



Birbal Sahr
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An enigmatic plant from the Lower Cretaceous Oguchi Formation, Tetori Supergroup, Inner Zone of Japan

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A large bipinnate leaf found as an impression in the Lower Cretaceous Oguchi Formation, Tetori Supergroup, in the Inner Zone of Japan was earlier regarded as *Dictyozamites reniformis* by Oishi. The present specimen of bipinnate leaf has a thick main rachis, and reniform and stalked ultimate pinnae with finely anastomosed venation. Since the features of this specimen differ from those of *Dictyozamites*, a new generic name *Tetoriophyllum* is proposed for this leaf. *Tetoriophyllum reniformis* (Oishi) new comb. is described here. The affinity of this plant is uncertain.

IN 1987 Keiju Yamazaki collected a large bipinnate leaf-impression from the Lower Cretaceous Oguchi Formation of the Tetori supergroup in the Inner Zone of Japan. Its penultimate pinna axis bears ultimate pinnae, which have long been regarded as those of *Dictyozamites reniformis* Oishi¹⁻⁴. However, these authors have noticed that the pinna of *Dictyozamites reniformis* has a distinct stalk, and this feature is quite different from other *Dictyozamites* species hitherto known. In addition, the bipinnate nature is obvious in the present specimen. Under the circumstances, I feel that it is inappropriate to retain the present leaf in the bennettitalean *Dictyozamites*. Hence I propose a new generic name, *Tetoriophyllum*, for the present leaf. This paper deals with the description of *Tetoriophyllum reniformis* (Oishi) new comb. on the basis of its external morphology.

Form-genus *Tetoriophyllum* Kimura gen. nov.

Generic diagnosis: Leaf large, bipinnate. Main rachis thick, with long penultimate pinnae parallel to each other. Ultimate pinnae (or pinnules) reniform, with

distinct stalk and finely anastomosed venation, attached to the upper sides of penultimate pinna axis at a wide angle.

Tetoriophyllum reniformis (Oishi) Kimura, new comb. (Figure 1)

Dictyophyllum reniformis Oishi: Oishi, 1936, p. 29, pl. 9, figs. 1, 1a; 1940, p. 327 (general remarks); Kimura, 1961, p. 25, text-figs. 3,4; Kimura and Sekido, 1976, p. 302, pl. 32, fig. 4; text-fig. 11. ? *Dictyozamites kawasakii* Tateiwa: Takahashi and Naito, 1950, p. 188, text-fig. 11.

Holotype: KM-87001. Specimens examined, over 100. All the specimens are kept in the Komatsu City Museum, Komatsu City, Ishikawa Prefecture.

Stratum typicum: Oguchi Formation (alternation of sandstone and black shale; Early Cretaceous in age), Itoshiro Group, Tetori Supergroup.

Locus typicus: Upper course of the Mekkodani Valley (roughly 136° 42' 55" E, 36° 11' 04" N), a tributary of the Tetori River (Ozo, Oguchi-mura, Ishikawa-gun, Ishikawa Prefecture).

Derivatio nominis: Generic name, after the Tetori River. Specific name, after reniform shape of ultimate pinna.

Occurrence: Broken penultimate pinnae are common.

Diagnosis: Same as generic diagnosis.

Description: Judging from the piece of specimen shown in Figure 1,a (holotype), the leaf appears to be fairly large, but the whole is unknown. Leaf is bipinnate with thick main rachis, 4.4 cm wide measured from impression. The main rachis sends off penultimate pinnae from its upper sides at an angle of about 60° and at intervals of 5.2 cm. The penultimate pinnae are with rather slender axis, 8 mm wide, more than 21.6 cm long, and are parallel to each other.

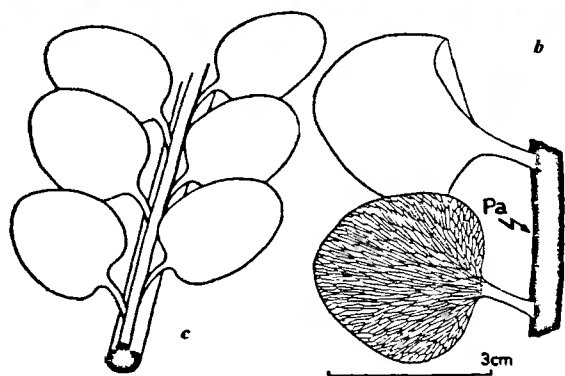
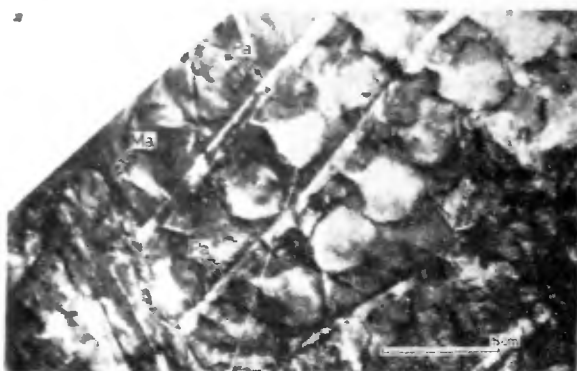


Figure 1. *Tetoriophyllum reniformis* (Oishi) Kimura, new comb. a. Holotype [Oishi (1936) did not designate any holotype for *Dictyozamites reniformis*], KM-87001. Wrong-side view; Ma, main rachis; Pa, penultimate pinna axis. b. Ultimate pinnae (or pinnules), showing their mode of attachment to the penultimate pinna axis and venation [Reinserted from Kimura and Sekido (1976), text-fig. 11]. c. Reconstruction of a part of penultimate pinna, showing the V-shaped insertion of ultimate pinnae (or pinnules) with marked stalks.

The ultimate pinnae (or pinnules) are at intervals of 3.2 cm, reniform in outline, up to 3 cm wide and 2.8 cm high, with a distinct stalk 1 cm long. The stalk is attached to the adaxial sides of penultimate pinna axis. The adaxial surface of pinna is usually convex and the abaxial one concave. Veins are numerous, radiating from the tip of the stalk, and are finely anastomosed to form elongate-rectangular areoles, as shown in Figure 1, b (reinserted from Kimura and Sekido, 1976, text-fig. 11).

In all the specimens examined, the pinnae on the acroscopic side are unexceptionally hidden and buried in the rock-matrix. Possibly both acroscopic and basiscopic pinnae are originally not lying in one plane but as V-shaped in sectional view (Figure 1c) [or like the wings of butterfly; cf. the pinnules of *Weichselia* (ref. 6, p. 11)]. The cuticle is not preserved and reproductive organs are not known.

Discussion and comparison: It is certain that the present

ultimate pinnae resemble in form and venation the 'leaves' of *Chiropteris*, as mentioned by Oishi², but in *Chiropteris* pinnate habit of the leaf is not known to me. The present specimen is characterized by the leaf being bipinnate, with reniform and stalked ultimate pinnae (or pinnules) showing finely anastomosed venation, and V-shaped disposition to the penultimate pinna axis. So far as I know, such features have not been recorded in bennettitalean leaves and in neither fossil nor extant cycadalean leaves. No *Dictyozamites* species with stalked pinnae have been found except the specimens wrongly assigned to this genus as *D. reniformis*.

Some Palaeozoic fern-like plants, such as *Angaropteridium* Zallesky and *Cardiopteridium* Nathorst, have pinnae (or pinnules) similar in form to the present pinnae. However, their veins are not anastomosed.

I have therefore proposed a new generic name, *Tetoriophyllum*, to include the present leaf (described here as *T. reniformis* (Oishi) nov. comb.) together with those regarded earlier as *Dictyozamites reniformis* Oishi.

So far, to our knowledge, *Tetoriophyllum reniformis* is restricted in occurrence, to the Lower Cretaceous Oguchi Formation in the Inner Zone of Japan. A doubtful but similar leaf-fragment was recorded as ?*Dictyozamites kawasakii* Tateiwa by Takahasi and Naito⁵ from the Uppermost Jurassic (or Lowermost Cretaceous) Kiyosué Formation, Yamaguchi Prefecture, Japan.

It is difficult to ascertain the affinity of *Tetoriophyllum reniformis*, because all the specimens examined are only impressions without preserved cuticle and reproductive organs. In addition, I cannot set aside the possibility that this plant might be a pteridosperm or even a fern.

If additional specimens with preserved cuticle are found in the younger Mesozoic plant sites in north and northeast China, they would give more information or its identity. These plant sites yield abundant fossil plants similar in floristic composition to those of the Oguchi Formation.

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