

***Pterophyllum* (Cycadopsida) from Carnian beds in Poljane valley (Slovenia)**

***Pterophyllum* (Cycadopsida) iz karnijskih plasti v Poljanski dolini**

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Abstract

A well-preserved plant remain was found in Upper Triassic, Carnian beds in the surroundings of Gorenja vas. According to the first estimations, this plant probably belongs to the genus *Pterophyllum*.

Kratka vsebina

V okolici Gorenje vasi je bil v zgornjetriasnih, karnijskih plasteh, najden dobro ohranjen rastlinski ostanek, ki po prvih ugotovitvah pripada cikadoidnemu rodu *Pterophyllum*.

Introduction

A few years ago, a plant remain was found among extremely large Upper Triassic bivalves at a site near Gorenja vas (Fig.1). The fossil plant was found by Vili Rakovec from Kranj, an enthusiastic collector of fossils and minerals, who kindly offered it at our disposal for investigation. The remain was relatively well preserved, which enabled us to determine the plant genus. Unfortunately, the cuticle that would enable the species determination was not preserved. The specimen is extremely large which indicates that it may belong to a new species.

Geological setting

The Carnian beds where the plant was found is a part of the Upper Triassic succession. These beds extend from the northern margin of Ljubljana moor, with the most well known Carnian fauna site in the Lesno Brdo quarry (Jelen, 1990), towards Podlipa and Smrečje, run along the Brebovnica valley to Gorenja vas. Northwards, the beds extend towards Blegoš (Grad & Ferjančič, 1976). The locality where the plant was found lies in the vicinity of the Boršt mine tailings disposal, in the area around the Žirovski vrh mine, and was found during the construction of a mine road.

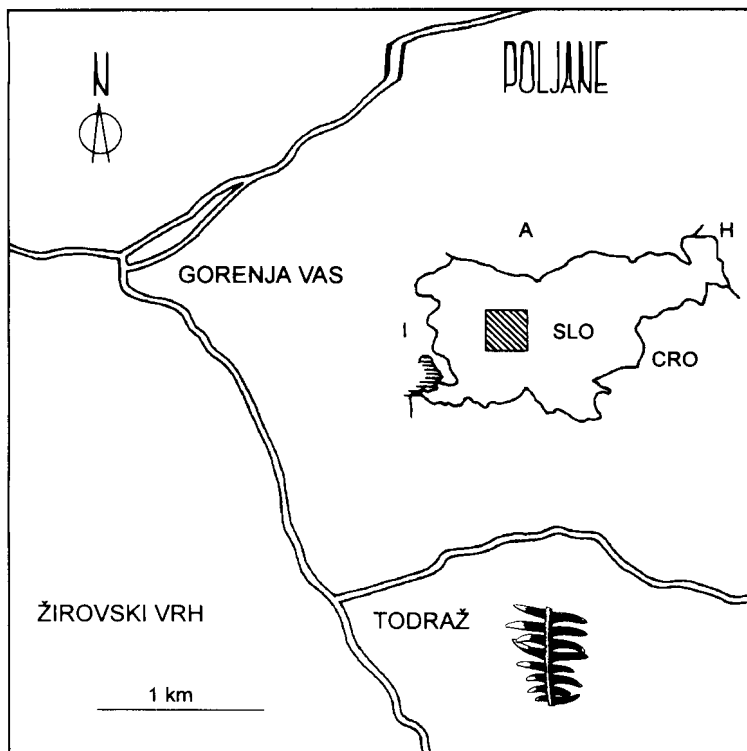


Fig. 1. Situation of the locality of plant remains at Gorenja vas in the Poljane valley
Sl. 1. Položaj najdišča rastlinskih ostankov pri Gorenji vasi v Poljanski dolini

The source rock is a black to grey limestone and greyish marlstone. The total thickness of the Carnian limestones, Julian age (proved by bivalves), in this area is between 10 and 40 meters (Mlakar & Placer, 2000).

The collectors of the mostly bivalve fauna were especially fascinated by the extremely large specimens of *Myophoria kefersteini*. Their size differs a lot from the size of the specimens that were found at other well-known sites, for example at Lesno Brdo (Ramovš, 1999, 2000). The fauna association is similar to the one at Lesno Brdo. According to Ramovš (1999), the mentioned specimens of miophorias, some *Trigonodus* remains and snails remains were found. He didn't report the presence of any other animal fossils. He mentioned, however, some poorly preserved plant remains. He found these remains indeterminate in spite of more than 20 cm long plant stalk that was found among them.

Paleontology

Introduction

The first findings of Cycadophytes were documented by Austrian geologists as early as the end of the 19th century. Stur (see Pleničar, 1970) wrote about the species *Pterophyllum jaegeri* that was found, along with numerous remains of fern and gymnosperm flora, in the Middle Ladinian »Skonza« beds in the area around Idrija. Stur mentioned only the names of single plants and did not give either detailed descriptions or illustrations, which makes the comparison and review of the flora impossible.

Systematic palaeontology:

Division Gymnospermyphyta
Classis Cycadopsida
Ordo Cycadales
Familia Cycadaceae

Pterophyllum sp.

Plates 1-2

Description

The largest specimen is a leaf fragment, 45 cm long and 12.5 cm wide. It consists of a rachis, ca. 1.2 cm wide and longitudinally striated. Pinnae are attached more or less perpendicularly at the sides of this rachis. Most of the pinnae miss the apex, but the more or less complete ones have a length of 6-7 cm and a width of ca. 2 cm. The pinnae are closely placed, usually either touching or with 1-2 mm between them. The pinnae are usually slightly contracted at their base (minimum basal width 1.5 cm), but some pinnae are not contracted at all. The pinnae taper in their distal third; some are curving upwards, others remain perpendicularly throughout. The apex, when preserved, is obtuse.

The venation consists of parallel veins with a concentration of 10-12/cm. No forking of the veins has been observed.

In another specimen, the rachis appears to be of the same width. The pinnae attached are all incomplete, but one demonstrates a length of 8 cm and a width of almost 3 cm. The venation is again parallel, without forking; vein concentration 11-12/cm.

Discussion

These specimens must have belonged to a large Cycadophyte leaf, as the longest specimen (45 cm) does not show any trace of either base or apex.

The attribution to *Pterophyllum* is by no means certain but, lacking more data (such as a cuticle), the most probable. Attribution to the Cycad genus *Nilssonia*, which resembles this material in pinnate appearance and venation, is impossible because of the attachment of the pinnae to the side of the rachis. In *Nilssonia* the lamina of the pinnae is always attached to the middle of the upper side of the rachis, so that when seen from above, no rachis is visible. Another Cycad genus, *Pseudoctenis*, usually has expanded bases, especially on the lower side, and the pinnae usually arise at a smaller angle than 90°. The veins in this genus are either unforked or fork once.

In the Bennettitalean leaf genus *Pterophyllum*, the pinnae are either attached laterally to the rachis as is the case in our material, or if on the upper surface of the

rachis then at least some part of the rachis is always exposed. The pinnae are usually attached at angles of 70-90°. The pinna bases vary between expanded via straight to slightly contracted (as is the case in the material described here). The veins are always parallel, either forked or not.

Because of the lateral attachment of the perpendicular pinnae to the rachis, we attribute the material rather to *Pterophyllum* than to *Pseudoctenis*, but the latter genus cannot be excluded.

Comparison to other Pterophyllum species

When comparing the present material to large, well-known, mainly Triassic species of *Pterophyllum*, we can say that *P. hanesianum* Harris 1932 from the uppermost Triassic of East Greenland is the largest of the *Pterophyllum* species in this flora. It differs from the present material in having even larger pinnae (2-6 cm wide) but especially in the vein concentration of 30-45/cm.

P. braunsii Schenk 1867 as described by Antevs (1919) from the Rhaeto-Liassic of Scania has large pinnae (up to 11 cm long and 6 cm wide; but usual width is 2.5 - 3 cm), perpendicularly and laterally attached to a stout rachis (ca. 8 mm wide). The pinnae are basally expanded and the venation is finer than in our material. Schenk originally described the species from the Rhaeto-Liassic of Bavaria (Germany). The lamina is so wide that the species might be better attributed to the genus *Macrotaeniopteris* than to *Pterophyllum*. The pinnae are certainly much larger than in the present material.

From the same flora, Schenk (1867) described *P. blasii* (Brauns 1862) Schenk; this species has a much thinner rachis than in our material, and it is quite probable that it is a *Nilssonia* species as Schenk's pl. XL fig. 2 shows an upper view of a leaf in which the rachis is completely covered by the lamina. The pinnae have more or less the same dimensions as in our material, but the bases are expanded, especially on the lower side.

From the well-known Upper Triassic flora of Lunz, Krasser (1910) described several *Pterophyllum* species, of which *P. jaegeri* (including *P. longifolium* and *P. brevipenne*) is the most common one. This species is much smaller in morphology than the one described here.

P. haueri Stur 1888 from the same flora is distinguished from our material by its thin rachis and pinnae that are sparsely spaced, up to 19 cm long and 1 cm wide, with a vein concentration of 16-18/cm, according to Krasser (1910).

Another species is *P. grandifolium* (Fontaine 1883) Krasser, originally described as *Ctenophyllum grandifolium* Fontaine 1883 from the Triassic of Cloven Hill, Pennsylvania, USA. The rachis in this species has about the same width as in our material, but the pinnae are longer (up to 30 cm) and narrower (ca. 1 cm wide). The pinnae bases are usually slightly expanded but can also be straight or even slightly contracted. A large difference with the present material is that the veins usually fork near the rachis.

The only large size *Pterophyllum* species from the German Keuper flora is *P. robustum* Compter 1894. This species resembles *P. grandifolium* quite closely in its up to 30 cm long pinnae that are about 8 mm wide and attached with an expanded base at angles of 60-80° (see e.g. K e l b e r & H a n s c h 1995).

***Pterophyllum* sp. (Cycadopsida) iz karnijskih plasti v Poljanski dolini**

Pred nekaj leti je bil na najdišču pri Gorenji vasi, med izredno velikimi zgornjetriasnimi školjkami, odkrit rastlinski ostanek. Fosilno rastlino je našel vnet zbiralec okamnin Vili Rakovec in nam jo je ljubeznivo odstopil v obdelavo. Ostanek je razmeroma dobro ohranjen, tako da je bilo mogoče določiti rod rastline. Žal ni ohranjena kutikula, ki bi omogočala tudi določitev vrste. Primerek je izredno velik, kar nakazuje, da gre verjetno za novo vrsto.

Nahajališče karnijske favne in flore je del zgornjetriasnih plasti, ki se vlečejo od severnega obrobja Ljubljanskega barja, kjer je najbolj znano nahajališče karnijske favne v kamnolomu pri Lesnem Brdu (Jelen, 1990), proti Podlipi in Smrečju in se nadaljuje po dolini Brebovnice do Gorenje vasi. Plasti se nato severno nadaljujejo proti Blegošu. (Grad & Ferjančič, 1976). Nahajališče rastlinskega ostanka je v bližini jalovišča Boršt na območju Rudnika Žirovski vrh in je bilo odkrito ob gradnji rudniške ceste.

Tam je ploščasti črni do sivi apnenec in sivkasti lapor. Celotna debelina karnijskih apnencev julijske starosti s školjčno favno je na tem območju od 10 do 40 metrov (M l a k a r & P l a c e r, 2000).

Nabiralci predvsem školjčne favne so bili pozorni na izredno velike primerke školjk vrste *Myophoria kefersteini*, ki močno odstopajo od velikosti najdenih školjk na drugih znanih nahajališčih, npr. na Lesnem Brdu (R a m o v š, 1999, 2000). Favnistična združba je zelo podobna združbi na Lesnem Brdu. Kot poroča R a m o v š (1999), so našli že omenjene primerke mioforij, nekaj ostankov školjčnega rodu *Trigonodus* in ostanke polžev. O drugih živalskih fosilih ne poroča. Omenja pa slabo ohranjene rastlinske ostanke, za katere trdi, da so nedoločljivi, čeprav omenja več kot 20 cm dolgo rastlinsko steblo.

O prvih najdbah cikad v Sloveniji so poročali avstrijski geologi že koncem devetnajstega stoletja. Tako poroča Stur (cf. Pleničar 1970) o najdbi vrste *Pterophyllum jaegeri*, ki so jo našli poleg številnih drugih praprotnic in golosemenk v srednjeladinskih skoncach plasteh v okolici Idrije. Stur navaja samo imena posameznih rastlin, brez podrobnih opisov in ilustracij,

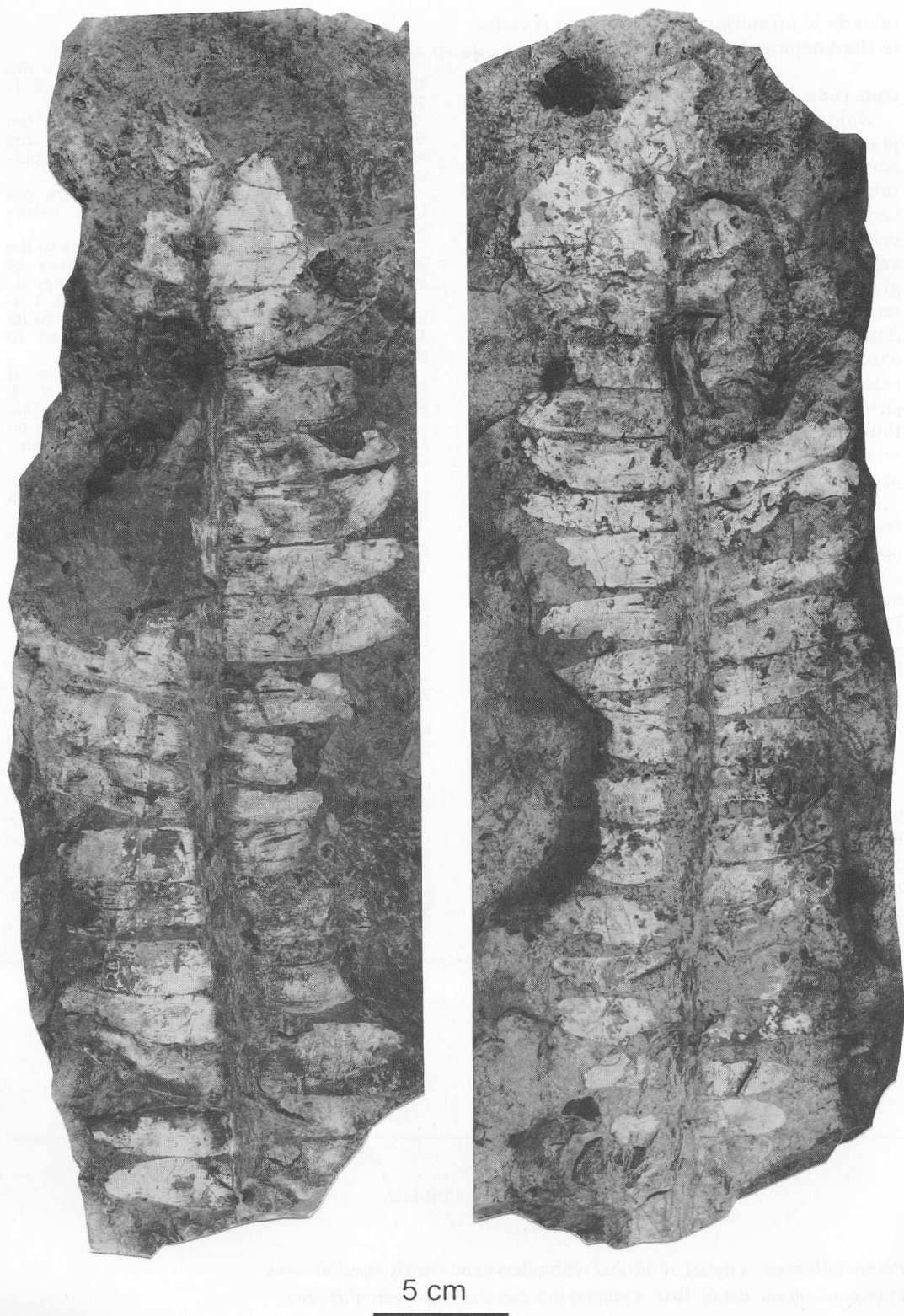
Plate 1 - Tabla 1

Left: *Pterophyllum* sp. from the Upper Triassic beds in the vicinity of Gorenja vas in Poljane valley, positive print

Levo: *Pterophyllum* sp. iz zgornjetriasnih plasti pri Gorenji vasi v Poljanski dolini, pozitivni odtis

Right: The counterpart of the split rock with the same specimen

Desno: Drugi del razpolovljene kamninske plošče z istim primerkom



tako da je primerjava in morebitna revizija te flore nemogoča.

Opis rodu *Pterophyllum*

Najdaljši primerek rastlinskega ostanka je ostanek lista dolg 45 cm in širok 12,5 cm. Na ostanku je vidna osrednja os lista ali rahis, ki je širok približno 1.2 cm z rahlimi vzdolžnimi rebrci. Pine so pritrjene pravokotno na rahis. Pri večini pin ni ohranjen vrh, bolj ali manj popolni ostanki pin so dolgi 6-7 cm in široki okrog 2 cm. Pine so tesno nameščene ena ob drugi, pogosto se celo dotikajo ali je njihova medsebojna razdalja okrog 1.2 mm. Nekatere pine so ob bazi nekoliko skrčene, kjer je najmanjša bazalna širina okrog 1,5 cm, druge ne kažejo krčenja. Pine so zašiljene v distalni tretjini, nekatere so zavite navzgor, druge ostajajo vseskozi pravokotne. Kjer je ohranjen vrh je ta top.

Žilnatost pin je vzporedna s koncentracijo 10 do 12 žil na cm. Na žilah nismo opazili nobene cepitve.

Pri drugih primerkih je rahis enake širine. Stik pin z rahisom je povsod nepopoln. Pri enem rahisu smo izmerili dolžino 8 cm in širino 3 cm. Žilnatost pin je tudi tukaj enaka in ne kaže cepitve.

Zahvala

Avtorji se v prvi vrsti zahvalujemo najditelju rastlinskega ostanka gospodu Viliju Rakovcu, da nam je dragoceno najdbo odstopil v strokovno obdelavo. Nadalje se zahvaljujemo višjemu tehničnemu sodelavcu Marijanu Grmu za fotografije in izdelavo skice, ter g. Ireni Trebušak za prevod v angleščino.

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Plate 2 - Tabla 2

Pterophyllum sp., a detail of the leaf with pinnae and clearly parallel veins

Pterophyllum sp. detajl lista s pinami in z razločno vzporednimi žilami



1 cm