Z. dt. Ges. Geowiss., 156/3, p. 403–414, 8 figs., 2 tabs., Stuttgart, September 2005

A reinvestigation of *Selaginella* species from the Asturian (Westphalian D) of the Zwickau coalfield, Germany and their assignment to the new sub-genus *Hexaphyllum*

Barry A. Thomas*

Thomas, B.A. (2005): A reinvestigation of *Selaginella* species from the Asturian (Westphalian D) of the Zwickau coalfield, Germany and their assignment to the new sub-genus *Hexaphyllum*. [Neuuntersuchung der *Selaginella*-Arten aus dem Asturian von Zwickau, Deutschland, und deren Zuordnung zum neu eingeführten Subgenus *Hexaphyllum*.] – Z. dt. Ges. Geowiss., 156: 403–414, Stuttgart.

Abstract: Specimens of herbaceous lycophytes from the Zwickau coalfield are redescribed, together with new epidermal details. They are assigned to *Selaginella gutbieri* (Göppert), *S. stachygynandroiodes* (Geinitz) and *S. zeilleri* (Halle) and new diagnoses given. The recognition of a third double rank of small ventral leaves leads the case for including them in a new sub-genus of the extant genus *Selaginella* Beauvoir named and diagnosed here as *Hexaphyllum*.

Kurzfassung: Funde krautiger Lycophyten aus dem Zwickauer Karbon werden zuzüglich neuer blattanatomischer Merkmale neu beschrieben. Sie werden zu *Selaginella gutbieri* (Göppert), *S. stachygynandroiodes* (Geinitz) und *S. zeilleri* (Halle) gestellt, wofür neue Diagnosen gegeben werden. Die Entdeckung einer dritten Doppelreihe kleiner ventraler Blättchen begründet die Einführung eines neuen Subgenus innerhalb der Gattung *Selaginella* Beauvoir, welches hier als *Hexaphyllum* eingeführt wird.

Keywords: *Selaginella*, lycophytes, subgenera, *Hexaphyllum*, Westphalian
Germany, Zwickau

Schlüsselworte: *Selaginella*, Lycophyten, Subgenera, *Hexaphyllum*, Westphal
Deutschland, Zwickau

1. Introduction

In previously reviewing the literature on Euramerian Upper Carboniferous herbaceous lycopsids, I summarised their stratigraphic ranges, challenged the identification of some specimens, and suggested that the anisophyllous *Selaginella*-like forms made their first appearance in the Bolsovian of the Saar-Lorraine Basin (Thomas 1992, 1997). In agreement with previous authors (Darrah 1938, Lundblad 1950, Townrow 1968, Schlanker & Leisman 1969, Watson 1969, Ash 1972), I concluded that such *Selaginella*-like species were close enough to extant *Selaginella* Beauv. to be included within that genus. The main reason for including them within *Selaginella* has always been their anisophyllous morphology, that is their possession of two sets of leaves, with the larger leaves attached laterally and the smaller leaves medially on the upper surface. Those species that are fertile have all been shown to be heterosporous and it is likely that all were. Taking all this into account a number of nomenclatural combinations were proposed (Thomas 1997).

I have been continuing to study these anisophyllous herbaceous lycopsids, but more lately, with incident-light darkfield microscopy, a technique that enables epidermises to be studied directly on the fossils without the need to prepare their cuticles (Thomas, Cleal & Barthel 2004). However, while using this technique on these Carboniferous selaginellas, I recognised something else of great taxonomic importance. The plants were not the same as extant anisophyllous selaginellas that have two kinds of leaves. Instead there were three pairs, with the extra pairs of even smaller leaves being located on the underside of the stems; referred hereafter as ventral leaves. These ventral leaves are very small and adpressed and not reflexed outwards from the stem. Therefore, they are only visible when the specimens are preserved inverted with their upper surfaces face down on the rock surface. When the specimens are preserved with their median leaves uppermost, as in life, these smaller ventrally positioned leaves are hidden and cannot be seen. Therefore, my earlier assertion (Thomas 1997) that Hirmer's illustration (1927: fig. 372a) of *Selaginella gutbieri* (Göppert) was incorrect in

* Address of the author: Prof. Dr. Barry A. Thomas, Institute of Rural Sciences, University of Wales Aberystwyth, Llanbadarn Fawr, Aberystwyth, Ceredigion SY23 3AL, UK (e-mail: bat@aber.ac.uk).

DOI: 10.1127/1860-1804/2005/0156-0403
1860-1804/05/0156-0403 $ 5.40