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A new form of *Annulariopsis* from the Carnian Momonoki Formation, Southwest Japan

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Abstract

A new form of *Annulariopsis* from the Carnian Momonoki Formation is described, and its comparison with other members of this genus is demonstrated.

Foreword

The generic name *Annulariopsis* was established for leaf-whorls consisting of small lanceolate and uninerved leaves borne in a terminal position probably through the breaking off of a stem or bud above (ZEILLER, 1902-03 ; HARRIS, 1961). However, some leaf-whorls, such as *Annulariopsis inopinata* ZEILLER (KIRITCHKOVA, 1969), *A. hashimotoi* KON'NO (KON'NO, 1972), *A. annularioides* HUANG et ZHOU (HUANG and ZHOU, 1980) and *A. bunkeiensis* (KOBATAKE) (KIMURA and KIM, B. K., 1988), are attached clearly to the successive stem nodes as leaf-whorls, like those of other sphenophytes. Thus, KIMURA and KIM, B. K. (1988) revised the diagnostic character of the genus *Annulariopsis* on the basis of their newly collected specimens from the Upper Triassic Amisan Formation, Nampo Group, Korea and its equivalents in Korea.

The systematic relation between *Lobatannularia* KAWASAKI (1927) and *Annulariopsis* ZEILLER (1902-03) has already been discussed by such authors as HALLE (1927), YABE and KOIWAI (1928), KAWASAKI (1934), KON'NO and ASAMA (1950), HARRIS (1961) and KIMURA and KIM, B. K. (1988).

This paper deals with the description of *Annulariopsis* sp. on the basis of newly collected specimens from the Carnian Momonoki Formation. This species is probably new to science but is incompletely known to permit giving a new specific name.

Brief Geology

Numerous paleobotanical data of the Ominé Coal-field in the western part of Yamaguchi Prefecture, western edge of the Honshu Island of Japanese Islands were summarized by OISHI (1940) and KIMURA (1980).

The Triassic Miné Group distributed in the Ominé Coal-field rests unconformably on the Permian sediments and is divided into four formations, i. e., Aso, Momonoki, Hirabara and Takiguchi Formations in descending order (TAKAHASI and MIKAMI, 1975).

The Miné Group has been assigned to the Carnian in age based on its marine benthic invertebrate fossils.

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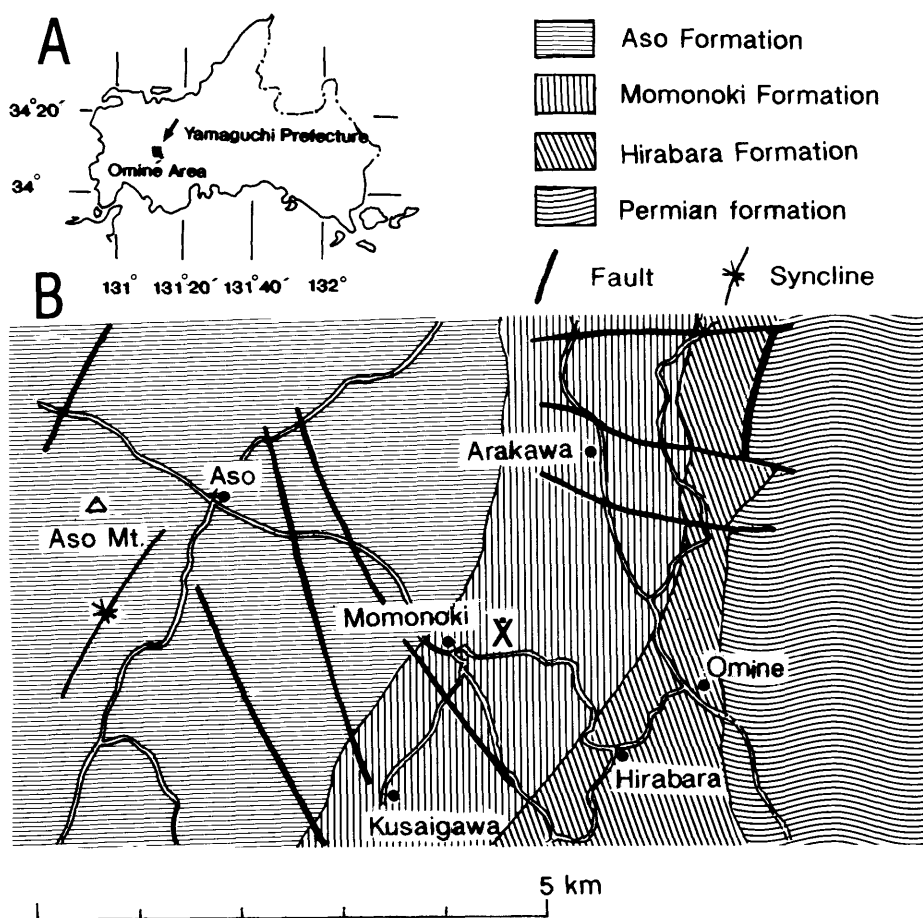


Fig. 1. A : Location of the Ominé area indicated by an arrow. B : Brief geological map of the Ominé area (in part after KIMURA *et al.*, 1983) and the fossil locality.

The plant remains were collected from one of the classical plant-sites of the Momonoki Formation together with many other plant taxa (Fig. 1 : Loc. no. 5, in KIMURA *et al.*, 1983). The Momonoki Formation, up to 1500m thick, is mostly composed of non-marine sedimentary rocks (lacustrine, partly deltaic) except for its upper part where *Halobia* aff. *aotii* KOBAYASHI et ICHIKAWA of marine origin is known (KIMURA, 1980 ; KIMURA *et al.*, 1983).

Repository : The specimens described and figured in this paper are kept in the type specimen room of the Department of Earth and Planetary Sciences, Faculty of Science, Kyushu University with the registered number by the designation GK-S.

Systematic description

Order Equisetales

Family Equisetiaceae

Genus *Annulariopsis* ZEILLER em. KIMURA and KIM 1988

Type species : *Annulariopsis inopinata* ZEILLER 1902

Annulariopsis sp.

Figs. 1-2.

1936 *Annulariopsis inopinata* ZEILLER ? : OISHI and TAKAHASI, p. 116, text-fig. 2
(Momonoki).

1940 *Annulariopsis inopinata* ZEILLER ? : OISHI, 1940, p.185 (Remarks).

Material : GK-S 1-4

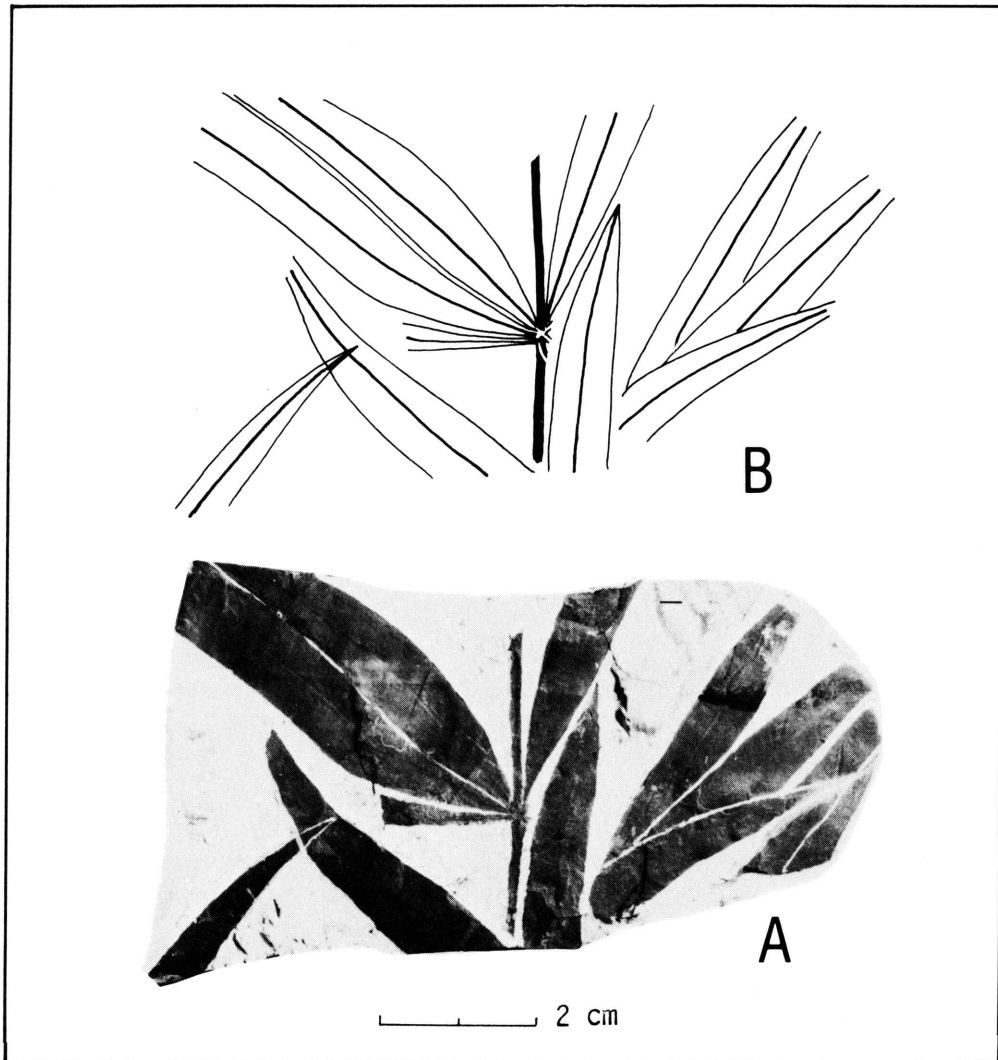


Fig. 2. A : *Annulariopsis* sp. : A leafy stem with a single leaf-whorl and detached leaves (GK-S 1). B : Drawn from Fig. 2-A. (Figures natural size).

Description : Articulate plant. Stem slender, 1 mm wide, surface smooth ; internode rather long. Leaf whorl borne at node, not divided into two lobes, spread out in one plane, consisting of 7 or more uninerved leaflets ; leaflets large-sized, lanceolate in shape, with acutely pointed apex, broadest near one third of their length from leaf base, more than 5 cm long and 9 mm wide (smaller one up to 5 mm wide), nearly free at their bases. Midrib distinct, about 0.5mm wide, persisting to the tip. Margins entire.

Distribution and occurrence : Rare and known from the Miné and Nariwa Groups.

Discussion and comparison : The new material of *Annulariopsis* sp. is represented by four fragmental specimens. The most distinctive characters of this species are the slender stem with leaf whorl at each node, the seven uninerved and large-sized leaflets and the lanceolate leaflets being free at their base. The present leafy stems differ apparently from other Mesozoic forms by these characteristic states. However, until more information about this leafy stem is sufficiently known, it is provisionally retained in *Annulariopsis* sp.

Fig. 2 shows a leafy-stem fragment with slender stem bearing a single leaf-whorl. The leaf whorl consists of seven lanceolate leaves of which lower three are represented only by basal part of leaf.

Annulariopsis stems still preserved with lateral leaf whorls in position have rarely been recorded. As far as we know, such stems were described by KIRITCHKOVA (1969) as *Annulariopsis inopinata* ZEILLER from the middle Keuper beds of Ural, by KON'NO (1972) as *A. hashimotoi* from the Upper Triassic of Sarawak, East Malaysia, by HUANG and ZHOU (1980) as *A. annularioides* and *A. spp.* from the Upper Triassic Yanchang Formation, and by KIMURA and KIM, B. K. (1988) as *A. bunkeiensis* (KOBATAKE) KIMURA et KIM from the Upper Triassic Amisan Formation and its equivalents in Korea.

Among the above mentioned, *Annulariopsis hashimotoi* and *A. bunkeiensis* are rather similar in leaf form and number of leaves in a whorl to the present species. *Annulariopsis hashimotoi*, however, is distinguished from *A. sp.* by its large-sized (9 cm long and up to 1.2 to 1.5cm wide) and a large number (about 20) of leaves. *A. bunkeiensis* is distinguished from the present species by its spatulate leaves with emarginate apex. The other two species are also distinguishable from the present one by their form, size and number of leaves.

Besides the above, the following leaves of *Neocalamites* and *Annulariopsis* are similar in form, size and number of leaves to the present specimens, but are distinguished from the other by the respective reason as briefly mentioned below :

Neocalamites carcinoides HARRIS : SZE, 1956 ; SZE *et al.*, 1963, Upper Triassic Yanchang Formation : Leaf whorl divided into two lobes, leaves size up to 12cm long and 5 to 6mm wide.

Neocalamites minensis KON'NO et NAITO : KON'NO and NAITO, 1960, Carnian Momonoki Formation : Leaf whorl consisting of 8 to 12 leaves and divided into two lobes.

Annulariopsis ? sp. (= *Neocalamites annularioides*, according to SZE, 1956) : SZE, 1956 ; SZE *et al.*, 1963, Upper Triassic of Junggar Basin : Leaf whorl consisting of 8 to 12 linear-lanceolate leaves.

Annulariopsis ? *sinensis* (NGO) LEF : SZE *et al.*, 1963, Upper Triassic Xiaoping

Formation : Leaf apex rounded.

Annulariopsis inopinata ZEILLER : ZEILLER, 1902-3, Upper Triassic of North Viet Nam : Leaf whorl consisting of 16 to 24 lanceolate or spatulate leaves with obtusely pointed apex.

OISHI (1930, '32, '40) and OISHI and TAKAHASI (1936) described three leaf whorls from the Nariwa Group and a single broken leaf whorl from the Momonoki Formation as *Annulariopsis inopinata* ? respectively. Of them the last one is highly referable to the present leafy stems of *Annulariopsis* sp.

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