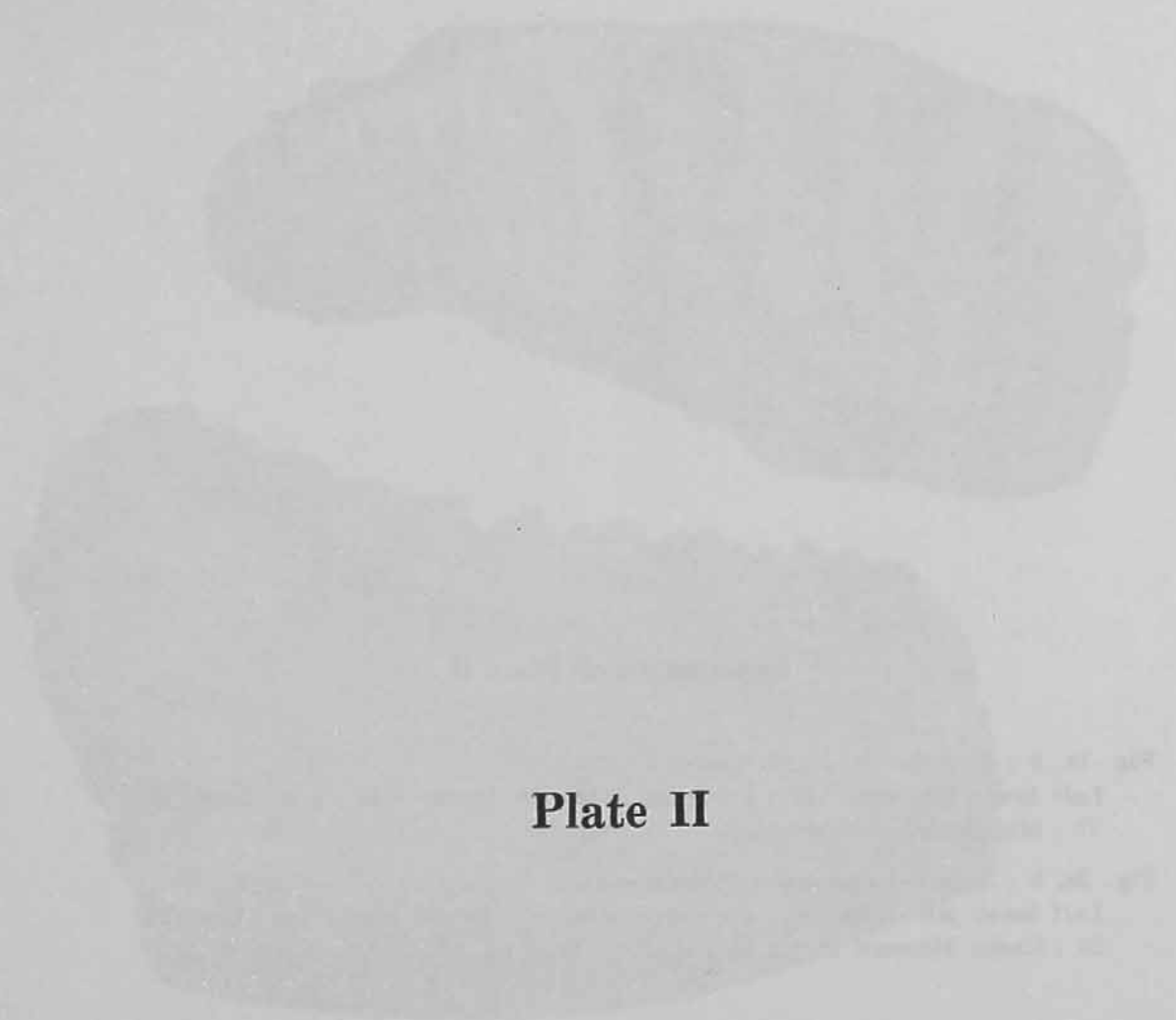


Plate II



Explanation of Plate II

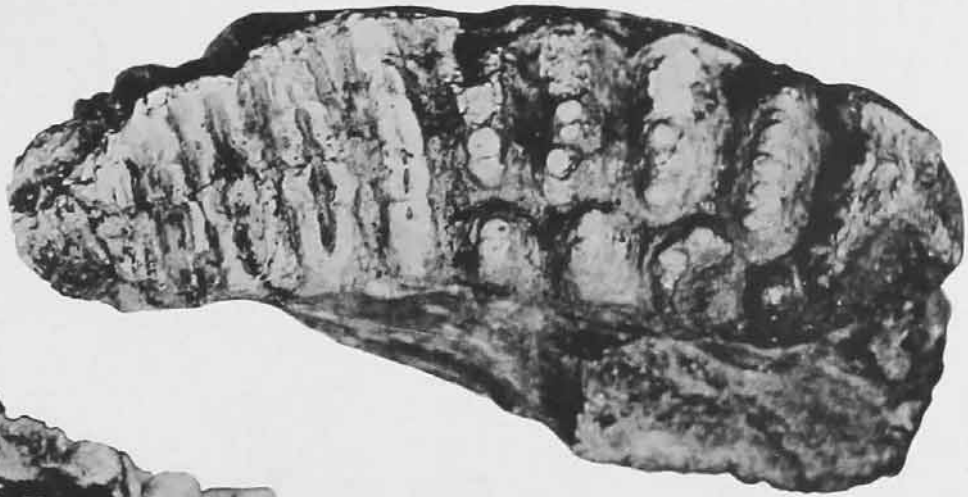
Fig. 1a, b ; *Stegodon cf. elephantoides* CLIFT

Left lower jaw with $_3M$; a : upper side, b : buccal side ; Loc. List. no.
31 ; Mie Prefectural Museum. $\times 1/4$

Fig. 2a, b ; *Stegodon sugiyamai* (TOKUNAGA)

Left lower jaw with $_3M$; a : upper side, b : buccal side ; Loc. List no.
26 ; Osaka Museum of Natural History, Reg. no. 1714. $\times 1/3$

1a



1b

2a



2b

Plate III

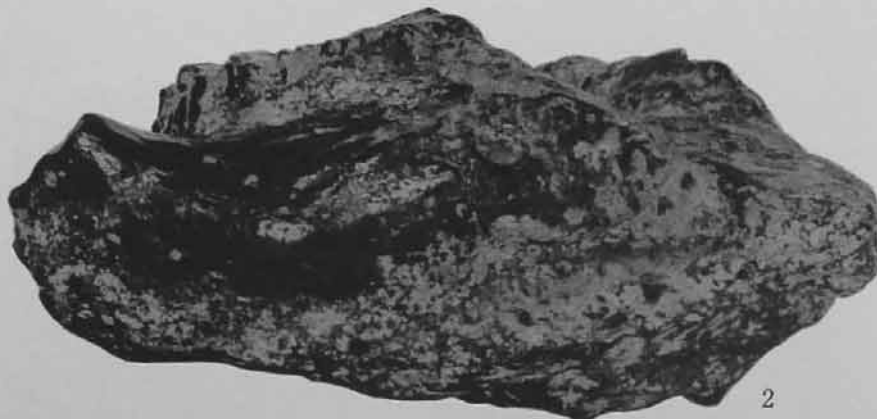
Explanation of Plate III

Stegodon shodoensis akashiensis (TAKAI)

Lower jaw with M₃ ; Loc. List no. 22 ; Osaka Museum of Natural History ;
1 : upper side, 2 : right side. × 1/4



1



2

Plate IV

Explanation of Plate IV

Stegodon orientalis OWEN

Lower jaw ; 1 : upper side, 2 : lingual side of right lower jaw ; Loc. List
no. 18 ; National Science Museum × 1/3



Plate V

Explanation of Plate V

Fig. 1, 2a, b ; "*Elephas shigensis*" (MATSUMOTO and OZAKI)

1 : Left lower jaw with $\text{}_2\text{M}$; upper side ; Loc. List no. 14 ; Mano Primary School. $\times 1/3$

2 : M^2 ; a : lingual side, b : palatal side ; Loc. List no. 15 ; Mr. Yûki's possession. $\times 1/3$

Fig. 3 ; *Archidiskodon paramammonteus shigensis* MATSUMOTO and OZAKI

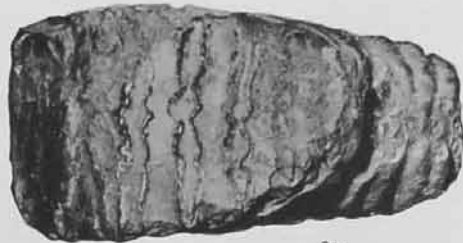
$\text{}_3\text{M}$; a : upper side, b : buccal side ; Loc. List. no. 13. (After Matsumoto and Ozaki, 1957) $\times 1/2$



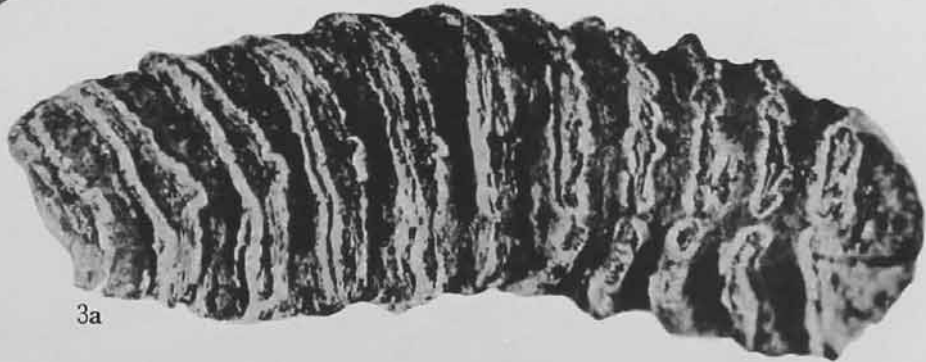
1



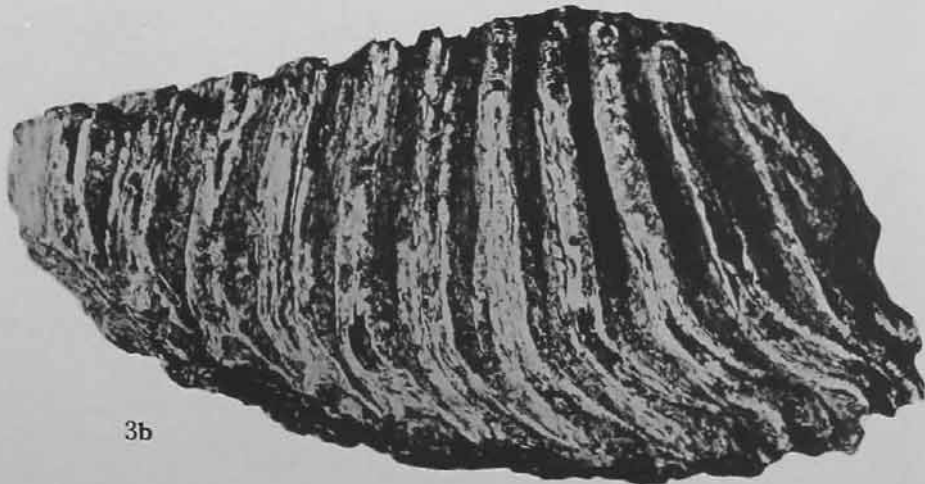
2a



2b



3a



3b



Plate VI

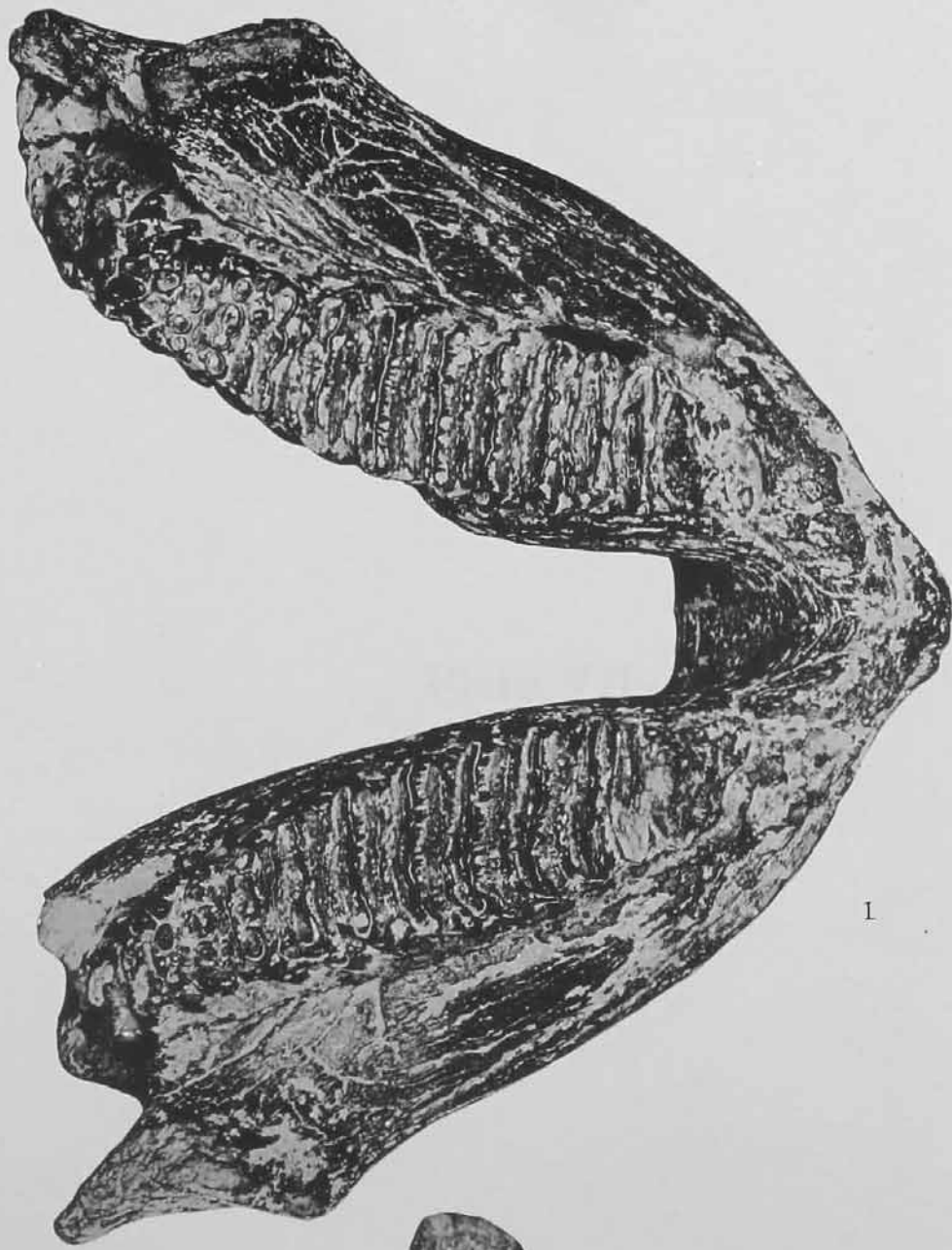


Explanation of Plate VI

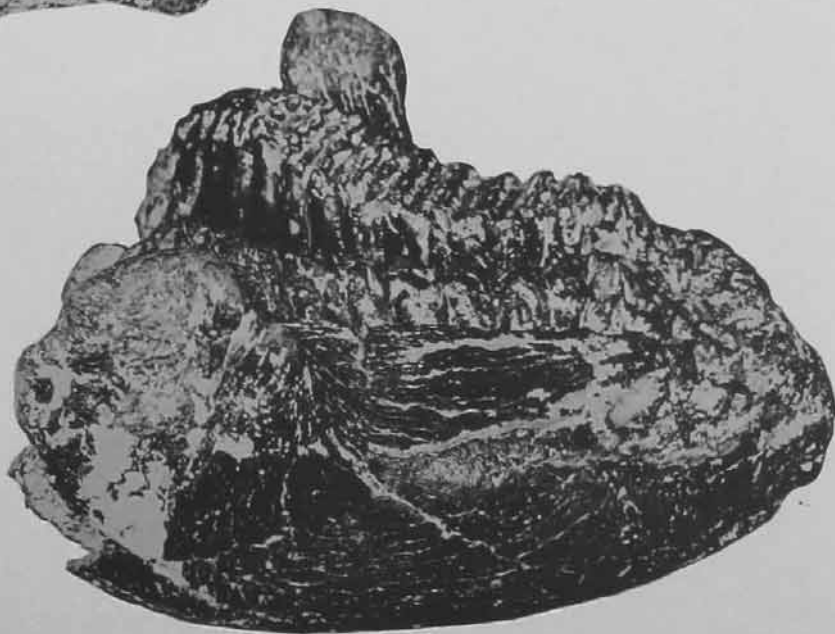
Elephas naumanni MAKIYAMA

Lower jaw with M_3 ; Loc. List no. 12 ; Osaka Museum of Natural History,
Reg. no. 1715

Fig. 1, upper side, Fig. 2, right side. $\times 1/4$



1



2



Plate VII

FIG. 1. (Left) The skull of a patient with a fracture of the base of the skull. (Right) The skull of a patient with a fracture of the base of the skull.



Explanation of Plate VII

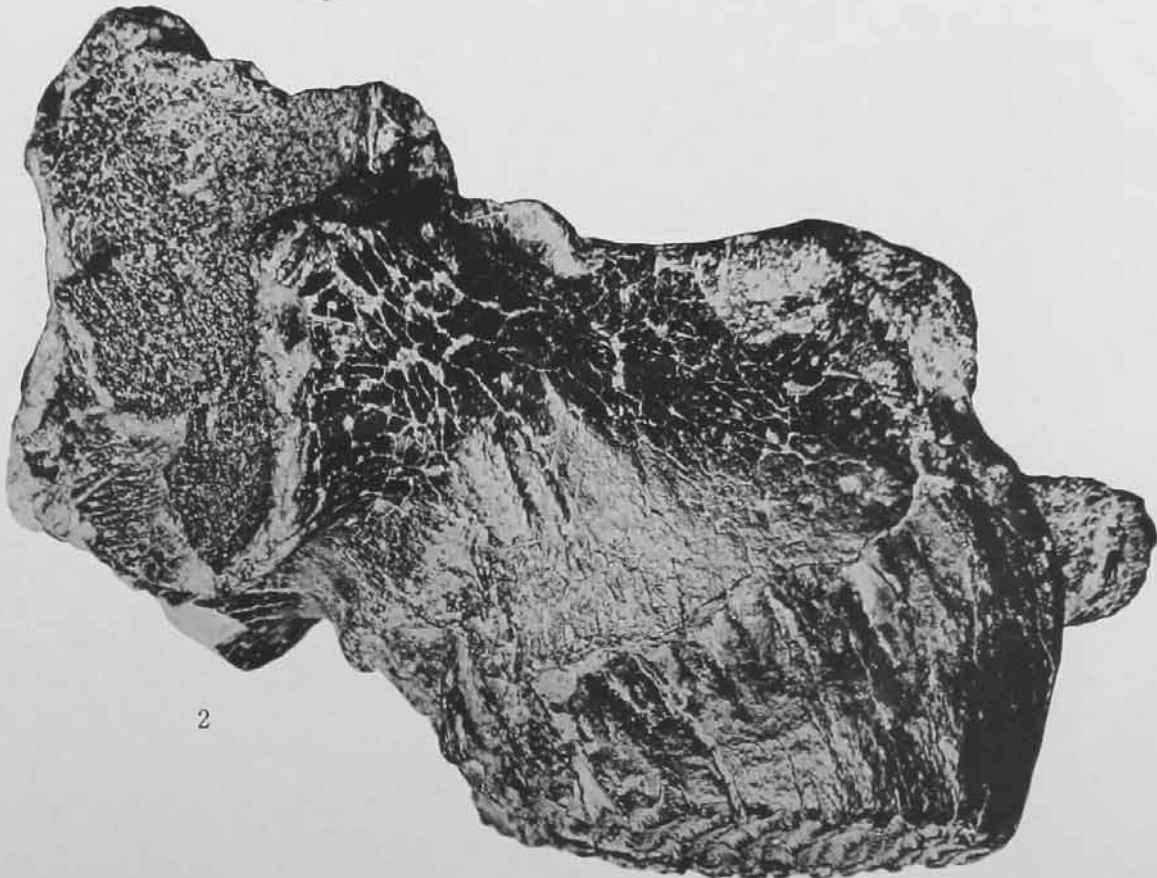
Elephas naumanni MAKIYAMA

Upper jaw with ²M² ; Loc. List. no. 8 ; Osaka Museum of Natural History,
Reg. no. 1744.

Fig. 1, palatal side, Fig. 2, left side. × 1/4



1



2

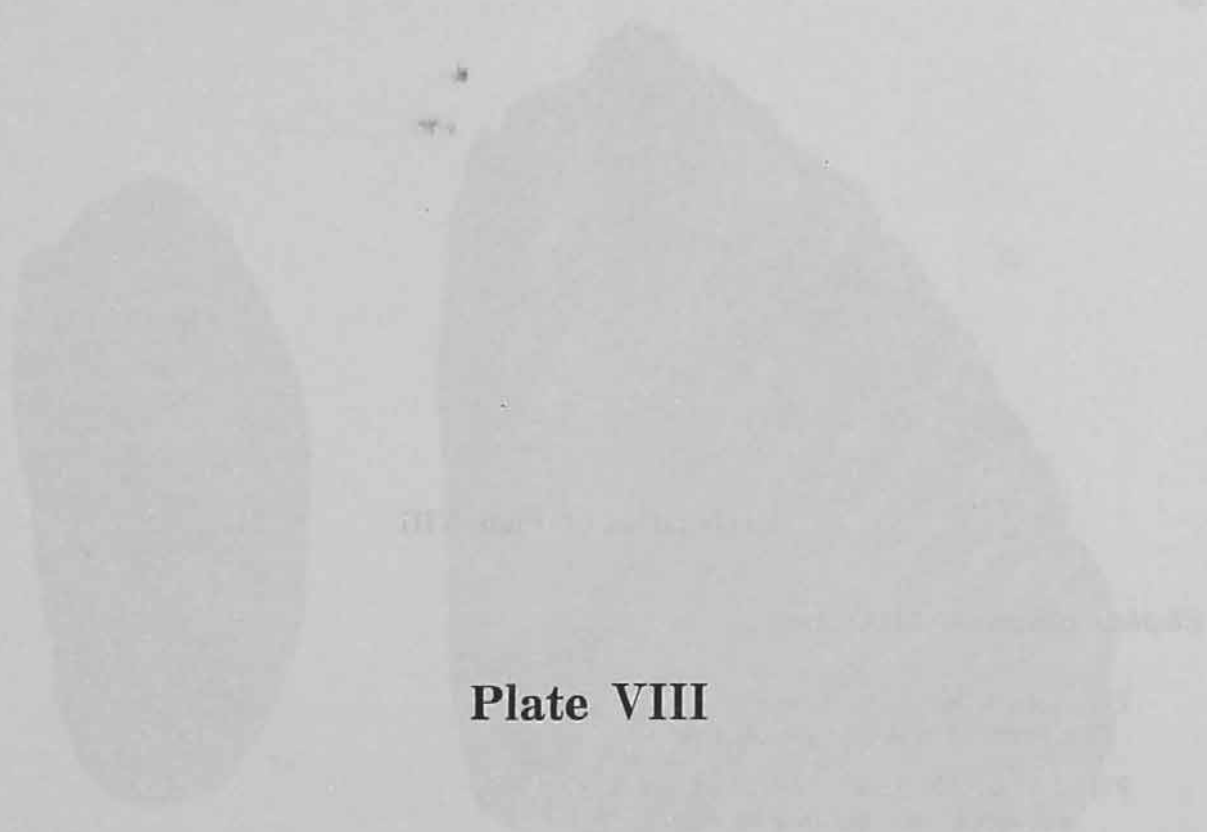


Plate VIII



Explanation of Plate VIII*Elephas naumanni* MAKIYAMA

Fig. 1 a, b, M³ ; Loc. List no. 3. $\times 1/3$
a ; palatal side, b : buccal side.

Fig. 2 a, b ; M ; Loc. List no. 3 ; $\times 1/3$
g : upper side, b : lingual side.

Osaka Museum of Natural History.

