

Zeitschrift: Candollea : journal international de botanique systématique = international journal of systematic botany
Herausgeber: Conservatoire et Jardin botaniques de la Ville de Genève
Band: 62 (2007)
Heft: 2

Artikel: Two new epitypes in Danaea (Marattiaceae, Pteridophyta) selected from original historical collections in Paris
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DOI: <https://doi.org/10.5169/seals-879183>

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Two new epitypes in *Danaea* (Marattiaceae, Pteridophyta) selected from original historical collections in Paris

Maarten J. M. Christenhusz

Abstract

CHRISTENHUSZ, M. J. M. (2007). Two new epitypes in *Danaea* (Marattiaceae, Pteridophyta), selected from original historical collections in Paris. *Candollea* 62: 221-230 In English, English and French abstracts.

Charles Plumier (1646-1704) completed nearly 200 drawings of ferns and clubmosses during his travels in the French Caribbean between 1689 and 1695. Many of these plates have been cited by Linnaeus in his *Species Plantarum* (1753), and were subsequently designated as lectotypes for the taxa they represent. Surveys of historical specimens from the herbarium in the National Museum of Natural History in Paris have revealed many original fern specimens annotated by Plumier that have most probably been collected by Surian. Several of these specimens should be designated as epitypes, in addition to the lectotypified Plumier illustrations, because not all distinguishing characters necessary to unambiguously identify the species are represented in the Plumier plates. The advantage of these epitypes is that they are specimens, rather than illustrations, and show characters that are not visible in Plumier's illustrations. We have chosen the genus *Danaea* Sm. (Marattiaceae) as an example and provide new synonymy and a complete taxonomic history of the genus. Two new epitypes of *Danaea* are proposed here, *Danaea alata* Sm. and *Danaea nodosa* (L.) Sm. The name *Danaea angustifolia* C. Presl is lectotypified.

Key-words

MARATTIACEAE – *Danaea* – Antilles – Plumier – Epitypes – Ferns – Historical specimens – Pre-Linnaean illustrations

Résumé

CHRISTENHUSZ, M. J. M. (2007). Deux nouveaux épitypes de *Danaea* (Marattiaceae, Pteridophyta), sélectionnés à partir des collections originales historiques à Paris. *Candollea* 62: 221-230. En anglais, résumés anglais et français.

Charles Plumier (1646-1704) a réalisé près de 200 illustrations de fougères et de lycopodes durant son voyage dans les Caraïbes françaises entre 1689 et 1695. Ces planches ont été citées, entre autres, par Linné dans son *Species Plantarum* (1753), et ont été désignées comme les lectotypes des taxons qu'elles représentent. Des recherches récentes dans les collections historiques de l'herbier du Muséum national d'Histoire naturelle à Paris ont permis de découvrir de nombreux spécimens annotés par Plumier et probablement collectés par Surian. Plusieurs de ces spécimens devraient être désignés comme épitypes, en complément des illustrations de Plumier classées comme lectotypes, du fait de l'absence dans les planches de Plumier de certains caractères distinctifs nécessaires à une identification sans ambiguïté des espèces. Ces épitypes présentent l'avantage d'avoir conservé des caractères qui ne sont pas visibles sur les illustrations. Nous avons choisi le genre *Danaea* Sm. (Marattiaceae) comme exemple et en donnons une nouvelle synonymie ainsi qu'un historique taxinomique. Deux nouveaux épitypes de *Danaea* sont proposés ici, *Danaea alata* Sm. et *Danaea nodosa* (L.) Sm. Le nom *Danaea angustifolia* C. Presl est lectotypifié.

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Submitted on December 19, 2006. Accepted on October 30, 2007.

Introduction

The French missionary Charles Plumier (1646-1704), a member of the catholic order of the Minims, sketched numerous plants during his stay on Martinique and Hispaniola. He travelled in the Caribbean between 1689 and 1695, and had a close working relationship with Joseph Donat Surian, who later returned to France with a large collection of dried specimens (many of which are still preserved in P). Plumier did not collect specimens himself, but instead drew and described the plants he studied in the field, which were subsequently collected by Surian. These drawings and descriptions formed the basis of a series of works: PLUMIER (1693, 1703, 1705), describing the flora of the French Caribbean. In PLUMIER (1705), 50 plates of his 1693 publication were reproduced. In total nearly two hundred ferns and clubmosses were described and illustrated by Plumier (PENNEL, 1945).

LINNAEUS (1753) based several species descriptions on Plumier's illustrations, since he had been able to study copies of these in Groningen, the Netherlands. Several authors such as FÉE (1866), JENMAN (1888), URBAN (1925: 273-397), PROCTOR (1977, 1985, 1989), LELLINGER & PROCTOR (1983) and PROCTOR & LOURTEIG (1990) designated Plumier plates as lectotypes for many Linnaean fern species. Also in several West Indian fern floras, PROCTOR (1977, 1985, 1989) selected lectotypes from among Plumier's drawings.

Despite the good quality and detail of the Plumier plates, a plate as a lectotype can be problematic if the image does not depict all characters necessary to distinguish between species. Some characters such as hairs, scales, glands or venation may not be well illustrated. According to MCNEILL & al. (2006), "when a holotype, a lectotype, or a neotype is an illustration, the specimen or specimens upon which that illustration is based should be used to help determine the application of the name" (*recommendation 8A.1*). For several species the Plumier plates are demonstrably ambiguous, which would imply the designation of the original specimens in the Surian and Tournefort collections that were annotated by Plumier, as epitypes (MCNEILL & al., 2006, *article 9.7*). The lectotype and epitype should both be considered when deciding on the identity of a species. It is in this spirit that I have conducted the study of the specimens in the Tournefort collection and other historical collections at P.

Many of the original specimens on which Plumier based his illustrations are preserved in the herbaria of Tournefort (P-TRF), Vaillant (P), and Surian (P). In cases where the illustration is not sufficient for the unambiguous identification of the plant, many of these specimens may be designated as epitypes.

Because I am currently revising the genus *Danaea* Sm. (*Marattiaceae*, *Pteridophyta*), I chose this genus as an example for epitypifying specimens linked to Plumier plates. The

identity of the two species depicted by Plumier is ambiguous, because the venation, pinna margins and petiole nodes are not clearly illustrated, and these names have therefore often been misapplied (i.e. PRESL, 1845; JENMAN, 1898; ROLLERI, 2004). The illustrations are thus not sufficient to distinguish these species they depict from related taxa. The epitypes selected in this study will clarify this issue and may prevent confusion of *D. alata* Sm. and *D. nodosa* (L.) Sm. with related species in the future.

Taxonomic History of *Danaea*

The first mention of taxa now belonging to the genus *Danaea* was by PLUMIER (1705), who published two plates that he named: "*Lingua cervina nodosa minor*" (Fig. 1) and "*Lingua cervina nodosa maior*" (Fig. 2). LINNAEUS (1753) applied "*Lingua cervina nodosa major*" to *Acrostichum nodosum* L. Even though PLUMIER (1705) stated that the species was observed in either Martinique or Hispaniola, LINNAEUS (1753) wrote "*Habitat in Dominica*", and further indicated "*stipitis articulis nodosis*", an unfortunate error because this species does not bear nodes on the petioles. LINNAEUS (1763) reconsidered the placement of *Acrostichum nodosum* and transferred it to *Asplenium*.

The second plate of PLUMIER (1705: 91, tab. 109) "*Lingua cervina nodosa minor*", was not mentioned by LINNAEUS (1753), but SMITH (1793) described it as *Danaea alata*, indicating "*Habitat in Martinica, Plumier in herb. Linn.*" as the original material (not present at LINN). In this article SMITH (1793) described *Danaea* in honor of "*Bot. Prof. J. Petri Mariae Dana*", and he based his new genus on *Asplenium nodosum* (L.) L. (= *Acrostichum nodosum* L.), citing "*Plumier, Fil. 90, 1. 108*" and referring to "*a specimen in the Linnaean Herbarium*". The latter was probably an assumption made at the time, for there is no original *Danaea* material known in LINN.

RUDGE (1805: 24) added a third species, *D. simplicifolia* Rudge, which is remarkable for its undivided blades. SMITH (1808) revised his genus for Rees' *Cyclopaedia*, and added a fourth species *D. elliptica* Sm. The description of this species was ambiguous, and therefore this name became very widely but variously applied. However, the material (*Herb. Sloane 1: 85*, BM-SL) indicated in the original description by SMITH (1808) and lectotypified by PROCTOR (1977), is a juvenile of *D. nodosa*, and thus the name *D. elliptica* becomes a synonym of that species (CHRISTENHUSZ & TUOMISTO, 2006).

In subsequent years, six new species were added to the genus (DESVAUX, 1811; RADDI, 1825: 75-76; KUNZE, 1837, 1840: 55-57, 1843: 137-138), until PRESL (1845) revised the genus. He described four additional species, erroneously synonymised *D. geniculata* Raddi under *D. elliptica*, and placed the 11 species

known to him into three sections: *Eudanaea* C. Presl, *Arthrodanaea* C. Presl and *Holodanaea* C. Presl, based on inconsistent morphological characters. Additionally two species were placed into segregate genera: *Heterodanaea* C. Presl and *Danaeopsis* C. Presl. The lectotype of *Heterodanaea* [*Danaea stenophylla* Kunze; Guadeloupe, *l'Herminier 213 ex herb. Bory, Danaea nr. 37* (K!), designated by PROCTOR (1977)] is a specimen identical to *Danaea alata* (ROLLERI, 2004). It therefore becomes a synonym of that species, and *Heterodanaea* is thus a synonym of *Danaea*. The other genus *Danaeopsis* was based on *Danaea paleacea* Raddi of which the holotype is: *Raddi s.n.* (P!) from Serra d'Estrella, Est. Sao Paulo, Brazil. This specimen has reticulate venation, a character that does not occur in *Danaea*, and is *Bolbitis serratifolia* (Kaulf.) Schott (PICI-SERMOLLI & BIZZARRI, 2005), which coincidentally is the type species of the genus *Bolbitis* Schott (*Dryopteridaceae*). To confuse matters, the fossil genus *Danaeopsis* Heer (HEER, 1865) is in use for certain marattialean fossils. The correct name for these fossils is *Marantoidea* Jaeger (WEBB, 2001). Presl's genera, sections and classification were not widely accepted and were rarely followed by subsequent authors on *Danaea*.

Over the following 57 years, little taxonomic attention was given to *Danaea* apart from listings in various indices (i.e. MOORE, 1861: 285-288), and the occasional addition of new species (LIEBMANN, 1849; FÉE, 1869; REICHENBACH, 1872; BAKER, 1881, 1891; JENMAN, 1898).

UNDERWOOD (1902) published the first review of the genus. He described, typified, and redefined several species and provided an analytical key for 12 species, of which five were new to science. This work was adapted for the North American Flora, where UNDERWOOD (1909) determined the type locality for *D. nodosa* as "Near Port de Paix, Haiti", and where he provided descriptions of a dozen species, which, remarkably, were a different set of species than he presented in his 1902 review. Meanwhile several new species were described (CHRIST, 1905, 1907, 1909, 1910; ROSENSTOCK, 1907, 1909), and CHRISTENSEN (1906, 1913) provided an overview of the genus listing a total of 32 species names.

SMITH (1793) did not explicitly establish that *D. nodosa* was the type of *Danaea*. So PICI-SERMOLLI (1957) designated it as such. Additionally he proposed to conserve the genus *Danaea* Sm. over *Danaa* All. (*Apiaceae*) and *Danaa* Colla (*Asteraceae*), which was approved by MCNEILL & al. (2006).

It took nearly a century, during which only a few new *Danaea* species were described (MAXON, 1924; ROSENSTOCK, 1925; MORTON, 1951; STOLZE, 1987), before TUOMISTO & MORAN (2001) revised the, until then, poorly known and challenging genus *Danaea*. They recognised a total of 18 species for Ecuador alone, of which eight were newly described. Their

work was the first comprehensive regional monograph of the genus, based on field work and herbarium studies. Subsequently, ROLLERI (2004) accepted a total of 17 species of *Danaea* in her revision of the genus. Recent studies (CHRISTENHUSZ & TUOMISTO, 2005; CHRISTENHUSZ, 2006; CHRISTENHUSZ & TUOMISTO, 2006; CHRISTENHUSZ & al., in press) have shown however that several species, not recognised by ROLLERI (2004), are morphologically and genetically distinct and warrant recognition. I estimate this exclusively Neotropical genus to consist of approximately 50 species, but several species complexes need to be unravelled before a more exact species number can be established.

New epitypes in *Danaea*

Several specimens in P-TRF have been annotated by Plumier. Many of these specimens are available as lecto- or epitypes of species that are based on Plumier's descriptions and illustrations. As an example of how typifications may need to be revised in the light of this collection, I epitypify two *Danaea* species below, and we provide their full synonymy.

1. *Danaea alata* Sm. in Mém. Acad. Roy. Sci. Turin 5: 420. 1793.

Lectotypus (designated by PROCTOR, 1977): Martinique, Morne de la Calebasse (PLUMIER, 1705: tab. 109) (Fig. 1).

Epitypus (designated here): *Ibitoboua Surian 648, Herbarium Vaillant 56* (P!) (Fig. 2).

= *Danaea fendleri* Underw. in Bull. Torrey Bot. Club 29: 673. 1902. **Typus:** TRINIDAD & TOBAGO. **Trinidad:** *A. Fendler 147* (holo-: NY!; iso-: BM!, GH!, K!, US!, YU!).

= *Danaea stenophylla* Kunze, Farnkraüter 1: 55. 1840. ≡ *Heterodanaea stenophylla* (Kunze) C. Presl, Suppl. Tent. Pterid.: 38. 1845. **Typus:** GUADELOUPE: *l'Herminier 213 ex herb. Bory, Danaea nr. 37* (holo-: LZ [destroyed]; lecto-: K!; isolecto-: P!, NY! (fragment of K), P! (fragment), designated by PROCTOR, 1977).

The material cited by SMITH (1793) was "*Plum. Fil. 91., t. 109*" and "*Habitat in Martinica, Plumier in herb. Linn.*" The venation of the epitype is clearly that of *D. alata*, and matches modern specimens collected in Martinique (i.e. *Christenhusz 2711, 2713, TUR!*). The venation depicted in the plate is variable and unclear. Since this character is very important in distinguishing this species from the otherwise similar *D. mazeana* Underw. and *D. moritziana* C. Presl, an epitype showing the venation is necessary.

Since its publication the name *D. alata* has been very variously applied, and some authors have erroneously synonymised species (such as *D. moritziana* and *D. mazeana*)

with this name (i.e. PRESL, 1845; JENMAN, 1898; ROLLERI, 2004). Revision of this complex requires the application of the name *D. alata* to an original specimen, hence this epitype is selected.

Additional historical specimen. – Herbarium Tournefort 5383 (P-TRF!).

2. *Danaea nodosa* (L.) Sm. in Mém. Acad. Roy. Sci. Turin 5: 420. 1793.

≡ *Acrostichum nodosum* L., Sp. Pl.: 1070. 1753.

≡ *Asplenium nodosum* (L.) L., Sp. Pl. ed. 2: 1539. 1763.

Lectotypus (designated by UNDERWOOD, 1909): Haiti, Port de Paix (PLUMIER, 1705: tab. 108) (Fig. 3).

Epitypus (designated here): Herbarium Vaillant 43 (P!) (Fig. 4).

= *Danaea angustifolia* C. Presl, Suppl. Tent. Pterid.: 35. 1845. ≡ *Danaea nodosa* var. *angustifolia* (C. Presl) T. Moore, Index Fil. 2: 287. 1861. **Lectotypus** (designated here): Antilles, s.l., *Bertero s.n.* (P!; isolecto-: PRC!, fragment).

= *Danaea longifolia* Desv. in Mag. Ges. Naturf. Freunde Berlin 5: 307. 1811. ≡ *Danaea nodosa* var. *longifolia* (Desv.) Hassl. in Trab. Inst. Bot. Farmac. 45: 89. 1928. **Lectotypus** (designated by PROCTOR, 1985): “*Habitat in Antillis*”, collector unknown [perhaps *Lavallée s.n. anno 1896*], ex herb. Desvaux (P!).

= *Danaea elliptica* Sm. in Rees, Cycl. 11: *Danaea* n° 2. 1808. **Lectotypus** (designated by PROCTOR, 1977): Jamaica, Mount Diablo, *Herb. Sloane* 1: 85 (BM-SL!). [It is not the lectotype suggested by LELLINGER (2000): West Indies, *Herb. Smith No. 1645.7* (LINN-SM!). The lectotype of PROCTOR (1977) has priority (CHRISTENHUSZ & TUOMISTO, 2006)].

Danaea nodosa is part of a complex of closely related species, which has often been misunderstood. This has incorrectly resulted in a very broad application of the name *D. nodosa*. Revision of this group requires epitypification of *D. nodosa* to match this name to an actual specimen, rather than an illustration, permitting an unambiguous definition. The epitype will be an additional aid in defining the morphological differences between species of the *D. nodosa* group (CHRISTENHUSZ & TUOMISTO, 2005; CHRISTENHUSZ & al., in press) and it will facilitate the distinction of *D. nodosa* from closely related species (i.e. *D. cartilaginea* Christenh. & Tuomisto, *D. grandifolia* Underw., *D. kalevala* Christenh., *D. media* Liebm., *D. nigrescens* Jenm., *D. sellowiana* Underw., and *D. ushana* Christenh.)

Additional historical specimen. – Herbarium Tournefort 5377 (P-TRF!).

Acknowledgements

Many thanks to Gerard Aymonin, from the National Museum of Natural History in Paris, for sharing his knowledge of the historical collections. I am also grateful to the herbarium staff at Paris (P), and especially France Rakotondrainibe who permitted me to study the historical specimens, and who provided the photographs. In addition, I thank George Proctor (IJ) and Hanna Tuomisto (TUR) for their support and valuable comments, as well as Molly McMullen (DUKE), Michel Boudrie (CAY) and Frédéric Tronchet (P) for commenting on the manuscript.

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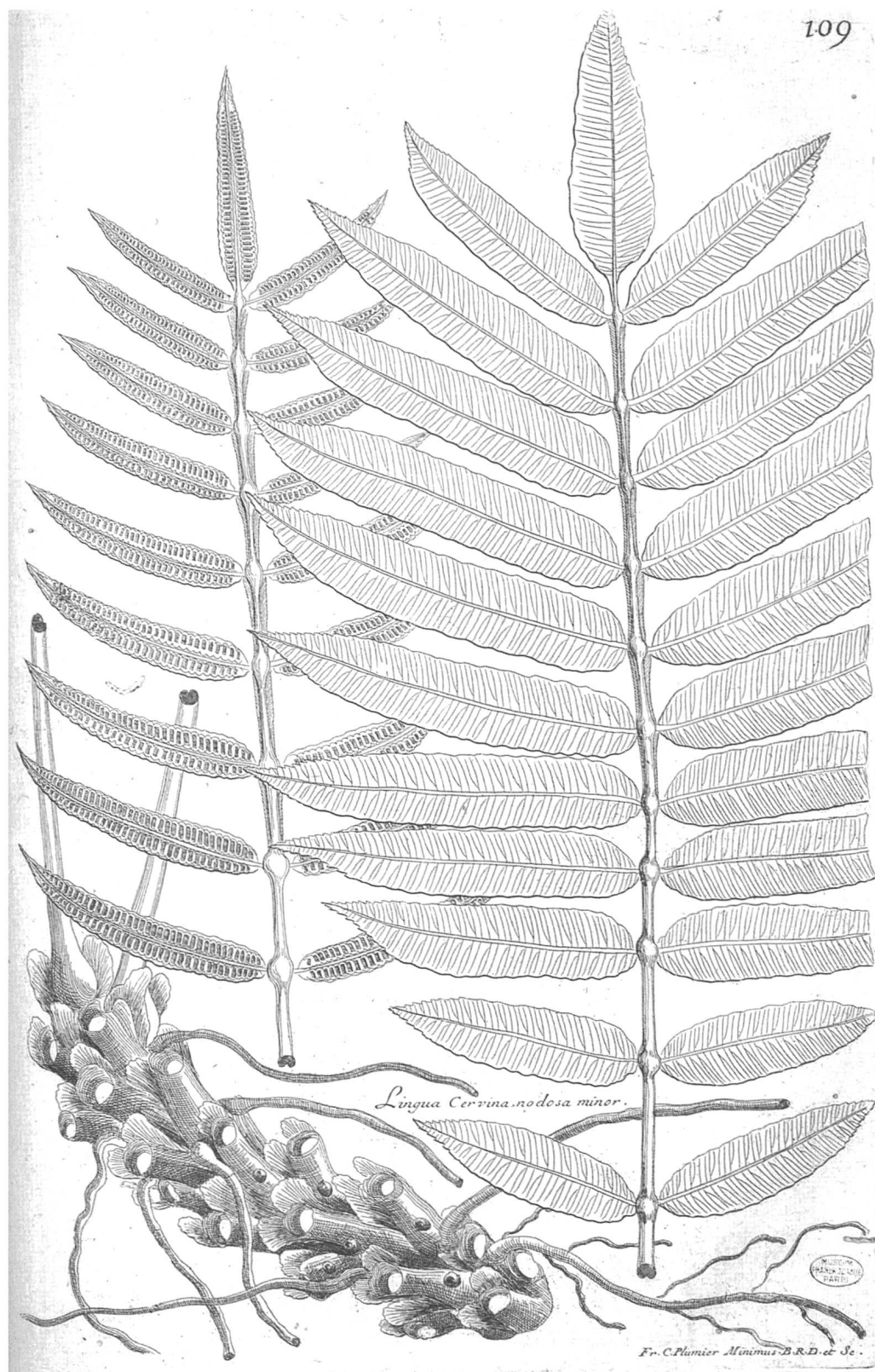


Fig. 1. – Lectotype of *Danaea alata* Sm.

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Fig. 2. – Epitype of *Danaea alata* Sm.

[Surian 648, Herbarium Vaillant 56, P] [© Herbier du Muséum National d'Histoire Naturelle, Paris. Reproduced with permission]

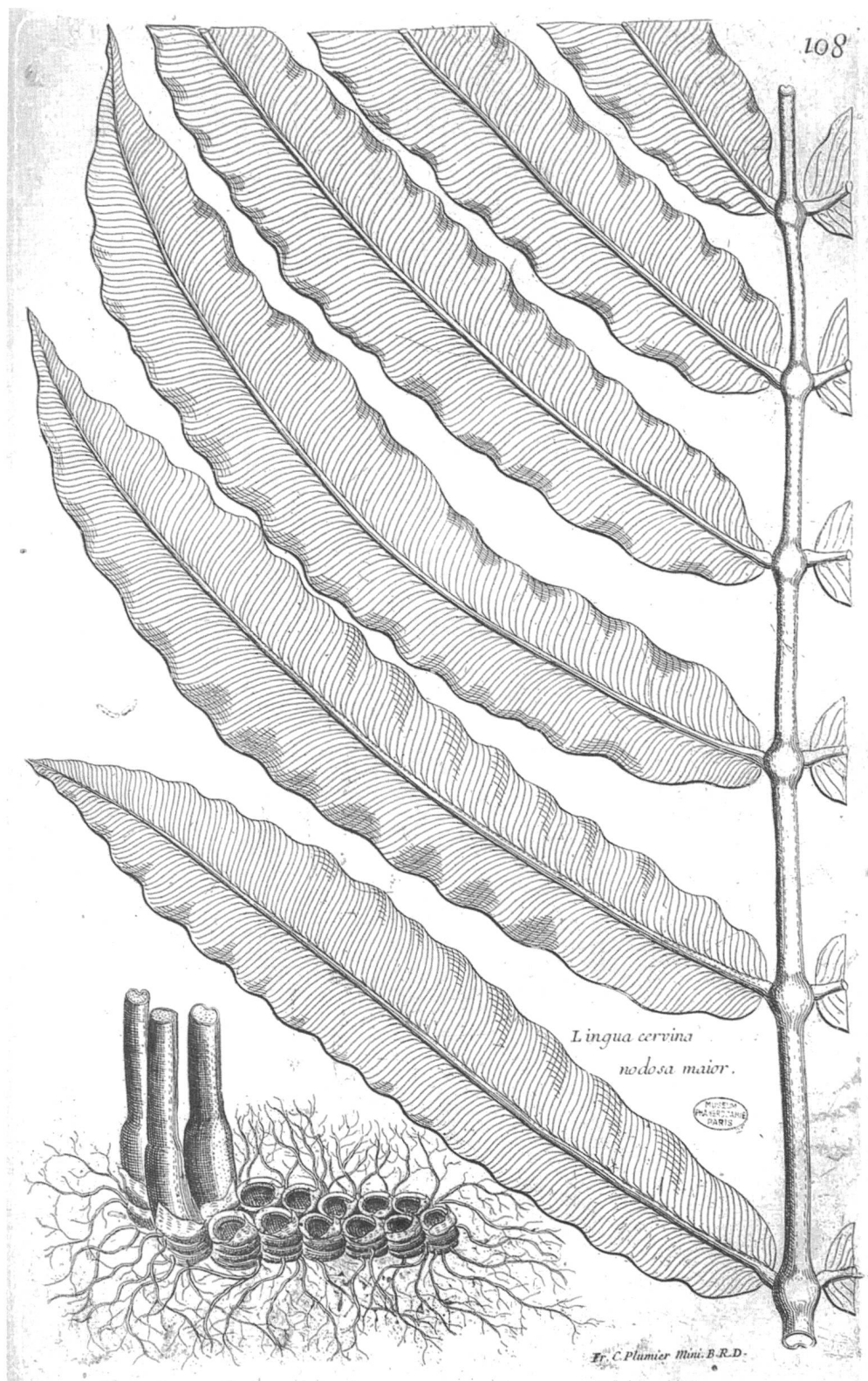


Fig. 3. – Lectotype of *Danaea nodosa* (L.) Sm.

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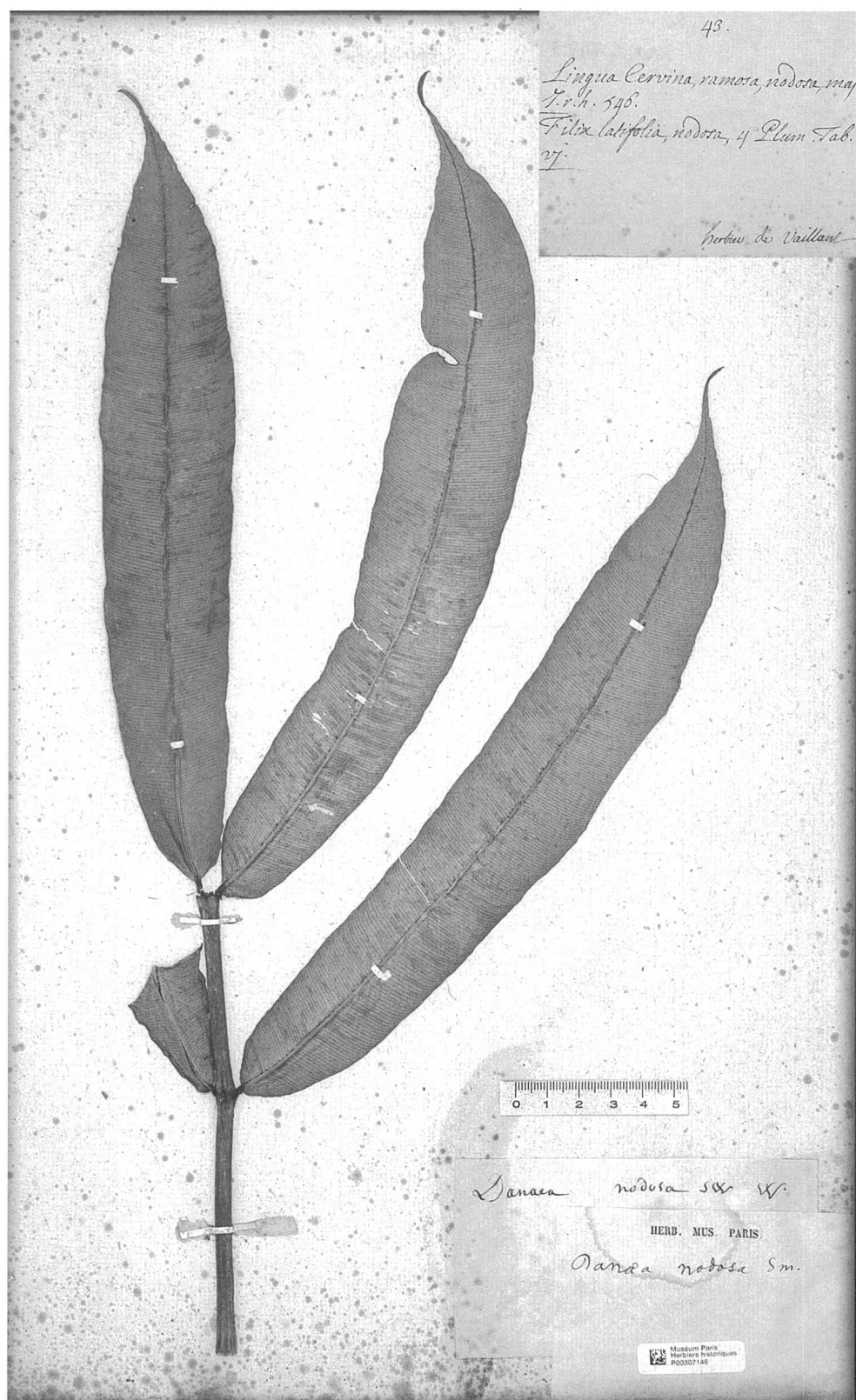


Fig. 4. – Epitype of *Danaea nodosa* (L.) Sm.

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