423. DISCOVERY OF THE FOSSIL GIANT SALAMANDER
(MEGALOBATRACHUS) IN JAPAN*

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Introduction

In the spring of 1958, Prof. K. NAGAI of the Geological Institute of the University of Ehime sent the writers numerous fossil bones and teeth collected at a limestone quarry of Shikimizu, Hijikawamura, Kita-gun, Ehime Prefecture (132°43'E, 33°28'N). Among them they found a dental bone of a giant salamander. Further, in the summer of the same year, in a field survey jointly held by the Geological Institute of Yokohama National University and the Geological Institute of Ehime University, supported by the Caving Club of Shikoku, Ehime News Press Co., the authorities of the Hijikawa-mura, several specimens of the similar species were gained from the same quarry. The writers could obtain valuable help and assistance from Prof. K. NAGAI and the members of his Institute, Prof. K. YAMAGUCHI and the other members of the Caving Club of Shikoku. Messrs. M. NOGUCHI, H. OCHI and the other gentlemen of Ehime News Press Co., Mr. M. IKEDA and the other gentlemen of Hijikawa-mura, and wish to extend their cordial thanks to them. The junior writer could observe some comparative specimens by the courtesy of Drs. S. UENO, H. OZAKI and Y. IMAIZUMI. He also could gain valuable advice and help for his research from Drs. Y. OKADA, K. KOBAYASHI, Y. SHINAMA, T. MIYAO, Y. IZUMI and J. UCHIDA. The writers also express their hearty thanks to these gentlemen.

The fissure deposits at the quarry of Shikimizu, the Shikimizu bed of the writers, are mainly composed of brown brecciated clay of 14 m thick, underlain by layers of black sand, yellow clay and gravel, also overlain by red clay and black humus. From the bed are found the following species.

*Cervus (Depéretia) praenipponicus SHIKAMA
Sinomegaceroides yabei (SHIKAMA)
Capricornis crispus (TEM.)
Germs (Sika) nippon TEM.
Maraca fuscata (BLVTH)
Metes leucurus kuzuiiensis SHIKAMA
Ursus japonicus Sch.
Martes ten SHIKAMA
Mustela itatsi TEM.
Leptas brachyurus TEM. & SCH.
Sciurus sp.
Clethrionomys sp.

* Received Oct. 6, 1961, read Jan. 15, 1961.
Apodemus sp.
Sorex shinto Thomas
Crocidura dsinezumi (Tem. & Sch.)
Mogera sp.
Rhinolophus sp.
Pipistrellus sp.
Phasianus sp.
Aves, gen. & sp. indet.
Ophidia, gen. & sp. indet.
Lacertilia, gen. & sp. indet.
Bufo sp.
Rana sp.
Pisces, gen. & sp. indet.

Beside vertebrates tolerable numbers of Decapoda, Myliapoda and Mollusca were found. The fauna above mentioned is correlated with that of the Upper Kuzu formation and regarded to Late Pleistocene in age. Hitherto no fossil giant salamander were found in Japan, so the discovery of it from the Pleistocene formation in Shikoku is very significant from the palaeogeographical point of view.

Description

*Megalobatrachus japonicus* (Temminck)

Plate 29, figures 1-8

*Specimens*:-A right parietal, a right parnasphenoid, three right dentary and three vertebrae, stored in the Geological Institute, Yokohama National University.


*Horizon*:-Late Pleistocene; Shikimizu bed composed of yellowish brown brecciated clay (fissure deposits).

*Description*:-Right parietal (figs. 1a, 1b).

Bone rather complete in preservation but marginal part a little broken. Jointing borders with left parietal, right frontal and with right orbitosphenoid have some simple parallel shallow grooves. Bone becomes thinner from posterior-inner to anterior-outer sides. Length and width as preserved 28.5 and 15.6 mm respectively, thickness 4.7 mm.

Right parasphenoid (figs. 2a, 2b).

A fragmental bone of anterior part of parasphenoid thin, flat, smooth and broken in marginal part. Ventral and dorsal surface of anterior part marked with shallow grooves running in radial direction. Maximum length, width and thickness are 27.8, 9.8 and 2.2 mm respectively.

Right dentary no. 1 (figs. 3a-3d).

Bone good in preservation although tips of anterior and posterior parts slightly broken. Length as preserved +8.7 mm, height and length of dental arch 54.5 and 4.7 mm; height and thickness at anterior end 9.4 and 5.6 mm respectively. Fossa for angular large, long and concave in buccal side. Pleurodont teeth sit at ridge of bone; teeth crown lost. Root undeveloped, but tubes of dental pulp of thirty three in numbers, developed at dental arch. A cross section of tube oval shaped, 1.5 mm in long diameter and 0.7-1.0 mm in short diameter. Height of tube +4 mm in median part; interval between tubes 1-2 mm. The osseous tissue of tubes the same as that of dentary. Attached area of the tubes to the wall of dental arch becomes narrower upwardly.

Right dentary no. 2 (figs. 4a, 4b).

A fragment of posterior part preserved. Bone as large as no. 1; height and thickness at end of dental arch 14.3 and 5.1 mm respectively; length as preserved +50 mm and length of dental arch +33.4 mm. Dental pulp tubes all lost; shallow fossae and low ridges run in alternation on dentary.

Right dentary no. 3 (figs. 5a, 5b).
A small fragment of dentary preserved at the area of maxillary foramen. Bone considerably worn.

Three vertebrae preserved of presacral and post third vertebra.

Vertebra no. 1 (figs. 6a-6d).
Bone lustred, considerably large and thicker than the following two bones; ossification developed; ventral side thicker than dorsal side. Centrum amphicoelous, longer than high and hard-drum formed in general outline with median constriction. Centrum 18.8 mm long along median ventral line; anterior glenoid cavity 11.5 mm wide and 12.0 mm high, while posterior glenoid cavity 12.2 mm wide and 11.2 mm high. Glenoid cavity oval, deep, unpierced and with median foramen lying dorsally; ventral surface of glenoid cavity larger than dorsal one; anterior median foramen almost touches posterior one. Some nervous foramen opened on ventral surface of mid centrum. Right prezygapophysis and right transverse process broken off; base of left transverse process preserved. Right half of neural broken. Prezygapophysis stout and large. Zygapophyseal ridge well developed, concave in dorsal view, particularly at its posterior part. Articulating surface of prezygapophysis elongate oval in shape, longer than wide, approximately 7 x 6 mm and directed anterto-lateralward.

Vertebra no. 2 (figs. 7a-7e).
Bone slightly smaller than no. 1 and ossification insufficient. Distance from tip of left prezygapophysis to tip of left postzygapophysis 16 mm. Anterior glenoid cavity higher than wide, 6.7 mm wide and 6.9 mm high; posterior glenoid cavity wider than high, 7.4 mm wide and 6.6 mm high. Centrum 12.2 mm long, neural canal 3.7 mm wide and 2.2 mm high. Neural arch at the narrowest portion of zygapophyseal ridges slightly wider than centrum. Anterior neural canal crescent, convex upward, while posterior canal more circular than anterior. Articulating surface of prezygapophysis elongate oval, much longer than wide and relatively longer than that of no. 1. Articulating surface of postzygapophysis ovate. Zygapophyseal ridge well developed and slightly concave in dorsal view. Right pre- and postzygapophysis broken off. Neural arch provided with an elevated ridge-like median keel; neural spine absent.

Vertebra no. 3 (figs. 8a-8e).
Bone like no. 2. Transverse process, right prezygapophysis, left postzygapophysis and upper part of posterior glenoid cavity broken off. Length of centrum 12.0 mm: distance between tip of left prezygapophysis and tip of right postzygapophysis 18.8 mm; width of posterior glenoid cavity 17 mm. A foramen at the posterior margin of neural arch fairly deep and triangular with longest ventral margin.

Remarks:—The individual numbers of the giant salamander in question seem to be four in total; at least one is smaller sized and at least three are larger sized. The specimen stored in the Ueno National Science Museum is 1170 mm in total length and that of Ueno's collection is 380 mm in ditto: assuming from these specimens, the smaller one seems to be about 500 mm long and larger ones about 900 mm long. This species has relatively longer vertebrae than the recent species (figs. 9a-9d), and no other clear distinction can be noticed between the two species. Thus the writers put this species to a recent one. As the existence of fossil species is established in Shikoku, it may also be possible to discover a recent species in Shikoku, the writers think.

Distribution of Megalobatrachus:—
After I. SATO the recent species is known from Middle Honsyu and North Kyusyu; the Kirigamine, Suwa-gun, Nagano Prefecture (northern limit of distribution), the Nagara River and the Upper Hida River, Gihu Pref., the Nabari River, Mie- and Nara Pref., the Upper Asahi- and the Takahashi Rivers, Okayama Pref., the Upper Yura River, Kyoto Pref., the Upper Ōta River, Hiroshima Pref., the Toyooka River, Iyogo Pref., the Tenjin- and Hino Rivers, Tottori Pref., the Eno River, Shimane Pref., the Nishiki River, Yamaguchi Pref. and the Yakuwan River, Ōita Pref. etc. Some questionable samples, known from the suburbs of Matsuyama city and Kagawa Pref. (ISHIKAWA, 1935), may be supported by the fossil species. Cryptobranchidae is distributed in the world as follows: recent species is in Eastern Asia including Japan, Lower Pliocene one in Nebraska, North America and Miocene-Upper Oligocene one in Europe. It may be said that Cryptobranchidae migrated in geological ages from Europe to Eastern Asia.

References


Explanation of Plate 29

*Megalobatrachus japonicus* (TEM.)

Fig. 1. A part of right parietal. ×1. a. ventral side: b. dorsal side.
Fig. 2. A part of right parasphenoid, ×1. a. ventral side; b. dorsal side.
Fig. 3. Right dentary. a. buccal side, ×1; b. lingual side, ×1; c. upper side, ×1.95; d. lingual side, ×1.95.
Fig. 4. A part of right dentary, ×1. a. buccal side; b. lingual side.
Fig. 5. A part of right dentary, ×1. a. buccal side; b. lingual side.
Fig. 6. Vertebra no. 1. ×1.9. a. dorsal side; b. ventral side; c. left side; d. posterior side.
Fig. 7. Vertebra no. 2. ×2. a. dorsal side; b. ventral side; c. left side; d. right side; e. anterior side.
Fig. 8. Vertebra no. 3. ×2. a. dorsal side; b. ventral side; c. right side; d. anterior side; e. posterior side.
Fig. 9. Twentieth vertebra of recent specimen (Ueno's coll.). ×1.7. a. dorsal side; b. ventral side; c. anterior side; d. right side.