

*A New Find of a Proboscidean Fossil
from Nagano Prefecture, Central Japan*

By FOSSIL ELEPHANT RESEARCH GROUP*

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An excursion for students was made at Nakajo-mura, Kamiminochi-gun, Nagano Prefecture on April 29th, 1970, by the Department of Geology, Faculty of Science, Shinshu University. After the dispersion there, three of the students, Kazuhiko ITO, Teruko SEKIGUCHI and Masanori MATSUMOTO discovered a part of a Proboscidean fossil skull with four molar teeth. Then, on May 21st, the writers procured it with the help of the staffs and comrade students of that Department. The following is a brief report of the new find.

Locality and Geology of the Area The area is about 13 km to the west-southwest of Nagano City, and the fossil locality is in a valley called the Uranosawa (or the Urasawa), a tributary of the Dojirigawa in the easternmost part of Nakajo-mura. The very point is about 750 m northward along the stream from the junction of the Uranosawa with the Dojirigawa (Figs. 1 and 2).

The fossil was found in a drift boulder, about $70 \times 80 \times 230$ cm³. It is grey, medium-coarse, massive sandstone. It also contains fragments of Pelecypod shells and carbonized plants. It is somewhat argillaceous, and is rich in organic matter as a whole. It is also calcareous, and is hard especially near the fossil.

The strata around are composed mainly of massive, argillaceous and grey sandstones which resemble to that boulder. But they are rather soft. About 10-20 m upstream from the point of the boulder, colossal nodules of sandstone, round or irregular in shape and quite similar in lithology to that boulder, are arranged in an ascending zone reaching to the cliff just above the fossil-bearing boulder. Though the fossil was found not in situ as noticed above, derivation of the boulder from the cliff above is unquestionable. The strike and dip of the beds around are

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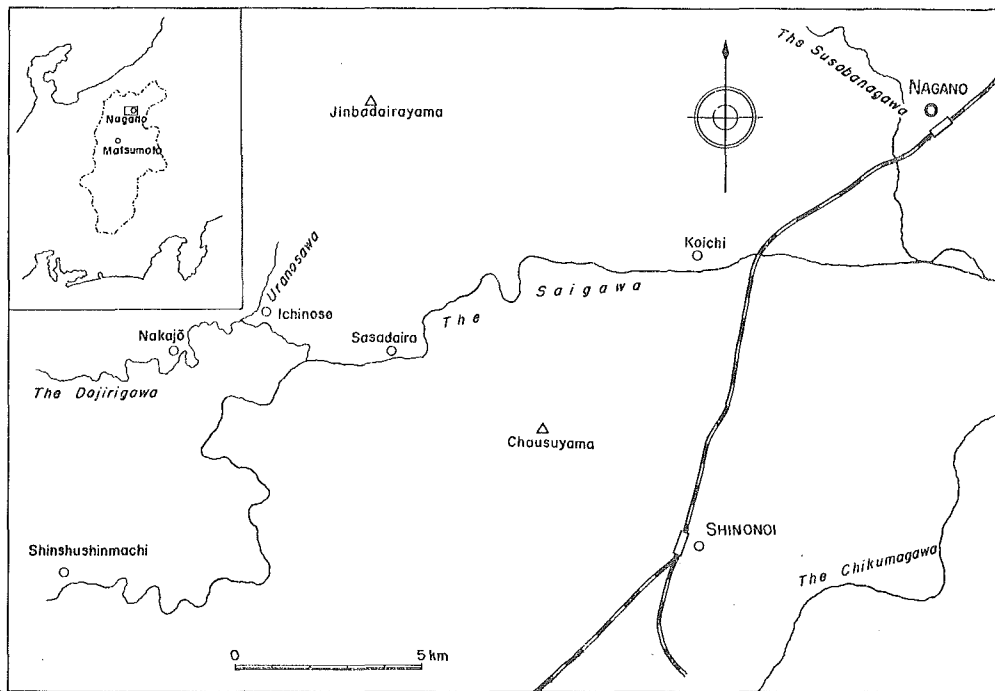


Fig. 1 Index map

N 30° E and 50° NW respectively.

Last year Kazuhisa SUZUKI, a member of our research group, made a detailed geological survey of the area as a theme of graduation thesis of the Shinshu University. The writers also surveyed the area jointly with him. The following is the result of these studies, though much informations are presented by K. SUZUKI.

An outline of the geology of this area is shown in a geological sketch map and a section in Figure 2 (a, b). The formation of the area, as shown in the map, forms a southwesterly plunging syncline, the axis of which running from northeast to southwest. General strike of the northwest limb is about N 50° E, while that of the southeast limb is about N-S. The syncline is asymmetrical, the northwest limb dipping more steeply than the southeast. That is, the northwest limb inclines about 80 degrees to the southeast, while the southeast does about 30 degrees to the west.

The formation in the area of Figure 2 is about 600 m thick, and consists mainly of medium-coarse, massive sandstones, which sometimes are conglomeratic. Generally they are argillaceous, and are often rich in organic matter. Three

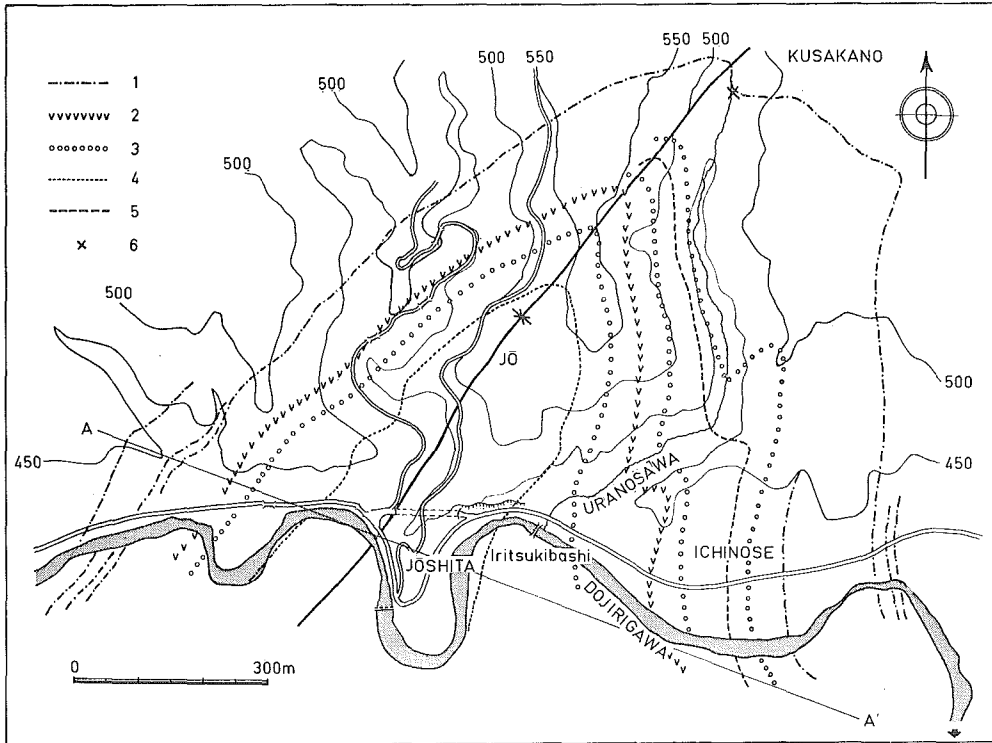


Fig. 2 a Geological sketch map of the eastern part of Nakajo-mura (after K. Suzuki, 1971, MS)

- 1 : the horizon rich in large nodules
- 2 : the bed containing amphibole and pyroxene grains
- 3 : conglomerate beds
- 4 : *Ostrea* beds
- 5 : *Anadara* beds
- 6 : Locality of the Proboscidean fossil

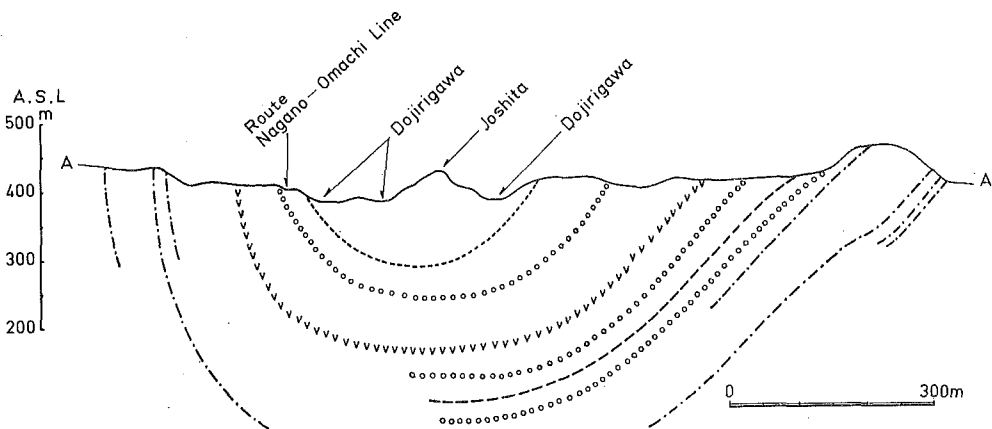


Fig. 2 b Geological section of the area
The position of the section is shown on the map (Fig. 2 a) by the line A-A'.

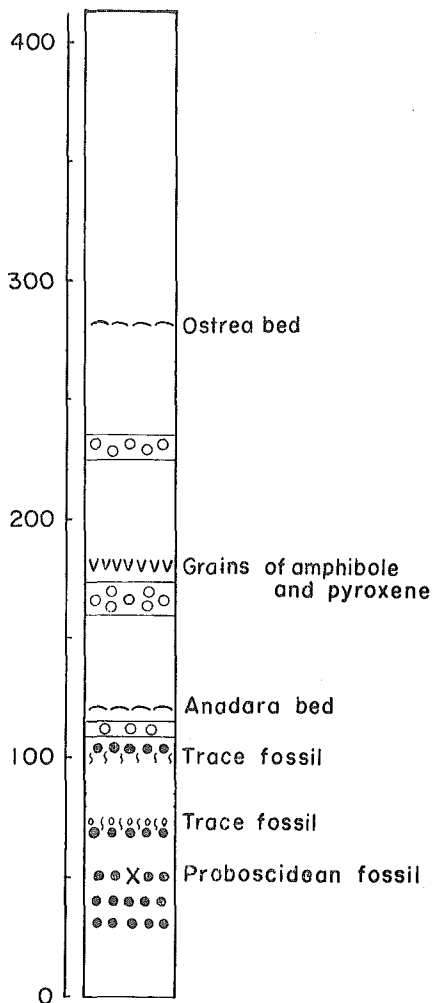


Fig. 3 Columnar section of the formation illustrated in Fig. 2

of this formation to other formations in the surrounding areas is not yet determined, K. SUZUKI (1971, MS) gave a new name of the "Ichinose conglomerate-sandstone member" to this formation. Among a few promising key beds in this region, the Susobana tuff member, exposed about 5 km to the east of the present area, is the most remarkable one in the Neogene sequence of this region. Though there may be an unconformity somewhere between the Susobana tuff member and the Ichinose conglomerate-sandstone member, the horizon of this Proboscidean fossil is estimated to be about 1,600 m higher above the top of the tuff member.

As to conditions and environment of sedimentation, the following are inferred

remarkable conglomerate beds are found in the area, and are conspicuous especially in the southeast limb. Pebbles of the conglomerates are round or subround, and are rather small being less than 10 cm in diameter. They are represented by chert, slate, andesite and others. In a certain horizon, grains of amphibole and pyroxene are conspicuous, and offer an important key bed. Fossils of Mollusca, most of which being Pelecypods, occur everywhere in this area. Among them *Anadara amacula* and *Ostrea gigas* are very abundant and often gregarious forming fossil beds. Other fossils found in this area are listed in Table 1. Spindle-shaped or fusiform, but tapering downward, trace fossils, about 5 cm in diameter and about 15 cm long, are found in certain horizons.

This formation has been correlated to the "Shigarami formation", the type locality of which is in the Shigarami area to the north of this district. There, it has been regarded as belonging to Pliocene. According to M. OMORI (written communication), the fossils of this district, listed in Table 1, show an age ranging from the latest Miocene to early Pliocene. As the stratigraphic relation

Table 1. Fossils from the Nakajo-mura district

<i>Anadara</i> (s. s.) <i>amica</i> YOKOYAMA	<i>Fulvia mutica</i> (REEVE)
<i>Glycymeris yessoensis</i> (SOWERBY)	<i>Spisula sachalinensis</i> (SCHRENCK)
<i>Patinopecten yamasakii</i> (YOKOYAMA)	<i>Mactra</i> (<i>Mictrotoma</i>) <i>angulifera</i> REEVE
<i>Patinopecten tryblium</i> (YOKOYAMA)	<i>Solen grandis</i> DUNKER
<i>Conchocele nipponica</i> (YABE et NOMURA)	<i>Macoma</i> sp.
<i>Callista brevisiphonata</i> (CARPENTER)	<i>Mya arenaria</i> LINNÉ
<i>Dosinia nomurai</i> OTUKA	<i>Panope japonica</i> A. ADAMS
<i>Dosinia</i> (<i>Kaneharaia</i>) <i>kaneharai</i> YOKOYAMA	<i>Pandora pulchella</i> YOKOYAMA
<i>Mercenaria chitaniana</i> (YOKOYAMA)	<i>Epitonium</i> sp.
<i>Lucinoma annulata</i> (REEVE)	<i>Tectonatica janthostomoides</i> KURODA et HABE
<i>Ostrea</i> (<i>Crassostrea</i>) <i>gigas</i> THUNBERG	<i>Neptunea modesta</i> (KURODA)
<i>Corbicula</i> sp.	<i>Turitella saishuensis</i> YOKOYAMA
<i>Laevicardium angustum</i> (YOKOYAMA)	<i>Echinarchnius</i> sp.
<i>Laevicardium shiobaraense</i> (YOKOYAMA)	<i>Linthia nipponica</i> YOSHIWARA
<i>Clinocardium ciliatum</i> (FABRICIUS)	

mainly from the Molluscan fossils. *Glycymeris yessoensis*, *Dosinia nomurai*, *Lucinoma annulata*, *Laevicardium shiobaraense*, *Clinocardium ciliatum*, *Neptunea modesta* and *Turitella saishuensis* are elements of the cold current like the Oyashio of the present-day Pacific. Some of the fossils such as *Anadara amica*, *Conchocele nipponica*, *Lucinoma annulata* and *Ostrea gigas* flourish on muddy bottom of the shallow sea with lower salinity. It suggests an environment of embayment. But, others such as *Patinopecten yamasakii*, *P. tryblium* and *Turitella saishuensis* are dwellers of the open sea. As these open-sea dwellers occur in the lower part of the sequence, and the bay elements in the middle and upper parts, a regressive history of the area under the cold current is inferred.

Observation of the Fossil The present fossil of a Proboscidea is broken into several blocks and fragments. Though it has not cleaned up yet, two molar teeth are accommodated on each side of the upper jaw. The two anterior teeth are in an worn condition. Five ridge-crests on the left molar are observable. Though the distal portions of the both left and right teeth are broken and lost, the number of ridge-crests, probably, does not exceed six, because the posterior molars seem to succeed immediately behind. The occlusal surface of the left molar is about 150 mm long and about 100 mm wide in the present state of preservation. Enamel is very thick being about 8 mm. On the first ridge a median fissure is discernible. The posterior teeth are also broken into several pieces, and are still covered with sandy matrix, so that the number of ridge-crests is not confirmed as yet. On one ridge-crest which is unworn, there are seven conelets. From the preliminary observation described above it is presumed that it belongs probably to the genus *Stegolophodon*.

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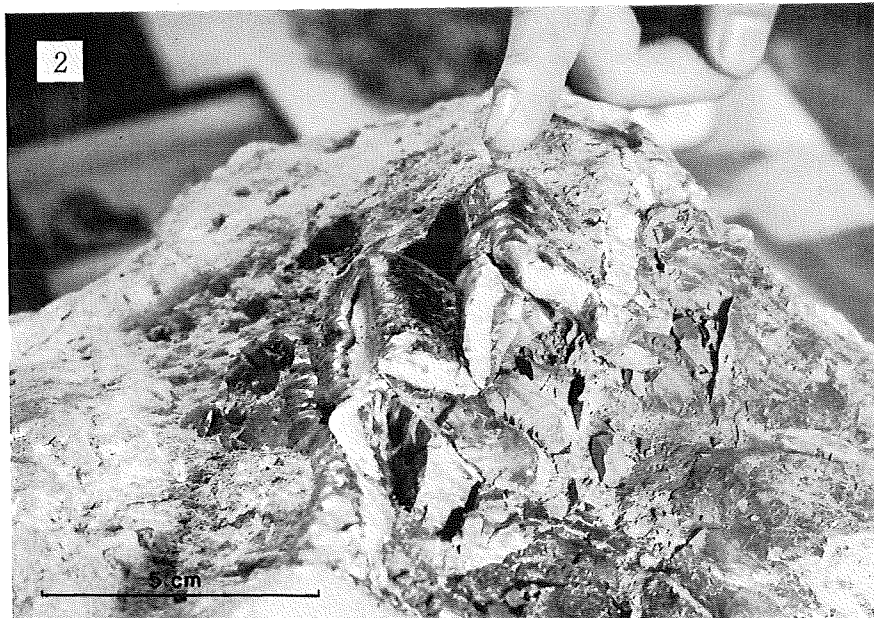
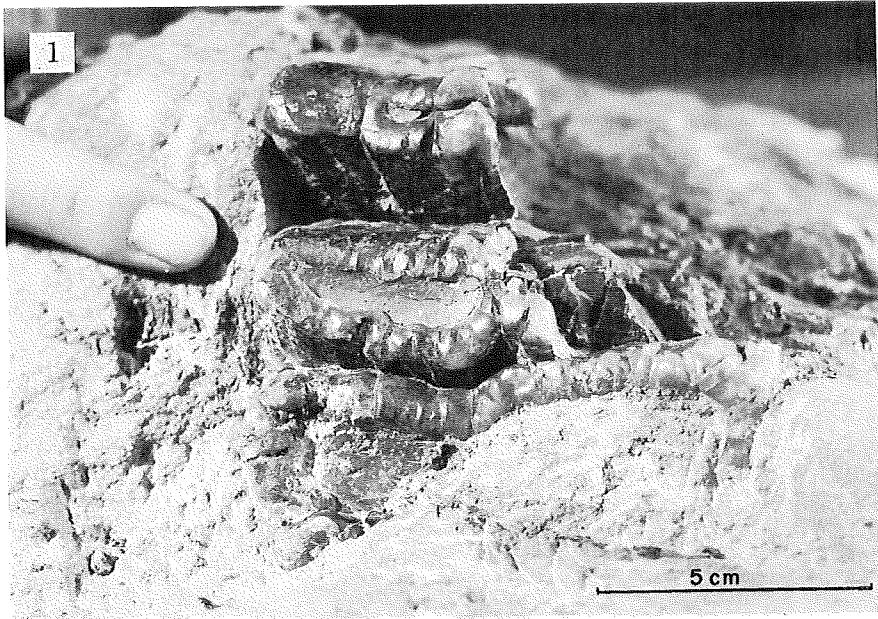


Plate I.

1. Occlusal view of the left upper molar, 2M
2. Lingual view of the partly broken 2M , showing thick enamel and moderately deep, V-shaped valleys separating ridge-crests

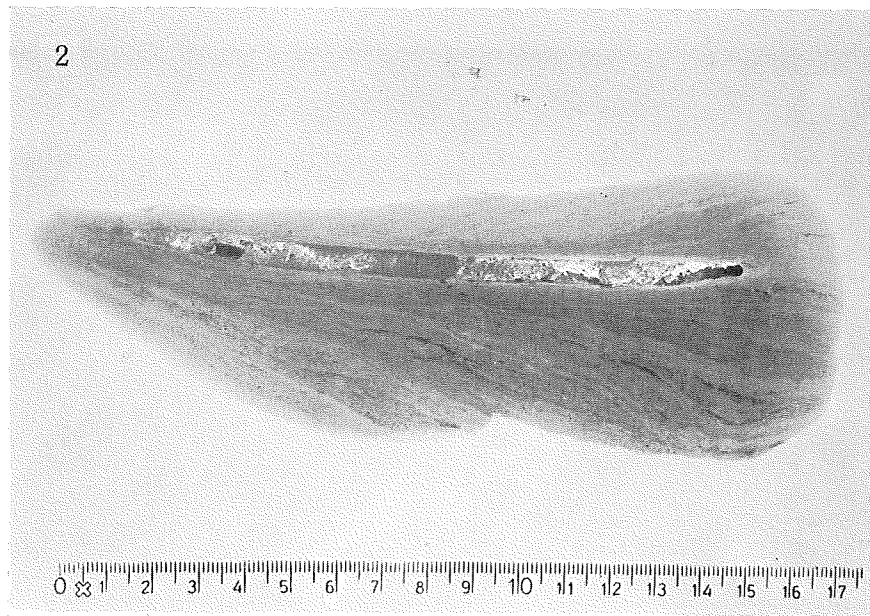
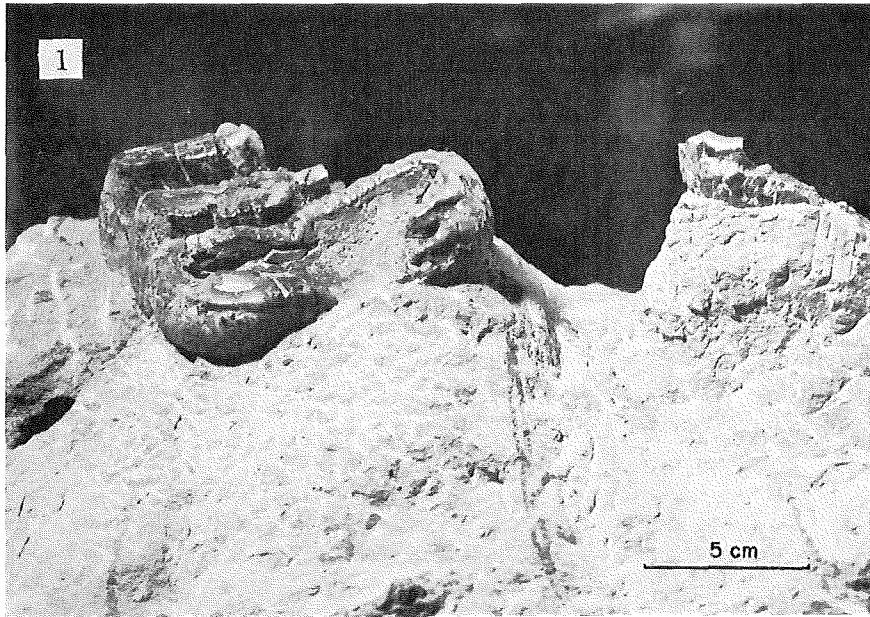


Plate II.

1. Oblique view of the left upper molar, $2M$, from medio-buccal side. A part of the broken right upper molar, M^2 , is seen in the right upper part of the photograph.
2. Longitudinal section of a spindle-shaped trace fossil. As the specimen is partly broken, the typical spindle shape is somewhat indistinct,