

ASTEROTHECA GOLONDRINENSIS N. SP. FROM THE LOWER PERMIAN GOLONDRINA SERIES OF THE BAJO DE LA LEONA, SANTA CRUZ, ARGENTINA

RAFAEL HERBST

Facultad de Ciencias Exactas y Naturales y Agrimensura,
University Nacional del Nordeste, Corrientes, Argentina

ABSTRACT

Asterotheca golondrinensis n. sp. is the new name proposed for fertile material of *Pecopteris unita* Bgt. from the Lower Permian Golondrina Series of Santa Cruz province, Patagonia, Argentina. European specimens known as *Pecopteris unita* Bgt. bear *Ptychocarpus*-type of sori and there is some confusion with specimens from other regions of the world. This makes it necessary to separate the Patagonian material bearing typical *Asterotheca* synangia.

RESUMEN

Sobre la base de material fructificado se propone el nuevo nombre de *Asterotheca golondrinensis* n. sp. para los ejemplares de *Pecopteris unita* Bgt. de la Serie La Golondrina, provincia Santa Cruz, Patagonia, Argentina. Los ejemplares europeos de *Pecopteris unita* Bgt. tienen fructificaciones del tipo *Ptychocarpus*, mientras que existe confusión con respecto al material de otras regiones del mundo. Ello hace necesario segregarse el material de Patagonia con típicos sinangios de *Asterotheca*.

AMONG the abundant and diversified fern flora contained in the Lower Permian sediments of the Bajo de La Leona (Santa Cruz province, Patagonia, Argentina) described mainly by Archangelsky (1958) and Archangelsky and de la Sota (1960) there are only three pectopterids with simple lateral veins: *Dizeugetheca waltoni*, *D. neuburgiae* and *Pecopteris unita*. Sterile specimens of these species can usually be distinguished in general form, size, pinnule arrangement and venation.

Dizeugetheca is a genus erected by Archangelsky and de la Sota (1960) for species with tetracapsulated fructifications (in groups of four, two upper ones piled over two lower ones) which differ neatly from other *Asterothecaceae*. In the Bajo de La Leona only the two above mentioned species are present but two more have later been described from Permian sediments of Patagonia and Bolivia respectively*.

Specimens attributed to the widely distributed *Pecopteris unita* Bgt. by these authors had not been found in fertile state in the extensive collections at Tucumán University (Instituto Miguel Lillo (LIL-PB)) and La Plata Museum (LP-PB) either from the Bajo de La Leona or from the Permian of Chubut province (Nueva Lubecka Series). The epithet *P. unita* has always been used in Europe for specimens with fructifications of the *Ptychocarpus* Weiss, 1869 type. In its use this genus has suffered a series of modifications (or interpretations) by Renault, Zeiller and others as shown by Kidston (1925) for example where different types of sori/synangia were included in it. The species itself seems to have a wide geographical and chronological distribution: it was found in Carboniferous and Permian strata in Europe, China (Shansi), South Africa (Rhodesia), New Guinea and finally Patagonia; in some of these localities the

*Incidentally, it seems that Maithy (1975) misinterpreted this genus as he includes in it the originally called *Alethopteris* and/or *Pecopteris phegopteroides*, for which he says (page 29): "Sori . . . , arranged in a row along the margin of pinnules, laterally contiguous to one another, four sporangia in a sori, egg shaped, arranged in two rows opposite to each other". Later (page 36) he states: "Sori are present on vein endings composed of four free sporangia arranged around a central point on the pinnule margin". These statements of the soral characters do not fit with the original definition of *Dizeugetheca*.

name was applied to sterile material. It also seems to be rather polymorphous as it has been separated at least into two varieties: var. *typica* and var. *emarginata* (see Kidston, 1925; Walton, 1929). According to Archangelsky (1958) in the Patagonian material there exists a complete transition between these extremes called varieties.

On the other hand, *Pecopteris arcuata* seems to be very close to *P. unita* and has sometimes been confounded with it. Lacey and Huard-Moine (1966) in their discussion of Rhodesian specimens feel able to separate both species on morphological grounds: *P. arcuata* is at least three times bigger, bears proportionately more lateral veins and the basal proximal lateral vein of each pinnule constantly arises directly from the pinna rachis instead of the pinnule mid-vein. They also discuss the possibility of this species being an heterosporous fern (or even a Pteridosperm) because there are some "pteridospermic" fructifications associated with it but there also are a few specimens bearing what look like true synangia.

Jongmans (1940) quotes, but does not describe, a *Pecopteris unita* from New Guinea. According to this author the specimen of his fig. 8 undoubtedly bears *Ptychocarpus* synangia but the photograph is not clear enough to confirm it; they could also easily be considered of the *Asterotheca* type. The sterile specimens surely look as typical *Pecopteris unita* specimens.

This state of affairs makes of *Pecopteris (Ptychocarpus) unita* Bgt. a very ample species, it being probable that we are handling with more than one natural taxon.

In the Corrientes University collection (CTES-PB) two specimens appeared with typical *Asterotheca* synangia on *Pecopteris unita* fronds. It is felt therefore, that it becomes necessary to separate this "species" from the genus *Pecopteris*, and to avoid undesired confusions with *Pecopteris unita* Bgt. to erect a new species, at least and restricted for now for the Patagonian specimens.

Asterotheca golondrinensis n.sp.

Pl. 1, figs. 1-5; Text-fig. 1a-d

1958 *Pecopteris unita* Archangelsky: 39, figs. 19-20.

1960 *Pecopteris unita* Archangelsky & de la Sota: 105, figs. 38-41, lam V, figs. 21, 23.

Diagnosis — Leaf at least tripinnate, main rachis up to 12 mm wide, giving off the pinnae at angles of 70-80°; pinnae opposite to alternate, linear, up to 110 mm long × 13 mm wide; pinnae rachis about 1 mm wide, sometimes striated.

Pinnules pecopterid, i.e. inserted by its whole base, with parallel lateral margins and rounded apex; pinnules at right angles or slightly bent forward with respect to the rachis, contiguous and free (or thinly basally united) in sterile specimens, some times free and separated (up to 2 mm) in one fertile specimen. Size of biggest pinnules up to 7×4 mm long/wide at base, normally 5-6×2-3 mm, and the smallest around 3.8-4×2.5 mm long/wide at base.

Mid-vein distinct, straight, reaching the apex; lateral veins arising approximately at 45°, also straight, reaching the pinnule margin, subopposite to alternate, generally 3-4 pairs per pinnule.

Six to eight almost circular tri- to tetrasporangiate synangia per pinnule, about 1.2 mm diameter, arranged in two slightly marginal rows. Sporangia pyriform (?), fused to a common base, free in upper half, about 0.4-0.5 mm the longest axis, which seems to lie parallel to the pinnule surface.

Holotype — CTES-PB n° 11; Locality: Bajo de La Leona, Santa Cruz, Patagonia.

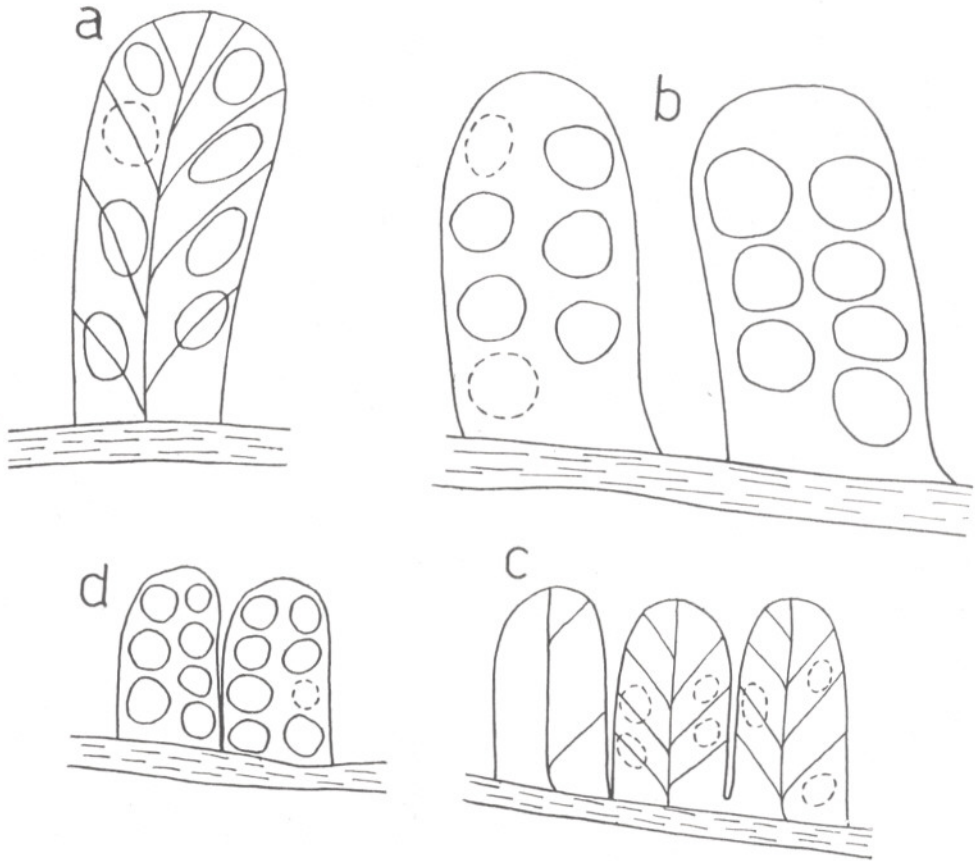
Horizon — Golondrina Series, Lower Permian.

Cotype — CTES-PB n° 2586; same locality and age.

Additional Material — Many of the specimens quoted by Archangelsky and de la Sota (1960) have been reviewed and are definitely included in the species.

DISCUSSION

This new species is based only on two fertile specimens, one of them being an impression and counterimpression of an incomplete pinna (65 mm long) and the other, two portions of frond segments, with several incomplete pinnae attached. Additionally a rather great number of sterile specimens in Tucumán, La Plata and Corrientes have been revised.



TEXT-FIG. 1 — a, b, sketches of specimen CTES n° 11 showing aspects of upper and lower surfaces respectively (approx. $\times 7$). c, d, same for specimen CTES n° 2586 (approx. $\times 7$).

In specimen CTES n° 11 the impression and counterpart show aspects of the upper and lower surface of the leaf respectively. On the former (Pl. 1, figs. 1-3) six to eight more or less circular to oval bulges, 1.2 to 1.5 mm diameter, located along the marginal half of each hemilamina can be seen; they are usually located between the lateral veins, but in cases they appear as if dissected by one of them and constituting two different bodies. But the lower surface clearly shows that it is a single body, an almost circular tri- to tetrasporangiate synangium. In many of the synangia a central short column can still be seen, which would indicate that the sporangia were fused at their bases; their upper half instead, in the same plane of the lamina, is free.

Specimen CTES n° 2586 is much smaller in overall size, with pinnae about 8 mm wide and pinnules up to 4×2.5 mm long/wide at base. Synangia are of course correspondingly smaller, about 0.6-0.7 mm diameter. As already mentioned, Archangelsky (1958) states that there is a complete transitional series from smaller, "marginata"-type, to bigger, "typica"-type of specimens. Apparently this remains true for fertile specimens as well, as shown by our two examples.

In general, the Golondrina Series did not render any palynomorphs up to date, and as expected no spores could be obtained here.

The fertile specimens described in this paper are essentially coincident in all characters with the sterile ones described

as *Pecopteris unita* Bgt. by Archangelsky (1958) and Archangelsky and de la Sota (1960) which is the reason to include them in the newly created species. Only specimen CTES n° 11 shows a slight difference

in that their pinnules are not contiguous but separate, in some cases up to 2 mm, but this minimal distinction can easily be attributed to the natural polymorphism of this species.

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EXPLANATION OF PLATE

PLATE 1

Asterotheca golondrinensis n. sp.

1, 2. Upper and lower surfaces of pinna of specimen CTES n° 11. Approx. $\times 1.3$.

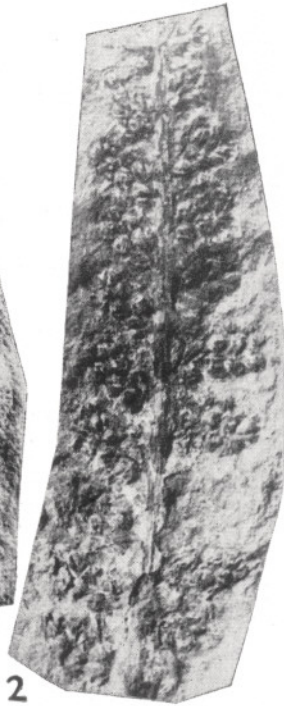
3. Same specimen; detail of lower surface with a few pinnules showing synangia. Approx. $\times 2.3$.

4. Same specimen; detail of upper surface showing the "bulges" representing synangia. Approx. $\times 2.3$.

5. Specimen CTES n° 2586; upper surface showing venation and a few synangia. Approx. $\times 2.3$.



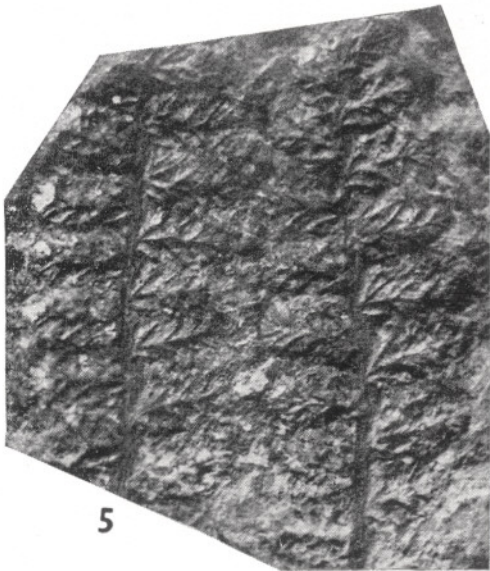
3



2



1



5



4

PLATE 1