**Weltrichia** sp. from the Late Triassic Amisan Formation of Nampo Group, Korea

Jong-Heon Kim*

Department of Earth Science Education, Kongju National University, Chungnam 314-701, Korea

Abstract: Since 1984, the author has been studying the Daedong flora and has collected a large number of fossil plants from the Amisan Formation of Nampo Group distributed in Chungnam Coal-Field. One of the fossil plants was bennettitalean male flower, which was collected in 1986. The author described it as *Weltrichia* sp. The occurrence of *Weltrichia* sp. is the first record in the Early Mesozoic Daedong flora of Korea.

**Keywords:** Amisan Formation, bennettitalean male flower, *Weltrichia*

Introduction

Bennettitales are well represented in the Mesozoic fossil floras of Europe, Asia and North and South America by vegetative and reproductive remains of extinct genera (Oishi, 1940; Harris, 1969; Watson and Sincock, 1992; Barboni and Dutra, 2013). The plants included in the Bennettitales extend from the Triassic to the Cretaceous and occur in both hemispheres (Talyor et al., 2009). However, recently McLoughlin et al. (2011) reported *Ptilophyllum muelleri* (Ettingshan) comb nov. from the Oligocene of Australia as a last of the Bennettitales. The presence of bennettitalean leaves in the Cenozoic beds of Australia indicates that they were a few survivors from the Mesozoic flora in the Gondwana land as a relic. If the result of study of McLoughlin et al. (2011) is accepted here, the stratigraphic range of Bennettitales extends from the Triassic to the Oligocene of Cenozoic.

The reproductive organs of the Bennettitales include both monosporangiate and biosporangiate forms as mentioned by Taylor et al. (2009), The former includes male reproductive organs of *Weltrichia* Braun and female reproductive organs of *Williamsonia* Carruthers, and the latter are grouped in *Williamsoniella* Thomas (Harris, 1969; Barboni and Dutra, 2013).

*Weltrichia* is the name assigned to pollen bearing organs of the Williamsinaeaceae belonging to Cycadeoidea or Bennettitales (Delevoryas, 1991; Talyor et al., 2009). They were originally included within the genus *Williamsonia*, but Harris (1969) transferred these pollen bearing organs to the genus *Weltrichia* Braun (Delevoryas, 1991).

So far as is known twenty one species of *Weltrichia* have been described from the Upper Triassic to the Lower Cretaceous beds in the Northern and Southern Hemispheres (Li et al., 2004; Pineda et al., 2011).

In Asia the occurrence of *Weltrichia* was very rare, three species has been known in the Upper Triassic to the Jurassic strata (Li et al., 2004). Despite the large number of bennettitalean leaves from the Daedong Supergroup of Korea (Oishi, 1940; Kim, 1993, 2001), the fossil record of *Weltrichia* have not been known.

Since Kawasaki’s (1925, 1926, 1939) monographs were published, some short papers on the plant fossils of the Nampo Group have been published by several authors (Kim, 1989, 1990, 2001; Kim and Kimura, 1988; Kim et al., 2004, 2005; Kim and Roh, 2008; Kimura et al., 1982; Kimura and Kim, 1988, 1989).

This paper deals with the description of *Weltrichia* sp. first found in the Amisan Formation of Nampo Group. The specimen here examined will be kept at...
the Department of Earth Science, Kongju National University.

Stratigraphy

The Nampo Group is distributed in the Chungnam Sedimentary Basin of southwestern part of the Chungechongnam-do, and consists of a 3,000 m thick sequence of terrestrial sediments (Reedman and Um, 1975).

Since Shimamura’s (1931) geological investigation on the Chungnam Sedimentary Basin, some geological studies were carried out by Korean geologists. The correlation of stratigraphic sequence of the Nampo Group was made by Suh et al. (1980). According to Suh et al. (1980), the Nampo Group is subdivided into five formations, i.e., the Hajo, Amisan, Jogyeri, Baegunsa and Seongjuri Formations in ascending order. The main fossil locality is shown in Fig. 1.

Recently, facies analysis of the Hajo Formation was made by Lee and Chung (2010). According to them, the Hajo Formation is interpreted to have been deposited at the talus/upper fan delta environment in early stage; it might have been deposited in the alternating environments of upper and middle fan delta in middle stage, and it seems to have been deposited in alternating environments of middle and lower fan delta in late stage.

The geological age of the Amisan Formation based on the fossil plants and conchostracans has been considered to be the Late Triassic (Kimura and Kim, 1984, 1988, 1989; Kobayashi, 1975; Kim, 1993). However, recently Egawa and Lee (2011) mentioned that the age of the Nampo Group is middle Jurassic (157-140 Ma) which is based on the K-Ar dating of illites collected from the Amisan Formation. Accordingly, both the results of palaeontological study and K-Ar dating do not correspond with each other.

Systematic description

Genus: Weltrichia Braun 1847 emended Harris 1969
Type species: Weltrichia mirabilis Braun 1849

Weltrichia sp.