

Original Article

A hadrosaurid vertebra from the Ashizawa Formation, Futaba Group, Fukushima, Japan

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Abstract

An isolated vertebra from the Coniacian (Late Cretaceous) marine Ashizawa Formation is described. The specimen can be classified as an indeterminate hadrosaurid. If this is the case, the secure age assignment of the specimen indicates that it represents one of the oldest records of the group in Asia.

Key Words : Dinosaur, Ornithopoda, Futaba Group, Ashizawa Formation, Fukushima

Introduction

An isolated vertebra was collected by the Kairyu-no-sato Fossil Study Group led by one of us (TT) to an outcrop in the Tsurubo area, Iwaki City in 1989. The locality is situated within the Obisagawa Member, Ashizawa Formation, Futaba Group. The

outcrop was subsequently incorporated into an on-site exhibition in the Ammonite Center which comprises a pavilion built over the outcrop from which visitors can view numerous ammonites. The vertebra was tentatively identified as a hadrosaurid cervical vertebra (Takahashi, 1990). Further comparisons enabled us to argue the vertebra is most likely to be a first

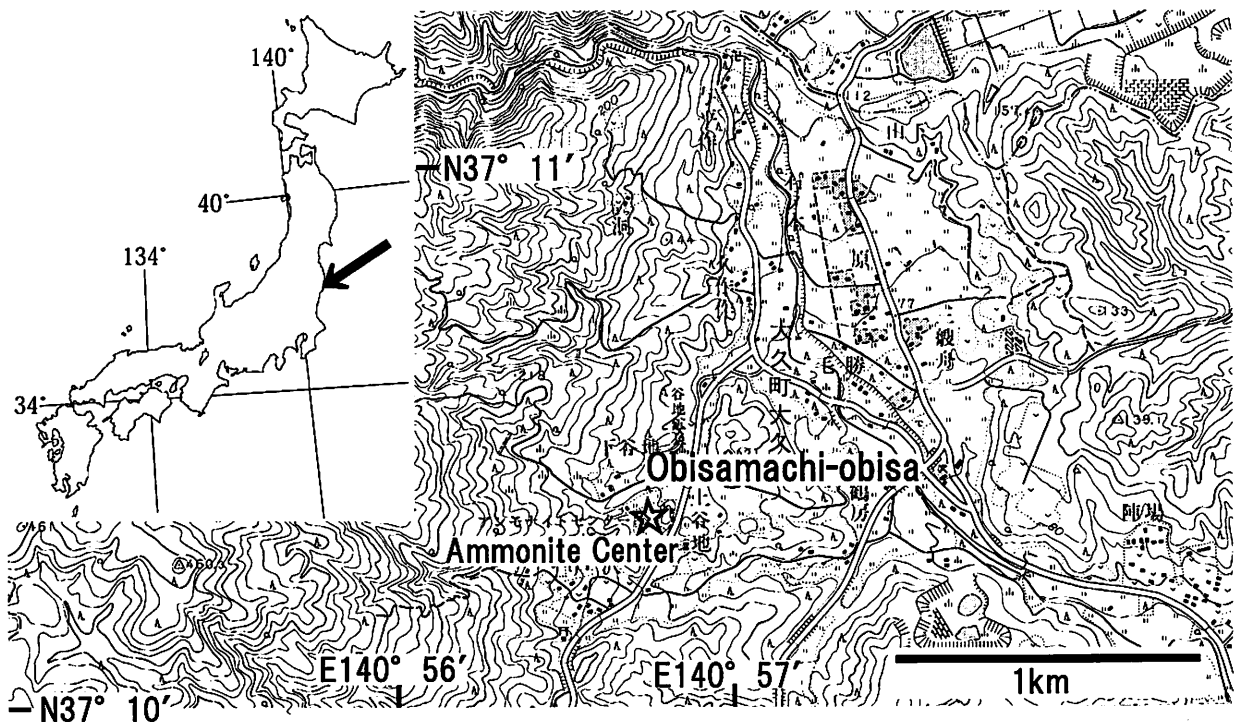


Figure 1 Location of the Hadrosaurian vertebra (Ammonite Center).

dorsal.

Abbreviations

IMCF: Iwaki Museum of Coal and Fossil, Fukushima, Japan

NSM: National Science Museum, Tokyo, Japan

Geology and Age

The Ashizawa Formation is divided into two members: the lower Asamigawa Member and upper Obisagawa Member. The locality lies within the lower part of the Obisagawa Member. The member consists mainly of fine-grained sandstones and sandy shales that were predominantly deposited in shallow marine environments (Obata, 1967; Obata & Suzuki, 1969). It is considered to be Coniacian in age based upon the occurrence of inoceramids and ammonites such as *Inoceramus uwajimensis* and *Yabeicerus orientale* (Matsumoto *et al.*, 1989). Other vertebrate fossils from the locality include a plesiosaur tooth and vertebra (Takahashi, 1990), a mosasaur tooth (Sato, 1991), shark teeth referable to *Cretolamna* and *Orthacodus* and fish teeth referable to *Enchodus* (Nabana, 1991).

Upper Cretaceous	Coniacian	Futaba Group	Kasamatsu Formation		
			Ashizawa Formation	Obisagawa Member	★
				Asamigawa Member	

Figure 2 Stratigraphic position of IMCF 1124

Systematic Paleontology

Dinosauria Owen, 1842

Ornithischia Seeley, 1888

Ornithopoda Marsh, 1881

Hadrosauridae Cope, 1869

Genus undetermined

Specimen No.: IMCF 1124

Locality: Tsurubo, Iwaki-shi, Fukushima Prefecture, Japan

Formation: Ashizawa Formation, Futaba Group

Age: Coniacian

Material: a nearly complete anterior dorsal vertebra

Collected by "Kairyu-no-sato" Fossil Study Group

Japanese common name: Obisa-ryu

The centrum is strongly opisthocoelous. It possesses a large hemispherical cranial articular surface and a deeply concave, cup-shaped caudal articular surface. It is wider caudally than cranially and is slightly constricted in the middle. The centrum is dorsoventrally compressed. There are no sign of the ventral keel. The neural arch is almost vertical and it forms a wide and regularly arched neural canal. The bases of the postzygapophyses are fused together and the neural spine forms a small tubercle situated dorsal to this junction. The distal ends of the transverse processes are not preserved. The cross-section of the transverse process is vertically elliptical. The height of the centrum is 39.4 mm; the width, 51.5 mm; the length, 57.6 mm. The height of the postzygapophyses is 66.7 mm; the width between the postzygapophyses, 72.8 mm; the width between the transverse processes as preserved, 146 mm; the width of the neural canal, 36.4 mm.

Discussion

This morphology is closely comparable to that of the anterior most dorsals of *Hypacrosaurus* sp. (NSM PV 20376, 20377, and 20378). In hadrosaurs, the distance between the postzygapophyses narrows through the posterior cervicals and anterior dorsals. The widely separated postzygapophyses of IMCF 1124 indicates that it is most likely to be a first dorsal vertebra. The size of the specimen lies within the range of a subadult *Hypacrosaurus* (NSM PV 20377 and 20378).

The presence of dorsal vertebrae with strongly upturned diapophyses with a relatively short neural spine suggests referral to the Hadrosaurinae (Gonzalez Riga and Casadio, 2000). However the characters states can also be observed in lambeosaurines such as *Hypacrosaurus*, leading us to question the utility of these features in hadrosaur classification. We therefore adopt a conservative approach and regard the specimen as an indeterminate hadrosaur.

The present oldest record of Hadrosauridae is *Protohadros* from the middle Cenomanian Woodbine Formation in Texas, USA (Head, 1998). Early Asian hadrosaurs include *Aralosaurus*, *Jaxariosaurus*, and *Tanius*, but their horizons have not been securely dated (e.g. Weishampel and Horner, 1990; Head, 1998). A Coniacian hadrosaur might be one of the oldest fossil records in Asia with a secure age assignment. It is definitely the oldest fossil record of this group in Japan.

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* in Japanese

** in Spanish

要 旨

福島県に分布する双葉層群足沢層から産出したハドロサウルス類恐竜の脊椎

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白亜紀後期コニアシアン階の海成層、双葉層群足沢層から産出した遊離した脊椎骨を報告する。本標本は第1胸胴椎であり、ハドロサウルス科まで同定することができる。この場合、正確な年代が推定されているハドロサウルス科化石としては、日本では最古、アジアでも最古級の化石記録のひとつとなる。

キーワード：恐竜，鳥脚類恐竜，双葉層群，足沢層，福島県

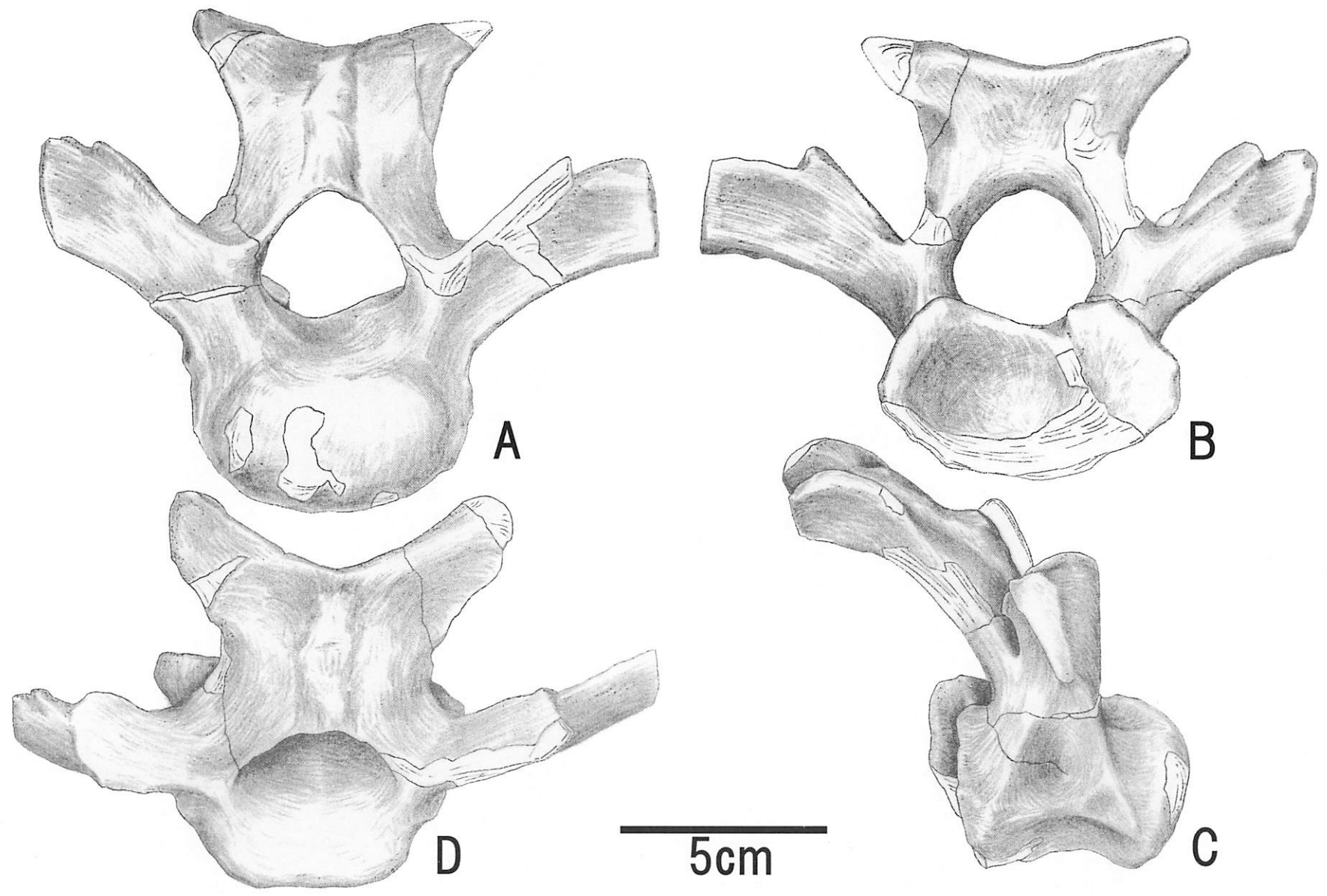


Plate 1 IMCF 1124. A, anterior view; B, posterior view; C, right lateral view; D, ventral view.