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The Carboniferous medullosalean pteridosperm *Havlenaea praeovata* (Němejc) Šimůnek & Cleal (Stradonice, Central Bohemia) is conspecific with *Neuropteris coriacea* Ettingshausen

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ABSTRACT. A study of Ettingshausen's type material of *Neuropteris coriacea* stored in the Geologisches Bundesanstalt in Vienna has demonstrated that they are conspecific with *Havlenaea praeovata* (Němejc) Šimůnek & Cleal (Carboniferous medullosalean pteridosperm). Because of priority, the epithet *coriacea* must take precedence, and a new combination is proposed: *Havlenaea coriacea* (Ettingshausen) Šimůnek & Cleal, comb. nov.

KEYWORDS: Carboniferous, *Havlenaea*, medullosalean pteridosperm, Radnice Member

INTRODUCTION

When Šimůnek & Cleal (2011) re-described the neuropterid-like foliage (medullosalean pteridosperms) from the Radnice Member (Duckmantian) of Central Bohemia, the authors had available many specimens from the Stradonice (Stradonitz) locality. This is a very famous locality, mainly thanks to the work of Ettingshausen (1852), who described its endemic flora, including many new species. His collection on which this pioneering work was based is now stored mainly in the Geologisches Bundesanstalt in Vienna. However, most of the specimens from the Stradonice locality included in the Šimůnek & Cleal (2011) study were from K. Feistmantel's Collection, now stored in the National Museum in Prague. The list of all species from this collection was published by Němejc (1930), including *Neuropteris coriacea* Ettingshausen and *Mixoneura* ex group *ovata* Hoffmann.

The Feistmantel Collection in the National Museum includes many specimens that were labelled by him as *Neuropteris coriacea*. However, it was difficult to correlate these specimens with the figure of the type given by Ettingshausen (1852, pl. 2, fig. 4), whose figure is imperfect and according to Havlena (1953) does not express the characteristic features of this species; Havlena (1953) seems to have had problems with classifying at least some of K. Feistmantel's specimens. Šimůnek & Cleal (2011), not having the Ettingshausen (1852, pl. 2, fig. 4) specimen to hand, followed Havlena (1953) in suggesting that *Neuropteris coriacea* was some form of mariopterid. Subsequently, however, the Ettingshausen collection in the Geologisches Bundesanstalt in Vienna has been visited by one of us (Šimůnek) and the type material of *Neuropteris coriacea* located. From this it has become clear that type *N. coriacea* is not a mariopterid. It is clearly conspecific with other specimens from Stradonice initially named by Němejc (1930) as *Mixoneura* ex group *ovata* Hoffmann and

later made the types of a new species *Mixoneura praeovata* Němejc, 1949 (= *Havlenaea praeovata* (Němejc) Šimůnek & Cleal). The taxonomic consequences of this are the subject of this paper.

MATERIAL

The studied material is stored in the National Museum, Prague (ca 50 specimens) and in the Geologisches Bundesanstalt, Vienna.

SYSTEMATICS

Order Medullosales Corsin, 1960

Fossil-genus ***Havlenaea*** Šimůnek & Cleal 2011

Species *Havlenaea coriacea* (Ettingshausen) Šimůnek & Cleal, nov. comb.

1852 *Neuropteris coriacea* Ettingshausen, p. 9, 10, pl. 2, Fig. 1.
1949 *Mixoneura praeovata* Němejc, p. 17, text Fig. 2; pl. 4, Figs 1–7.
1949 *Mixoneura grandifolia* Němejc, p. 18, text-Figs 3, 4.
1995 *Neuropteris praeovata* (Němejc) Cleal & Shute, p. 28.
2007 *Neuropteris praeovata* (Němejc) Cleal & Shute; Šimůnek, p. 396, pl. 1, Figs 1, 7; pl. 3, Figs 11, 12; pl. 4, Figs 1, 2.
2007 *Mixoneura grandifolia* Němejc; Šimůnek, p. 390; pl. 1, Fig. 4.
2011 *Havlenaea praeovata* (Němejc) Šimůnek & Cleal, p. 165–168, pl. 1, Figs 1–8, pl. 2, Figs 1–7.

Description of the type material. Ettingshausen (1852, pl. 2, fig. 4) shows two pinnae (Figure 1) but it is now clear they are preserved on two different rock fragments (Plate 1, Fig. 1, 2). They can nevertheless be considered as syntypes, the larger one (Plate 1, Fig. 1) being selected here as the lectotype (Collection of the Geologisches Bundesanstalt, Vienna, coll. no GBA 1852/010/0006/02).

The lectotype is a fragment of penultimate pinna with five attached but incomplete ultimate pinnae. There are also another two incomplete pinnae that were not figured by Ettingshausen (compare Figure 1 and Plate 1, Fig. 1), and were not mentioned by Havlena (1953), who probably had not seen the specimen. The pinnules are oval-elliptical, often with a markedly tapered distal part and a cordate base, 10–12 mm long, 5–7 mm wide. The veins run obliquely from the midvein to the pinnule margin and (although it is not depicted in the protologue) they are twice or three times divided in a neuropteroid manner (Plate 1, Fig. 3); marginal vein density ca 35 per cm.

Fig. 1. Illustration of *Neuropteris coriacea* from Ettingshausen (1852)

The second syntype (depicted on the left – lower side of Ettingshausen (1852, pl. 2, Fig. 4) is a small fragment of the terminal part of a pinna and does not represent the variability of the fully developed pinna [Plate 1, Fig. 2, Collection of the Geologisches Bundesanstalt, Vienna, coll. no. GBA 1852/010/0006/01 (former coll. no. 6831)].

Description of specimens assigned to *Neuropteris coriacea* by K. Feistmantel (Plate 1, Figs 4, 5): The ultimate-order pinnae are 50–100 mm long and 15–25 mm wide. The fully developed pinnules are 8–15 mm long and 4–8 mm wide. They have an oval to elliptical shape with obtuse to acute apices. The midvein is rigid; the veins are divided and are oriented straight to the pinnule margin. The base of the larger pinnules is narrowed and large basiscopic pinnules have a typical lobe on the basiscopic (catadromous) side (Plate 1, Fig. 5); this lobe is typical for some representatives of *Mariopteris* Zeiller.

Remarks. Because of discrepancies from the original figure, it was initially difficult to be sure that the specimen shown here on

Plate 1, Figure 1 is really the type depicted by Ettingshausen; the main penultimate pinna has more ultimate pinnae than are shown in the published figure, and the figure has an additional unconnected pinna terminal not present on the specimen. However, the basal pinnules on each of the ultimate pinnae of the main fragment are identical to those shown in the Ettingshausen figure, and there can be little doubt that this was in fact the *Neuropteris coriacea* type. Consequently, the specimens labelled by K. Feistmantel as *Neuropteris coriacea* in the collections of the National Museum, Prague (including that figured by Havlena, 1953, pl. 8, fig. 1) have nothing to do with that species; as correctly suggested by Havlena (1953), they belong to Mariopteris.

Ettingshausen's (1852) type is in fact very similar to *Havlenaea praeovata* (Němejc) Šimůnek & Cleal (= *Mixoneura praeovata* Němejc 1949), which has linguaeform, basally auriculate pinnules 8–16 mm long and 4.5–7 mm wide; a midvein for 1/2 to 2/3 of the pinnule length; and dense (marginal vein density 35–38 veins per cm), broadly arched and narrowly forking lateral veins that meet the pinnule margin at ca 80°. For instance, the *N. coriacea* lectotype compares very closely with the *M. praeovata* syntypes figured by Němejc (1949, fig. 2 left; pl. 4, fig. 7), having similar-sized linguaeform pinnules with a tapered distal part, and similar venation. In our view, there can be little doubt that the lectotype of *N. coriacea* is conspecific with the types of *H. praeovata*. Since the former species epithet was published earlier, it must take priority and a new combination is thus needed: *Havlenaea coriacea* (Ettingshausen) Šimůnek & Cleal, comb. nov.

Němejc (1949) considered this species to be related to *Neuropteris ovata* Hoffmann, however, as cuticles showed, it belongs to quite a different fossil genus, named by Šimůnek & Cleal (2011) as *Havlenaea*. Typical *Neuropteris* cuticles have abundant trichomes and well-developed intercellular flanges on the abaxial cuticles, and anomocytic or brachyparacytic stomata (Cleal & Shute 1995). In contrast, *H. praeovata* has few or no multicellular trichomes, and the abaxial surface has stomata with a single ring of subsidiary cells and strongly cutinised proximal papillae on the subsidiary cells (Šimůnek & Cleal 2011).

CONCLUSION

This paper has resolved the taxonomic confusion surrounding one of the enigmatic species of plant fossil from the late Carboniferous Stradonice flora of central Bohemia: *Neuropteris coriacea*. It in fact belongs to the fossil genus *Havlenaea*, a group of fronds of plants that appear to have favoured the upland intra-montane basins of the Variscan Mountains. However, whether these plants were growing in the upland wetlands of these basins, or were drifted fragments from the surrounding drylands, remains unclear.

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PLATE

Plate 1

Specimens from Stradonice locality, Radnice Member, Duckmantian

1–3. *Havlenaea coriacea* (Ettingshausen) Šimůnek & Cleal nov. comb.

1. Right figured specimen by Ettingshausen (1852), pl. 2, fig. 4. Collection of the Geologisches Bundesanstalt, Vienna, coll. no. GBA 1852/010/0006/02, scale bar: 1 cm
2. Left specimen, Collection of the *Geologisches Bundesanstalt*, Vienna, coll. no. GBA 1852/010/0006/01 (former coll. no. 6831), scale bar: 1 cm
3. Individual pinnules from Fig. 1 enlarged to show the venation, scale bar: 5 mm

4, 5. *Mariopteris muricata* (Schlotheim) Zeiller.

4. Penultimate pinna of *Mariopteris muricata* Collection of the *National Museum*, Prague, coll. no. E 4081
5. Individual pinnules from Fig. 4 with venation and a basiscopic lobe, scale bar: 5 mm