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Revision of *Ptilophyllum*-like leaves from the Lower Jurassic of Romania

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Abstract. The sure presence of the taxa in any floristical association should be argued not only by the determination of some specimens and by nomenclatural revisions of the old determinations, but also by the effective publication of at least a short description and a minimal figuration that must be in concordance with the diagnoses. In this context, author accomplishes a revision of the presence of genus *Ptilophyllum* in the Lower Jurassic of Romania. The acceptance or rejection of the presence of genera and species should not depend of the reviser's inclinations, workplace, or of the publication's rank. To eliminate the subjectivity, this study contains a table with a general revision scheme, proposed also for other genera. When the generic assignment is doubtful, revisers should place one of the signs „cf., aff., ?" before the generic name. They should simply delete in these cases the specific name, if it exists, and replace with „sp." If the generic name is fully acceptable for the determined material, but the acceptance of the specific name is problematic, one of the epithets „cf., aff." should precede the specific name. Instead of the old-fashioned and ambiguous „ex. gr.", palaeobotanists should use „aff." By using the revision scheme, the genus *Ptilophyllum* is present in the Lower Jurassic flora of the country only with two species, namely *Ptilophyllum maculatum* Givulescu, and *Ptilophyllum aninaensis* Czier. Many authors have assigned specimens to the genus *Ptilophyllum*, without description or figuration. This is mainly the case of some old collections. Until at least one of the so many insufficiently presented specimens found in the literature will eventually be described and figured, according to the scheme all belong questionably to the genus, or at the most with „cf."

Keywords. Macroflora, Mesophytic, Romania.

Introduction

The last paper dealing with the presence of *Ptilophyllum* in the Lower Jurassic of Romania (Czier 2010) shows that the attribution of the material to the majority of the recorded species is arbitrary. The presence of the genus in some fossil localities is only theoretical.

Many published specimens or even entire collections were lost during the long history of palaeobotany, other specimens are unidentifiable for example because they bear no inventory numbers. A considerable part of them are not described, not figured, or belong to species of which the validity is more or less questionable. Part of the specimens identifiable in the collections is in different phases of the palaeobotanical researches.

A big old problem. When the studied material is vast, long time may pass until the researches come to the end and the researchers elaborate the conclusions. Many years might be necessary to finalize a main research, but the life is finite. This is still not a big problem, or should not be, as scientists can simply accept the fact, or they can work on projects dealing with the lengthening of the life. Even if the results of such projects could considerably prolong our existence, life always has not just a beginning but also an end. Scientists do not constitute exception to this rule.

A big and old problem is, however, that many specimens mentioned just in lists may remain with no proof regarding the determination, if someone neglects the rule. This is the worst of all what may happen. The situation could be much better if that someone would not publish the material. The reason of why is simple. This is because a determination lack of description or figuration, although cannot constitute solid base for further researches, neither can be ignored, nor simply forgotten.

Nobody can be sure, if new publications will follow an actual study or not, but everybody would at once let known something important to the posterity. Perhaps this is why almost all the authors wrote first of all manuscripts that they deposited in supposed safe places, and quickly published lists of taxa concerning the flora that they had more or less thoroughly studied or of which the study they had just begun. The description and figuration of the material, even if existed somewhere, in the most cases never will appear if the authors did not published them during their life. The exigent posterity cannot accept any kind of determinations without believable evidences.

A small new solution. Maintaining the acceptance of the not described, not figured, or lost specimen's determinations, as well as accepting new species based on almost nothing – invalid species, *nomen nudum*, and unidentifiable material – almost surely would lead scientists astray, among others to erroneous biostratigraphical and palaeophytogeographical conclusions. This is the case for example of some never described and never figured lost specimens, recorded in meanwhile lost manuscripts, but cited over and over along the centuries with the statement together that they belong to a species or other. The perpetuation of such citations should anyway stopped, but if the name of a species already appeared in a text or list of taxa, an accurate researcher must take it into consideration, and finally probably will cite it. The solution to this dilemma is an urgent revision, which eliminates the specific name. Then nobody should arrive at conclusions using the name of that species for the fossil flora in case.

The above-proposed method at first sight might appear very drastic one, especially for nostalgic people. They must understand that even if those manuscripts could be somewhere, would be useless for arguing the validity of the palaeofloristic composition. Only the effective and valid publications, which contain not only lists but also relevant descriptions and figures or photos, can plausibly argue the presence of the taxa in any floristical association. Furthermore, if some influential persons, commonly used publishing lists of taxa, concluding anything on their base, and constraining others to accept them without comments, nobody should accept such determinations in the future.

Authors should therefore argue the sure presence of a taxon, not only by the determination of some specimens and nomenclatural revisions of the old determinations, but also by the publication of at least a short description and a minimal figuration. Nobody must accept such a presence without these minimal arguments. The things cannot continue in the manner as hundreds of years ago, and this statement has nothing to do with the reputation of the previous researches and the personality of the famous researchers. Particularly, we can respect the work of all the scientists who published data about the genus *Ptilophyllum*, but still firmly state, that a thorough revision of the presence of this genus in the Lower Jurassic of the country nevertheless is necessary. This is the subject of the present paper.

Principles and rules of the revision. The acceptance or the denial of the presence of genera and species in the fossil flora should be at the maximal possibly objective. In no case should it depend of the reviser's inclinations, nor of the publication's rank. All members of the national and international scientific community should

accept scientifically argued revisions, even if the revisers are not worldwide known, and even if the arguments appear in local publications. The workplace is other thing that must have no importance. It is ethically unacceptable to agree only the ideas of those who work in reputed metropolitan institutions, and to refuse the opinions of the others, just because those others work in less known places, in their small home locality or country. The scientific content grants the value of each palaeobotanical publication, not the names of the institutions, of the authors, or of the publishers.

All the revisions must follow clear objective principles and rules. In order to eliminate the subjectivity, I propose for the genus *Ptilophyllum* a general scheme (Tab. 1). Following with attention the literature, the table gives us the rules of what to do in the case of every specimen. Of course, the scheme could further be developed by introducing supplementary criteria, but it works efficiently even in its present state. It may be useful also in cases of other genera, even without any enhancement.

The scheme refers exclusively to the published material. It is not a determination-key for unpublished specimens, but a recommended verification-key and preliminary revision-key for those published. To prevent confusions, a combination of at most three digits distinguishes each of the possible cases to which the specimens may correspond. Using these combinations, we can shorten very much the discussions at the end of each taxon.

Some other concepts also are subject of clarification. I would embrace the opportunity here and now. The name of a taxon in a published text already means a published status, although it might refer to a not described, not figured, or lost specimen. In all the cases when the generic assignment is doubtful, one of the signs „cf., aff., ?" should placed in front of the generic name – the table shows details in this respect. In such cases, revisers should delete the specific name, if such a name exists, and replace it with „sp.", because no specific determination has sense when the generic assignment is unsure. If the generic name is fully acceptable for the determined material, but the acceptance of the specific name is problematic, one of the epithets „cf., aff." must precede the specific name. The old-fashioned and ambiguous „ex. gr." should not be used in the future. The author of this paper recommends the replacement of „ex. gr." with „aff." Instead indicating affinities to several species to which some specimens might belong, for a maximal clarity it is better to indicate affinity just to one species. This is besides sufficient.

Table 1. Scheme of a simple taxonomic revision based on objective principles.

Specimens	Generic determination	What to do	Specific determination	What to do
Case 1. Described and figured.	Case 1.1. The description and the figuration wholly concord with the characters of the genus, moreover the description and the figuration are sufficient for sure generic assignment.	Accept the generic assignment.	Case 1.1.1. The description and the figuration wholly concord with the characters of the species, moreover the description and the figuration are sufficient for sure specific assignment.	Accept the specific assignment.
			Case 1.1.2. The description and the figuration wholly concord with the characters of the species, but the description and/or the figuration is insufficient for sure specific assignment.	Use „cf.” before the specific name.
			Case 1.1.3. The description and/or the figuration only partly concord with the characters of the species.	Use „aff.” before the specific name.
			Case 1.1.4. The description and/or the figuration do not concord with the characters of the species.	Replace the specific name with „sp.”
	Case 1.2. The description and the figuration wholly concord with the characters of the genus, but the description and/or the figuration is insufficient for sure generic assignment.	Use „cf.” before the generic name.	Case 1.2.1. Always.	Replace the specific name with „sp.”
	Case 1.3. The description and/or the figuration only partly concord with the characters of the genus.	Use „aff.” before the generic name.	Case 1.3.1. Always.	Replace the specific name with „sp.”
	Case 1.4. The description and/or the figuration do not concord with the characters of the genus.	Use „?” before the generic name.	Case 1.4.1. Always.	Replace the specific name with „sp.”

Case 2. Described but not figured.	Case 2.1. The description wholly concords with the characters of the genus.	Use „cf.” before the generic name.	Case 2.1.1. Always.	Replace the specific name with „sp.”
	Case 2.2. The description only partly concords with the characters of the genus.	Use „aff.” before the generic name.	Case 2.2.1. Always.	Replace the specific name with „sp.”
	Case 2.3. The description does not concord with the characters of the genus.	Use „?” before the generic name.	Case 2.3.1. Always.	Replace the specific name with „sp.”
Case 3. Figured but not described.	Case 3.1. The figuration wholly concords with the characters of the genus.	Use „cf.” before the generic name.	Case 3.1.1. Always.	Replace the specific name with „sp.”
	Case 3.2. The figuration only partly concords with the characters of the genus.	Use „aff.” before the generic name.	Case 3.2.1. Always.	Replace the specific name with „sp.”
	Case 3.3. The figuration does not concord with the characters of the genus.	Use „?” before the generic name.	Case 3.3.1. Always.	Replace the specific name with „sp.”
Case 4. Not described and not figured.	Case 4.1. Always.	Use „?” before the generic name.	Case 4.1.1. Always.	Replace the specific name with „sp.”

Systematic palaeontology

GYMNOSPERMATOPHYTA
CYCADOPSIDA
BENNETTITALES
Ptilophyllum Morris 1840 em. Harris 1969

Type species. *Ptilophyllum acutifolium* Morris 1840

Ptilophyllum maculatum Givulescu 1992a

1989 *Ptilophyllum* sp. Givulescu & Farcaşiu, p. 139
1990 *Ptilophyllum* sp. Givulescu, p. 80
1992a *Ptilophyllum maculatum* sp. n. Givulescu, p. 11, plate 1, figs. 1, 2, plate 2, figs. 1, 2, plate 3, figs. 1, 2

1992b *Ptilophyllum maculatum* n. sp. Givulescu, p. 241, plate 1, figs. 1 - 3, text-fig. 1
1998a *Ptilophyllum maculatum* Givulescu. Givulescu, p. 82, plate 1, fig. 3, plate 2, figs. 1 - 4
1998b *Ptilophyllum maculatum* n. sp. Givulescu, p. 14, 37, 76, plate 5, figs. 1 - 4, 9, plate 9, fig. 3, plate 12, fig. 2, plate 21, figs. 1 - 5, plate 22, figs. 1 - 8, text-figs. 6/4-7, 7/3, tab. 1, tab. 6

Locality. Anina.
Lithostratigraphic unit. The Valea Terezia Sandstone Member of the Steierdorf Formation.
Biostratigraphic unit. The *Banatozamites chlamydostomus* Subzone of the *Clathropteris meniscioides* Biozone.
Age. Hettangian *pro parte* - Sinemurian.
Discussion. Case: 1.1.1. See also the perspective of the material's restudy (Czier, 2010).

Ptilophyllum aninaensis Czier 1995

1995 *Ptilophyllum aninaensis* Czier. Czier, p. 748, figs. 3–15
1998a *Ptilophyllum aninaensis* Czier. Givulescu, p. 82, plate 1, figs. 1, 2, 4. *Non* plate 1, fig. 3.

Locality. Anina.
Lithostratigraphic unit. The Valea Terezia Sandstone Member of the Steierdorf Formation.
Biostratigraphic unit. The *Banatozamites chlamydostomus* Subzone of the *Clathropteris meniscioides* Biozone.
Age. Hettangian *pro parte* - Sinemurian.
Discussion. Case: 1.1.1.

cf. ***Ptilophyllum*** sp.

1. 1852 *Pterophyllum imbricatum* Ettingsh. Ettingshausen, p. 7, plate 1, fig. 1
2. 1855 *Zamites gracilis* Kurr. Andrae, p. 40, plate 11, figs. 4, 5
3. 1855 *Pterophyllum rigidum* And. Andrae, p. 42, plate 11, fig. 1
4. 1855 *Pterophyllum (Divonites) rigidum* Andrae. Štúr, p. 345
5. 1860a *Pterophyllum (Dioonites) rigidum* Andrae. Štúr, p. 58 (*partim*)
6. 1930 *Ptilophyllum imbricatum* (Ett.) Krass. Thomas, p. 390, text-figs. 1, 2
7. 1930 *Ptilophyllum rigidum* (Andrae) Krass. Thomas, p. 392, text-figs. 3, 4
8. 1954 *Pterophyllum rigidum* Göp. Semaka, p. 847, figs. 25 - 30
9. 1958 *Pterophyllum rigidum* Andrae. Semaka, p. 411, tab. 2
10. 1958 *Stachyotaxus lippoldi* (Stur) Kräusel. Semaka, p. 414, tab. 3 (spelling error for *lipoldi*)

11. 1962 *Stachyotaxus lippoldi* (Stur) Kräusel. Semaka, p. 533 (*partim*), 542 (*partim*), 551 (*partim*), 554 (*partim*), plate 4, fig. 3, plate 5, fig. 1, plate 15, fig. a (*pro parte* - right bottom), text-figs. 5, 6, tab. 1 (*partim*) (spelling error for *lipoldi*)
12. 1962 *Stachyotaxus lippoldi* (Stur) Kräusel. Semaka, p. 533 (*partim*), 542 (*partim*), 551 (*partim*), 554 (*partim*), plate 15, fig. a (*pro parte* - top), tab. 1 (*partim*) (spelling error for *lipoldi*)
13. 1963 *Ptilophyllum rigidum* (Andrae) Krasser. Semaka, p. 166, 169, tab. 1
14. 1966 *Ptilophyllum rigidum* (Andrae) Krasser. Zberea *et al*., p. 49
15. 1966 *Stachyotaxus* sp. Zberea *et al.*, p. 50
16. 1970 *Stachyotaxus lippoldi* (Stur) Kräusel. Semaka, p. 25, 56, tab. 10 (spelling error for *lipoldi*)
17. 1989 *Ptilophyllum* sp. (aff. n. sp.). Givulescu & Farcaşiu, p. 139
18. 1997 *Ptilophyllum curvatum* Givulescu. Givulescu, p. 68
19. 1997 *Ptilophyllum grandis* Givulescu. Givulescu, p. 68
20. 1997 *Ptilophyllum romanicum* Givulescu. Givulescu, p. 68

Localities. 1, 2, 3, 6, 7, 10, 11, 12, 17, 18, 19, 20. Anina. 4, 8. Holbav. 5. Cristian. 9. Doman. 13. Pleşa. 14, 15. Crasna. 16. Pietrele Albe.
Lithostratigraphic units. 1. The Steierdorf Formation – possibly the Dealul Budinic Conglomerate Member, but most probably the Valea Terezia Sandstone Member. 2, 6, 7. Most probably the Steierdorf Formation, but possibly the Valea Sodol Marl Member of the Dealul Zânei Marl Formation. 3, 9, 10, 11, 12, 17, 18, 19, 20. The Valea Terezia Sandstone Member of the Steierdorf Formation. 4, 8. The Vulcan Sandstone Member of the Codlea-Vulcan Formation. 5. The Valea Schneebrich Sandstone Member of the Cristian Formation. 13. The Schela Formation. 14, 15. The Baia de Aramă Formation. 16. The Ogaşul Vodânischi Sandstone Member of the Sviniţa Formation.
Biostratigraphic units. 1. The *Clathropteris meniscioides* Biozone – most probably the *Banatozamites chlamydostomus* Subzone. 2, 6, 7. Most probably the *Clathropteris meniscioides* Biozone or the *Carpolithes liasinus* Biozone. 3, 4, 8, 9, 10, 11, 12, 17, 18, 19, 20. The *Banatozamites chlamydostomus* Subzone of the *Clathropteris meniscioides* Biozone. 5. The *Pterophyllum marginatum* Biozone. 13, 14, 15. The *Clathropteris meniscioides* Biozone. 16. The *Clathropteris meniscioides* Biozone – probably the *Neocalamites carcinoides* Subzone.
Ages. 1, 13. Hettangian – Sinemurian. 2, 6, 7. Hettangian – Toarcian. 3, 4, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20. Hettangian *pro parte* – Sinemurian. 5. Sinemurian. 14, 15. Sinemurian *pro parte*.
Discussions. The last assignments of the specimens see in Czier (2010). Owing to the revision model from the present paper, they fit in the following cases. 1, 2, 3, 6, 7, 8, 9, 12, 13, 18, 19, 20. Case: 1.2.1. 4, 5, 14. Case: 2.1.1. 10, 15, 16. Case: 2.1. 11. Case: 1.2. 17. Case: 3.1.

? ***Ptilophyllum*** sp.

1. 1860b *Pterophyllum rigidum* Goeppert. Štúr, p. 58
2. 1878 *Pterophyllum rigidum*. Hantken, p. 69
3. 1878 *Pterophyllum rigidium*. Hantken, p. 71 (spelling error for *rigidum*)
4. 1878 *Pterophyllum rigidum*. Hantken, p. 72
5. 1879 *Petrophyllum rigidum*. Römer, p. 54 (spelling error for *Pterophyllum*)
6. 1921 *Ptilophyllum imbricatum* (Ettingsh.). Krasser, p. 361
7. 1958 *Pterophyllum rigidum* Andrae. Semaka, p. 409, tab. 1 (*partim*)
8. 1962 *Pterophyllum rigidum* Andrae. Oarcea & Semaka, p. 241 (*pro parte*)
9. 1962 *Pterophyllum rigidum* Andrae. Oarcea & Semaka, p. 241 (*pro parte*)
10. 1962 *Pterophyllum rigidum* Andrae. Oarcea & Semaka, p. 241 (*pro parte*)
11. 1963 *Cladophlebis* sp. Humml, p. 194
12. 1963 *Ptilophyllum rigidum* (Andrae) Krasser. Humml, p. 196, 197
13. 1963 *Zamites gracilis* Kurr. Humml, p. 198
14. 1963 *Zamites* sp. Humml, p. 198 (*pro parte*)
15. 1963 *Pterophyllum* sp. Humml, p. 198
16. 1963 *Ptilophyllum rigidum* (Andrae) Krasser. Humml, p. 199
17. 1972 *Pterophyllum rigidum* Andrae. Semaka *et al.*, p. 436
18. 1972 *Ptilophyllum rigidum* (Andrae) Krasser. Semaka *et al.*, p. 439, tab. 1 (*pro parte*)
19. 1972 *Ptilophyllum rigidum* (Andrae) Krasser. Semaka *et al.*, p. 439, tab. 1 (*pro parte*)
20. 1972 *Ptilophyllum rigidum* (Andrae) Krasser. Semaka *et al.*, p. 439, tab. 1 (*pro parte*)
21. 1972 *Stachyotaxus lippoldi* (Stur) Kräusel. Semaka *et al.*, p. 439, tab. 1 (*pro parte*) (spelling error for *lipoldi*)
22. 1972 *Stachyotaxus elegans* Nathorst. Semaka *et al.*, p. 439, tab. 1 (*pro parte*)
23. 1994 *Ptillophyllum*. Popa, p. 14 (spelling error for *Ptilophyllum*)
24. *?* 1996 *Pterophyllum maculatum*. Teulea, p. 2 (possible spelling error for *Ptilophyllum*)
25. 2001a *Ptilophyllum* cf. *acutifolium* Morris. Czier, p. 35
26. 2001a *Ptilophyllum* aff. *jurassicum* Kimura & Ohana. Czier, p. 35
27. 2001a *Ptilophyllum* cf. *aninaensis* Czier. Czier, p. 35
28. 2001a *Ptilophyllum* sp. B. Czier, p. 35
29. 2001a *Ptilophyllum* sp. C. Czier, p. 35
30. 2001a *Ptilophyllum* sp. D. Czier, p. 35
31. 2001b *Ptilophyllum* sp. Czier, p. 38, 45, tab. 1

Localities. 1. Holbav. 2, 3, 4, 6, 8, 9, 12, 13, 14, 15, 23, 24, 25, 26, 28, 31. Anina. 5, 7. Vulcan. 10, 11, 27, 29, 30. Doman. 16. Unknown (probably Southern Carpathians). 17. Porcului valley. 18. Viezuroiu valley. 19. Viezuroiu mine. 20, 21, 22. Crasna.
Lithostratigraphic units. 1, 5, 7. The Vulcan Sandstone Member of the Codlea-Vulcan Formation. 2. The Dealul Zânei Marl Formation. 3, 4. The Valea Sodol Marl Member of the Dealul Zânei Marl Formation. 6, 9, 10, 11, 12, 14, 15, 31. The Steierdorf Formation – possibly the Dealul Budinic Conglomerate Member, but most probably the Valea Terezia Sandstone Member. 8, 13, 23, 24, 25, 26, 27,

28, 29, 30. The Valea Terezia Sandstone Member of the Steierdorf Formation. 16. Unknown. 17, 18, 19. The Schela Formation. 20, 21, 22. The Baia de Aramă Formation.

Biostratigraphic units. 1, 5, 7, 8, 13, 23, 24, 25, 26, 27, 28, 29, 30. The *Banatozamites chlamydostomus* Subzone of the *Clathropteris meniscioides* Biozone. 2, 3, 4. Undefined. 6, 9, 10, 11, 12, 14, 15, 31. The *Clathropteris meniscioides* Biozone – most probably the *Banatozamites chlamydostomus* Subzone. 16. Unknown. 17, 18, 19, 20, 21, 22. The *Clathropteris meniscioides* Biozone.

Ages. 1, 5, 7, 8, 13, 23, 24, 25, 26, 27, 28, 29, 30. Hettangian *pro parte* – Sinemurian. 2. Aalenian. 3, 4. Toarcian. 6, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 31. Hettangian – Sinemurian. 20, 21, 22. Sinemurian *pro parte*.

Discussions. The last assignments of the specimens see in Czier (2010). Owing to the revision model from the present paper, they fit in the following cases. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 17, 18, 19, 20, 24, 25, 26, 27, 28, 29, 30. Case: 4.1.1. 11, 14, 15, 16, 21, 22, 23, 31. Case: 4.1.

Conclusions

Based on an objective revision using a newly proposed scheme, the genus *Ptilophyllum* appears to be present in the Lower Jurassic flora of Romania only with two species, namely *Ptilophyllum maculatum* Givulescu, and *Ptilophyllum aninaensis* Czier.

Many assignments to the genus *Ptilophyllum*, especially of specimens from old collections, are doubtful, because nobody provided them with description or figuration. Until somebody will describe and figure at least one of them, they are just „cf. *Ptilophyllum* sp.”, or „? *Ptilophyllum* sp.”, respectively. Restudies, however, are possible only on few specimens. The majority of them is not identifiable, or was lost during the centuries passed since the beginning of the palaeobotanical researches.

References

Andrae, K. J. 1855. - Beiträge zur Kenntnis der fossilen Flora Siebenbürgens und des Banates. II. Lias-Flora von Steierdorf im Banate. - *Abh. k. k. Geol. R.A.* 2: 27-48, Wien.

Czier, Z. 1995. - Two new fossil plant species from the Lower Liassic of Anina, Romania: *Ptilophyllum aninaensis* n. sp. and *Williamsonia aninaensis* n. sp. - *N. Jb. Geol. Paläont., Mh.* 12: 747-755, Stuttgart.

Czier, Z. 2001a. - Rezumatul tezei de doctorat „Flora liasică din Crişana şi Banat” (Universitatea Eötvös Loránd - Budapesta, 1994). - *Nymphaea, Folia naturae Bihariae* 28: 27-46, Oradea.

Czier, Z. 2001b. - Determination of the fossil plants kept in Banatului Museum Timişoara. - *Analele Banatului, Şt. Nat.* 5: 37-54, Timişoara.

Czier, Z. 2010. - The presence of the genus *Ptilophyllum* in the Lower Jurassic flora of Romania. - *Nymphaea, Folia naturae Bihariae* 37: 5-38, Oradea.

Ettingshausen, C. 1852. - Begründung einiger neuen oder nicht genau bekannten Arten der Lias- und Oolithflora. - *Abh. k. k. Geol. R.A.* 1: 1-10, Wien.

Givulescu, R. 1990. - Über die wahre Angehörigkeit von *Stachyotaxus lipoldi* (Štúr) Kräusel aus dem Unteren Lias von Anina, Rumänien. - *Contribuţii Botanice*: 79-81, Cluj-Napoca.

Givulescu, R. 1992a. - A new contribution to the knowledge of the fossil flora at Anina, Romania. - *Studia Botanica Hungarica* 23: 9-15, Budapest.

Givulescu, R. 1992b. - *Ptilophyllum maculatum* n. sp., a new *Ptilophyllum* from the Early Lias of Anina/ Romania. - *Cour. Forsch.-Inst. Senckenberg* 147: 241-245, Frankfurt am Main.

Givulescu, R. 1997. - La flore du Lias inférieur d'Anina (Roumanie) (Note preliminaire). - *Natura Silvaniae* 1: 67-81, Jibou.

Givulescu, R. 1998a. - *Ptilophyllum maculatum* Givulescu 1992 or *Ptilophyllum aninaensis* Czier 1995 - a problem of priority. - *Documenta naturae* 117: 81-87, München.

Givulescu, R. 1998b. - *Flora fosilă a Jurasicului inferior de la Anina.* - (Editura Academiei Române) Bucureşti, 90 p.

Givulescu, R., Farcaşiu, V. 1989. - Les Plantes fossiles du Liassique inférieur d'Anina (Roumanie) de la collection du Musée Botanique de Cluj-Napoca. - *Contribuţii Botanice*: 139-140, Cluj-Napoca.

Hantken, M. P. 1878. - *A Magyar Korona országainak széntelepei és szénbányászata.* - (Légrády Testvérek) Budapest, 331 p.

Harris, T. M. 1969. - *The Yorkshire Jurassic Flora. III. Bennettitales.* - (Tr. British Museum, Natural History Ed.) London, 186 p.

Humml, H. 1963. - Catalogul florei fosile păstrate în Muzeul Regional al Banatului, Timişoara. - *St. Cerc. Şt. Acad. R.P.R., Şt. Agr.* 10: 185-201, Timişoara.

Krasser, F. 1921. - Zur Kenntnis einiger fossiler Floren des unteren Lias der Sukzessionsstaaten von Österreich-Ungarn. - *Sb. Akad. Wiss., Math.-naturw. Kl.* 130: 345-373, Wien.

Morris, J. 1840. - Memoir to illustrate a Geological Map of Cutch. - *Trans. Geol. Soc. London* 2: 289-329, London.

Oarcea, C. & Semaka, A. 1962. - Flora liasică din colecţia de la Anina. - *D.S. Şed. Com. Geol.* 46: 239-244, Bucureşti.

Popa, M. E. 1994. - Cariera Ponor (Anina): un viitor perimetru protejat. - *Geomemoria* 1: 12-16, Bucureşti.

Römer, J. 1879. - Die Steinkohlengrube „Concordia" bei Wolkendorf. Geologische Skizze. - *Verh. Mitt. Siebenb. Ver. Naturwiss.* 28: 47-56, Hermannstadt.

Semaka, A. 1954. - Contribuţii la flora liasică de la Vulcan-Codlea. - *Bul. Şt. Acad. R.P.R., Şt. Biol., Agron., Geol., Geogr.* 6: 837-856, Bucureşti.

Semaka, A. 1958. - Über die pflanzenführenden Lias-Schichten Rumäniens (I. Getische Decke). - *N. Jb. Geol. Paläont., Mh.* 8-9: 407-414, Stuttgart.

Semaka, A. 1962. - Flora liasică de la Anina (Banat). - *An. Com. Geol.* 32: 527-569, Bucureşti.

Semaka, A. 1963. - Despre vîrsta formaţiunii de Schela. - *Com. Şt. Asoc. Geol. Carp.-Balc., Stratigr.* 3: 165-173, Bucureşti.

Semaka, A. 1970. - Geologisch-Paläobotanische Untersuchungen im SO-Banater Danubikum. - *Mem. Inst. Geol.* 11: 5-79, Bucureşti.

Semaka, A. & Huică, I. & Georgescu, L. 1972. - Noi puncte cu plante liasice în Formaţiunea de Schela (Carpaţii Meridionali). - *St. Cerc. Geol., Geof., Geogr., S. Geol.* 17: 435-440, Bucureşti.

Štúr, D. 1860a. - Fossile Lias-Pflanzen aus Siebenbürgen. - *Jb. d. k.k. Geol. R.A. Verh.* 11: 57-59, Wien.

Štúr, D. 1860b. - Über das Alter der Steinkohlen von Holbak und Neustadt, nach den darin vorkommenden Pflanzen. - *Verh. Mitth. Siebenb. Ver. Naturwiss.* 11: 58-59, Hermannstadt.

Teulea, G. 1996. - Banat 1995: Geologie şi Paleontologie. - *Geomemoria, Supl.*: 1-9, Bucureşti.

Thomas, H. H. 1930. - Further Observations on the Cuticle Structure of Mesozoic Cycadean Fronds. - *J. Linn. Soc. London, Bot.* 323: 389-415, London.

Zberea, A. & Semaka, A. & Cioată, R. 1966. - Der Lias von Crasna-Jiu (Rumänien). - *N. Jb. Geol. Paläont., Mh.* 1: 44-51, Stuttgart.