

THE NEW INFORMATION ON THE TAXONOMIC POSITION OF *PACHYPTERIS NORDENSKIOELDII* (NATH.) DOLUDENKO (THE OLD *THINNFELDIA NORDENSKIOELDII* NATH.), AS A RESULT OF CUTICULAR EXAMINATION (PREVIOUS STATEMENT)

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ABSTRACT. As a result of the revision of *Thinnfeldia* and *Pachypteris* Doludenko (1969, 1971, 1974) combined both genera into one genus *Pachypteris* and treated *Thinnfeldia* as younger synonym of *Pachypteris*. After she had cancelled the *Thinnfeldia* name, *P. nordenskiöldii* and *P. rotundata* (the old *Thinnfeldia nordenskiöldii* Nathorst (1878a) and *T. rotundata* Nathorst (1878b)) were found among the reassigned species. However she suggested that the revised genus *Pachypteris* is not homogeneous, so it needs detailed revision. The examination of the material from Hungarian Liassic locality in Mecsek Mountains and the Nathorst's original material from Sweden confirmed this opinion. The examined specimens approved to form the separate group different from *Pachypteris*, so the old *T. nordenskiöldii* and *T. rotundata* do not belong to this genus.

KEY WORDS: Liassic flora, Hungary, *Pachypteris*, *Thinnfeldia*, cuticle

The *Thinnfeldia* and *Pachypteris* genera were known from XIX century, but the question of separate or combinate them has been discussed till today. The history of investigations of both genera converge in a lot of points, but the lack of clear and satisfying proofs made it impossible to solve this problem.

Brongniart (1828) was the first, who described from Yorkshire oolith *Pachypteris* genus, with the type species, *P. lanceolata*. The description concerned only the morphological view of specimens. As *Pachypteris* Brongniart defined "leaves pinnate or bipinnate, pinnule entire, coriaceous, veinless or one-nerved, base compressed, adnate near the rachis".

The name *Thinnfeldia* was used by Ettingshausen (1852) for description of *T. rhomboidalis* as "leaves distichous, alternate, oval, lanceolate or linear, with flabellate or pinnate venation", found in Steierdorf-Anina (Romania, Liassic). The visibility of venation was here the only considerable mark for separate these two genera.

Due to general morphological similarity of both genera *Thinnfeldia* and *Pachypteris*,

Andrae (1855) who investigated *Pachypteris* from the same locality where *T. rhomboidalis* was found (Steierdorf-Anina), combined them into one genus – *Pachypteris*. The problem, however, was not solved. During the next years, some of the authors used name *Thinnfeldia* (Schenk 1867, Heer 1875, Nathorst 1878 a, b, 1886, Saporta 1891, Seward 1898, 1963, Thomas 1911, 1915, Gothan 1912, 1914, Antevs 1914, Harris 1931, 1932, 1937, Hartmann 1967, Humml 1969, Maheshwari 1986), while the others – name *Pachypteris* (Goepfert 1836, Zigno 1856, Reymanówna 1963, Doludenko 1969, 1971, 1974, Boureau 1975, Barale 1981, 1984, van der Burch & van Cittert 1984, van Cittert & van der Burch 1989).

Some authors discussed the differences or similarities between *Thinnfeldia* and *Pachypteris*, so Nathorst (1880) on the ground of venation and morphological shape agreed with Andrae's (1855) opinion (see above) while the others pointed at the difference in the structure of stomata (Harris 1964) and their distribution (Bose & Roy 1968).

The problems with the classification of the specimens to either of the two genera, issued from the fact, that the type specimen of *Thinnfeldia rhomboidalis*, which was the type species of genus *Thinnfeldia*, was lost and its description based on the morphological marks only. Due to it, on the ground of the similarity of the leaf-shape to the Ettingshausen's drawing of *T. rhomboidalis*, the different specimens were determined as *Thinnfeldia*.

Doludenko (1969, 1971) revised genus *Thinnfeldia* on the ground of topotype she assigned from the type locality in Steierdorf-Anina. After its cuticular examination she determined this specimen as *Pachypteris* and treated *Thinnfeldia* as the younger synonym of *Pachypteris*. Among others were reassigned *T. nordenskiöldii* and *T. rotundata* described by Nathorst (1878a, b) from localities in Pålso and Bjuv (Scania, Sweden, Hettangian – the age is given according to the new results (Pienkowski 1991)).

In Mecsek Mountains a lot of specimens similar to Nathorst's material were found. Some of them belong to one of species revised by Doludenko – *P. nordenskiöldii* which is proved by the comparison with the original Nathorst's material from Pålso. The others represent some different, new species which have been worked up recently (here, they are mentioned as "*Thinnfeldia*" sp. due to their similarity to Nathorst's *Thinnfeldia*, untill their taxonomic position is unclear).

Beside them, one specimen of *Pachypteris* is represented in this locality. The examination of *Pachypteris* from Mecsek and from other localities (Steierdorf-Anina, Georgia; Fig. 1B-C) and comparison with descriptions in literature (Reymanówna 1963, Doludenko 1969, 1971, 1974, Boureau 1975, Barale 1981, 1984, van der Burch & van Cittert 1984, van Cittert & van der Burch 1989) showed the differences between "*Thinnfeldia*" and *Pachypteris*.

The first and main difference is in the distribution of stomata on the lower surface of leaflets. In "*Thinnfeldia*" they are situated exclusively in bands between the veins (Pl. 1 figs 3–4), while in *Pachypteris* they are scattered on the whole surface, except at the area over the midrib (Pl. 1, figs 1–2). In fact, van der Burch and van Cittert (1984) mentioned that in *Pachypteris* stomata may tend to avoid the lateral veins in large leaflets, but in "*Thinnfeldia*" the bands of stomata are irrespective of the size of the pinnule.

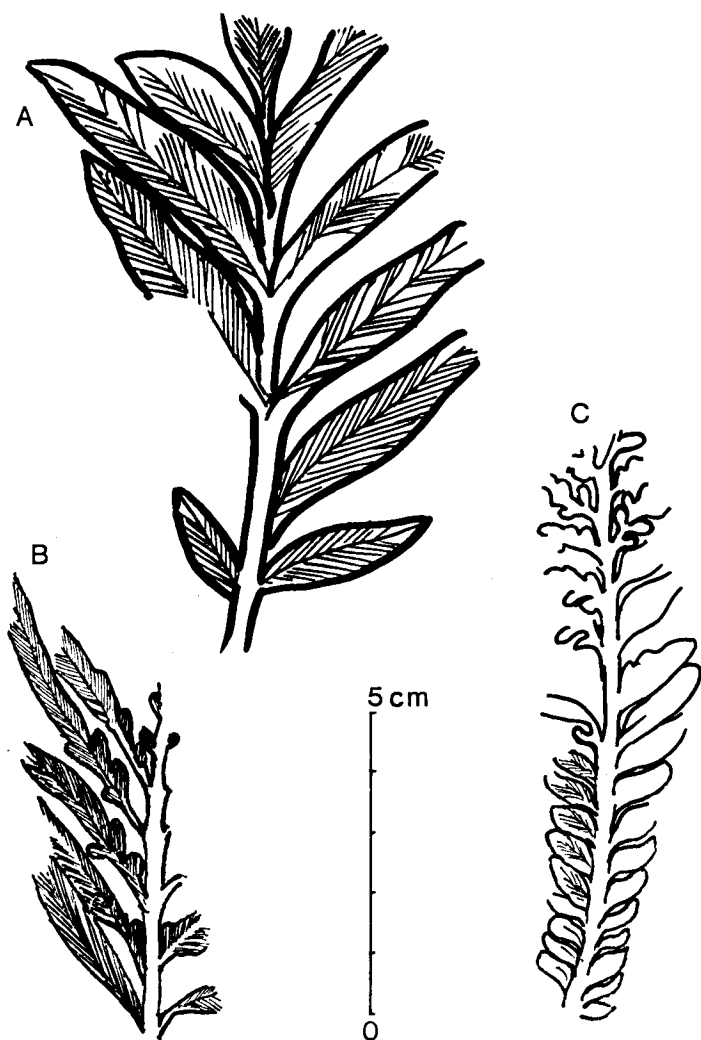


Fig. 1. A – *Thinnfeldia* *nordenskiöldii* Nath. from Mecsek Mts., No. BP 89.275.1; B – *Pachypteris lanceolata* Brongn. from Georgia, No. BP 91.120.1; C – *Pachypteris* sp. from Steierdorf-Anina No. BMP-80

The second difference is in the structure of the stomata, which agrees with Harris's (1964) opinion, that in *Thinnfeldia* the subsidiary cells are small and form a regular collar around the stomatal pit (Pl. 2 figs 3–4). In *Pachypteris* they are often irregular and large (Pl. 2 figs 1–2). Observations of material from Mecsek Mountains conform it and, in addition show, that in *Pachypteris* the stomatal pit is much smaller than in *Thinnfeldia* and the inner edges of the subsidiary cells always form the raised limb around it (Pl. 2 fig. 2).

The cuticular differences coincide with the different morphological shape of leaves

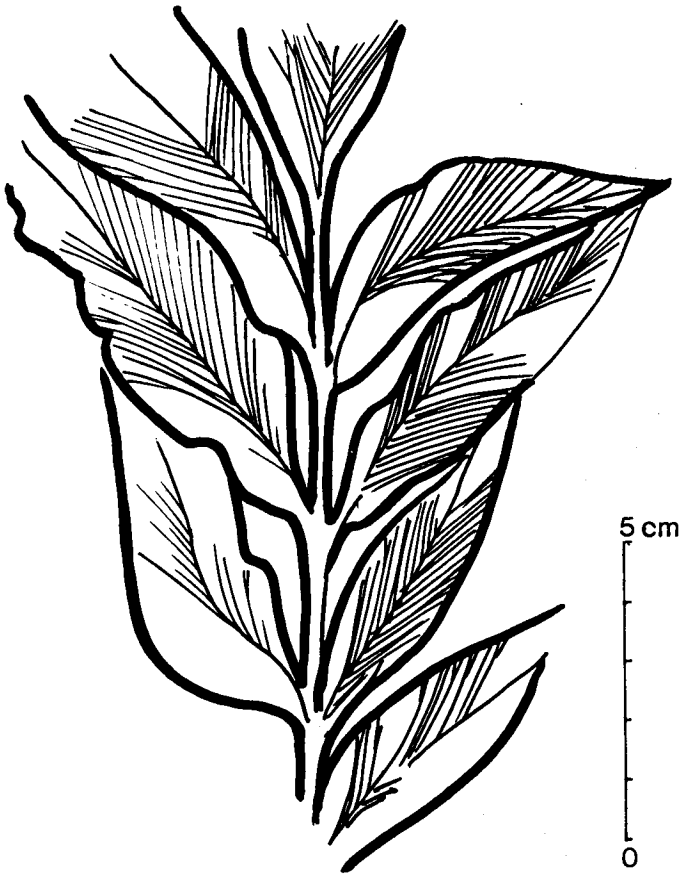


Fig. 2. "*Thinnfeldia*" sp. from Mecsek Mts., No BP 89.368.1

and leaflets. The leaves with "*Thinnfeldia*" type of cuticle are rather large, pinnate and have large leaflets with entire margins. In this case, large size of leaflets mines more than 20 mm length and 8 mm breadth, but only few specimens from Mecsek are as small as that. Generally, they are from 20 mm in small specimens to more than 150 mm to 30 mm wide, depending on the length (Figs 1, 2A).

The leaves of *Pachypteris* are more variable than those of "*Thinnfeldia*" and can be pinnate or bipinnate. The intermediate forms between pinnate and bipinnate shape are very common, even in the same specimen, in different leaflets (Fig. 1B-C). Their pinule are shorter in a lot of cases than in "*Thinnfeldia*", always narrower and often dissected. In bipinnate specimens "Zwischenfiedern" may be found. Considering its general shape and cuticular structure, the "*Thinnfeldia*" type is represented also in "*Thinnfeldia*" *rotundata* Nathorst (1878), and "*Thinnfeldia*" *indica* Feistmantel (1877) whose cuticular structure was described by Maheshwari (1986).

Summing up the present results, they prove, that inside the revised genus *Pachypteris*

exist such group of leaves which should not be included to it. This revision may be regarded as a next moving after Doludenko to clear the really taxonomic position of the species, which earlier belonged to "*Thinnfeldia*".

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STRESZCZENIE

W wyniku rewizji rodzajów *Thinnfeldia* i *Pachypteris* przeprowadzonej w latach 1969–1971 przez Doludenko, nazwa rodzaju *Thinnfeldia* została uznana za synonim *Pachypteris* (Doludenko 1971). Podstawą tego były rezultaty zbadania przez autorkę kutikuli topotypu wyznaczonego z typowego stanowiska w Steierdorf-Anina (Rumunia) na miejsce zaginionego typu rodzaju *Thinnfeldia* – *T. rhomboidalis*. W drodze rewizji między innymi dwa gatunki: *Thinnfeldia nordenskoeldii* i *T. rotundata* opisane przez Nathorsta (1878) z wczesnoliasowych (hettang) warstw w Pålso i Bjuv (Skania, Szwecja) również zostały włączone do rodzaju *Pachypteris*.

Badanie bogatej makroflory z liasowych pokładów węgla kamiennego w górach Mecsek (pd. Węgry) wykazały identyczność pewnej grupy liści z materiałami Nathorsta (*Thinnfeldia nordenskoeldii* i *T. rotundata*) i równocześnie unaoczniła została różnica między wspomnianymi gatunkami i gatunkami charakterystycznymi dla rodzaju *Pachypteris*. Tym samym została poparta teoria o niejednorodności dawnego rodzaju *Thinnfeldia*. Niniejsza praca przedstawia wstępne wyniki badań podjętych w celu definitywnej rewizji dawnego rodzaju *Thinnfeldia*, zapoczątkowanej przez Doludenko (1971).

PLATES

Plate 1

- 1, 2. Leaflet of *Pachypteris* sp. from Steierdorf-Anina (Romania) No. BMP-80, slide No. 366
- 3, 4. Leaflet of "*Thinnfeldia*" sp. from Mecsek Mts. No. BP 91.119.1, slide No. 368

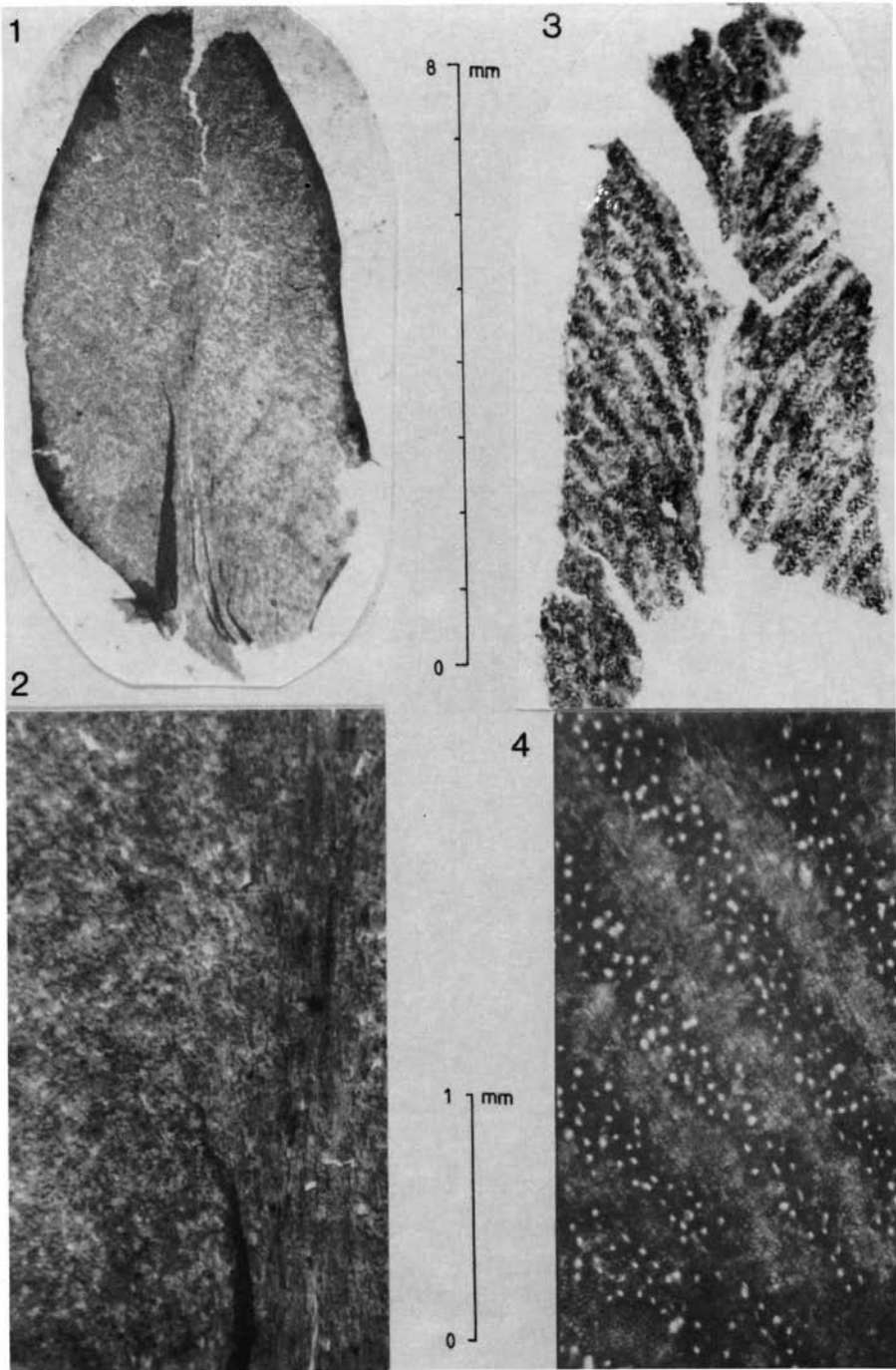


Plate 2

1. Stomata of *Pachypteris* sp. from Steierdorf-Anina No. BP 60.220.1, slide No. 338
2. Stoma of *Pachypteris* sp. from Mecsek Mts. No. BMP-12 (SEM)
3. Stoma of "*Thinnfeldia*" sp. from Mecsek Mts. No. 89.301.1, slide No. 277
4. Stoma of "*Thinnfeldia*" sp. from Mecsek Mts. No. BP 89.286.1. (SEM)

