
Austroannularia gen. nov., an asymmetrical Permian sphenopsid leaf whorl from Gondwanaland

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Austroannularia gen. nov. is proposed for species of morphologically asymmetrical sphenopsid leaf whorls similar to those included in the Cathaysian genus *Lobatannularia*, but lacking the strongly bilobate character of the latter genus. The two species, *A. subcircularis* sp. nov. from eastern Australia and *A. qubuensis* from southern Tibet (Xizang) occur in Permian non-marine strata containing typical Gondwana species in the absence of Cathaysian species.

Key-words—Megafossils, Sphenopsida, *Austroannularia*, *Lobatannularia*, Permian (Australia).

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सारांश

गोंडवानाभूमि से एक असममित परमी युगीन स्फेनोप्सिड पर्ण-चक्र *ऑस्ट्रोऐन्नुलेरिया* नव प्रजाति

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आकारिकीय दृष्टि से असममित स्फेनोप्सिड पर्ण-चक्रों की जातियों के लिए जो कि कैथेसीय प्रजाति *लोबेटेन्नुलेरिया* प्रजाति के सदृश है तथा जिनमें द्विपत्तीय लक्षण अनुपस्थित हैं, के *ऑस्ट्रोऐन्नुलेरिया* नव प्रजाति प्रस्तावित की गई है। कैथेसीय जातियों की अनुपस्थिति में सामान्य गोंडवाना जातियों से युक्त परमी असममिती स्तरों में पूर्वी ऑस्ट्रेलिया में *ऑ. सबसर्कुलेरिस* नव जाति एवं दक्षिणी तिब्बत से *ऑ. क्यूबुयेन्सिस* नामक दो जातियाँ पाई जाती हैं।

SYSTEMATIC DESCRIPTION

Order—Sphenophyllales *incertae sedis*

***Austroannularia* gen. nov.**

Diagnosis—*Annularia*-like to *Lobatannularia*-like leaf whorls, asymmetrical, with shorter leaves on one side of the whorl giving the whorl a reniform outline; longer leaves tending also to be broader, fused for half their length or less, shorter leaves fused to a lesser extent if at all; leaves linear-obovate, with an acute apex, possible mucronate, leaf tips or apical regions tending to droop or be lax, sheath probably absent.

Type species—*Austroannularia subcircularis* sp. nov.

Origin of name—Austro, derived from *Austrinus*, Latin for “southern”. *Annularia*, a well known Late Palaeozoic sphenopsid genus, derived

from *annulus*, Latin for “ring”.

Comparison—The genus *Austroannularia* may be distinguished from the genus *Lobatannularia* by the lack of strong bilobation of the leaf whorl. In *Lobatannularia* there are usually two diametrically opposite pronounced gaps in the whorl whereas *Austroannularia* has one or two regions where the leaves are shorter, but there is no break. Both genera are restricted to the Permian.

Austroannularia subcircularis sp. nov.

1916 *Annularia stellata* (?), Walkom, pp. 233-234, pl. 25.

Description—Leaf whorls almost circular, longest leaf about 1½ times longer than shortest leaf, longest leaf about 16 mm, broken leaves may be longer. There is no apparent foreshortening on the slab bearing the type specimen where whorls are spaced at slightly less than the length of the longest



Figure 1—*Austroannularia subcircularis* gen. et sp. nov. Holotype, Specimen no. F15/985/5, Queensland Museum. Natural size.

leaf. The leaves are lax, but this character may have been exaggerated during burial. The individual leaves vary in breadth in proportion to their length in approximately the ratio of five times as long as broad. This implies that the whorl has not been foreshortened during compression, but the asymmetry is a natural phenomenon. Longer leaves are fused for up to one third of their length, shorter leaves appear free. Shorter leaves are restricted to one side of the whorl, although on some whorls leaves may be slightly shorter on the opposite side of the whorl (Figure 1).

Holotype—F/15/985/5, housed by the Queensland Museum.

Locality—The only information available was given by Walkom (1916), no additional data are available—12.8 km from Dunedoo, New South Wales (approximately 260 km NW of Sydney). The horizon is unknown.

The colour and texture of the host rock, a pinkish mudstone, suggests it may be from the same or a similar horizon to that from which Holmes (1974, 1977) has described elements of the *Glossopteris* Flora from the Late Permian Illawarra Coal Measures near Dunedoo. Some *Glossopteris* leaves on the slab bearing the holotype are virtually indistinguishable from an unnamed species of *Glossopteris* from the Rangal Coal Measures, Middle Permian of Queensland, which is probably very slightly older than the Illawarra Coal Measures. The possibility exists that the holotype was found in the Illawarra Coal Measures.

Other Specimens—Two specimens from the Nychum Volcanics near Chillagoe, north Queensland, identified by White (1972) as *Annularia* belong in *Austroannularia subcircularis*. These specimens, F24235 and F24240, form part of the collections of the Bureau of Mineral Resources, Canberra.

Age—Bailey *et al.* (1982) give an age of 270 Ma for the Nychum Volcanics which is in the region of the Sakmarian-Artinskian boundary. If the holotype was collected from the Illawarra Coal Measures then the range of *A. subcircularis* may extend over the middle half or longer of Permian time. Early Permian-(?)Late Permian is the only reasonable age range.

Comparison—This species cannot belong in *Annularia*, as thought by Walkom (1916), and by White (1972), as it has an asymmetrical leaf whorl, whereas *Annularia* has leaves of uniform length throughout the whorl. Even when whorls lying across the bedding planes are compressed, they still retain bilateral symmetry both on the major and minor elliptical axes as demonstrated for *Raniganjia* by Pant and Nautiyal (1967). Although *Austroannularia* whorls are bilaterally symmetrical, this symmetry is only along a single plane corresponding to the minor axis.

Austroannularia qubuensis (Hsü 1976) comb. nov.

1976 *Raniganjia qubuensis* Hsü: 324, pl. 1, figs 4-7, text-fig. 1.

1983 *Stellotheca qubuensis* (Hsü) Li: 130-131.

Diagnosis—See Hsü, 1976, p. 324.

Type Specimen—Specimen 4783a, Institute of Botany, Academia Sinica, Xiangshan, Beijing, figured by Hsü, 1976, pl. 1, fig. 4, is selected as lectotype.

Locality—From the Qubu Formation, at Dingjie, Horizon 3, fig. 1-12, p. 40, of Wang *et al.*, 1984 in southern Tibet (Xizang). Wang *et al.* (1984), date this horizon as Early Permian, as does Li (1983). Li *et al.* (in press) have listed all identifiable species in the flora from Dingjie.

Comparison—The leaves of this species are much narrower than in *A. subcircularis*, being approximately ten times as long as broad, decidedly linear instead of linear-obovate, and with an acute apex. The leaf tips are more erect with no apparent drooping, a feature that separates *A. qubuensis* from *Lobatannularia* as well as from *A. subcircularis*.

A POSSIBLE SOUTH AFRICAN SPECIES

Kovács-Endródy (1986) identified some leaf whorls from the Late Permian Ecca Group of South

Africa in a new species, *Cycloptys lanceolata*, comparing it with *C. nordenskiöldi* from central Siberia. She was probably unaware that this latter species has disappeared into synonymy, and is now included within *Annulina neuburgiana* (Radczenko) Neuburg 1964. This genus was suggested by Neuburg (1954) and later validated (Neuburg, 1964). *A. neuburgiana* also includes *Lobatannularia comiana* Zalesky & Chirkova 1938 as a synonym. The figured specimens of "*Cycloptys*" *lanceolata* are symmetrical whorls, but as leaves are fused basally they cannot be accommodated in either *Annulina*, or the Gondwana genus *Stellotheca*. Future investigations may show the need to expand the definition of *Austroannularia* to include specimens of "*C.*" *lanceolata*. Her figured specimens demonstrate the South African species cannot be accommodated in either of the species of *Austroannularia* discussed in this paper.

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