Back to the starting point: Revised typifications of Linnaean names based on Plumier’s *Nova plantarum Americanarum genera*

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**Abstract** The typification of 14 Linnaean names is revised. Previous lectotypifications based on Burman’s illustrations in *Plantarum Americanarum* must be superseded since those elements were not available to Linnaeus before the publication of the first edition of *Species plantarum*. As a result, 12 Linnaean names, *Bellonia aspera*, *Bucephalon racemosum*, *Columnea scandens*, *Cupania americana*, *Mentzelia aspera*, *Ovieda spinosa*, *Renealmia paniculata*, *Rondeletia americana*, *Thalia geniculata*, *Tillandsia serrata*, *Tournefortia hirsutissima* and *Tournefortia humilis*, are hereby typified based on original material currently held at the Library of the Rijksuniversiteit in Groningen, the Netherlands, whereas a drawing included in Plumier’s *Nova plantarum Americanarum genera* is selected as lectotype of the name *Alpinia racemosa*. In addition, supporting information about the type material of a name already typified by Robert Kiger (*Samyda guidonia*) is provided.

**Keywords** Charles Plumier; Codex Boerhaavianus; Johannes Burman; Linnaeus; lectotype

### INTRODUCTION

The publication of *Species plantarum* (Linnaeus, 1753) serves as the starting point for botanical nomenclature. Many species included in this work were known solely from the accounts of earlier authors. This is the case for a large number of Caribbean species based on Plumier’s findings in the West Indies and included in the first edition of *Species plantarum* (Linnaeus, 1753). The plants described in Plumier’s *Nova plantarum Americanarum genera* (Plumier, 1703) served as the main basis for dozens of Linnaeus’s species accounts. Additionally, Boerhaave’s “Codex Boerhaavianus” is a relevant source of evidence that was certainly studied by Linnaeus when compiling *Species plantarum* (Polhill & Stearn, 1976; Moroni et al., 2018). The two volumes of the “Codex” include a set of 508 botanical illustrations based upon Plumier’s original, unpublished drawings, preserved since 1793 in the Muséum national d’Histoire naturelle, Paris. Linnaeus, who lived for approximately four years in the Netherlands (Rutgers, 2008), was well-regarded by Boerhaave, who allowed him to see and study the illustrations of the “Codex” together with A. van Royen in Leiden, in 1738 (Polhill & Stearn, 1976). As a result, a few decades after Plumier had landed in the Americas, Linnaeus (1753) described 116 species from the Caribbean partially or exclusively based on Plumier’s findings in the West Indies (Moroni et al., 2018).

Despite the links between the “Codex” and the first edition of *Species plantarum* (e.g., Urban, 1920), there has been confusion and disagreement about the material available to Linnaeus by 1753, with consequences for the typification of a significant number of species names. At this point, it is worth noting that what seems to be a simple story becomes an intricate one. Between 1755 and 1760, Johannes Burman produced a set of 256 engravings based upon Boerhaave’s “Codex” and compiled them in the 10 volumes of the *Plantarum Americanarum* (Burman, 1755–1760). The Burman plates, frequently cited by Linnaeus in his later works (Linnaeus, 1759, 1762, 1763), have more commonly been studied than the “Codex”. This presumably stems from the fact that the “Codex” was somewhat inaccessible, and the rather more widely available Burman copies were understood to be generally faithful tracings of Plumier’s original drawings. In this context, Jarvis (2007: 489) believed there to be “evidence that proof copies of Burman’s plates were available to Linnaeus before 1753” and thus, he accepted previous choices of lectotype for many Linnaean names. However, these lectotypifications are here revisited since it can be shown that as the Burman plates selected as lectotypes were studied by Linnaeus after 1753, they cannot therefore be original material.

In light of the above, according to Moroni et al. (2018), 14 Linnaean names based on Plumier’s findings have been found to be wrongly typified or in need of clarifying remarks regarding their typification. Thus, the overarching objective of this contribution is to make progress in producing a well-founded nomenclatural treatment for 14 Linnaean names currently typified on Burman’s plates, exploring the relationship between Plumier’s (1703) *Nova plantarum Americanarum genera*, the copies commissioned by Boerhaave, their later publication by Burman (1755–1760), and the use made of these various sources by Linnaeus while compiling the first edition of *Species plantarum*. 
HISTORICAL BACKGROUND

The second half of the 17th century saw the heyday of the scientific explorations in the Caribbean. The French botanist Charles Plumier was one of the most important researchers of the West Indies, whose detailed exploration of several islands led to the discovery of dozens of species of plants new to science. By order of Louis XIV on 22 July 1687, Plumier embarked for the Caribbean to “work to discover the properties of plants, seeds, oils, gums, and essences and to draw birds, fishes, and other animals” (Hrodej, 1997: 100). Despite Plumier’s findings, and largely due to his premature death, a minor proportion of his work was published. Among Plumier’s achievements was the Nova plantarum Americanarum genera (Plumier, 1703), which contains numerous illustrations and polynomial names that opened a window into the Americas, depicting plants never seen by the Europeans.

Since the time of its publication, the Nova plantarum Americanarum genera has been a source of intense interest to botanists, including Carolus Linnaeus, who based numerous species included in his Species plantarum on Plumier’s contribution. For many taxa included in Species plantarum (e.g., Duranta erecta L.), however, the diagnostic phrase-name coined by Linnaeus (1753) is quite detailed when compared with that which had been provided by Plumier (1703). The underlying reason for this is due to an additional piece of evidence for Linnaeus, Boerhaave’s “Codex Boerhaavianus”, a set of 508 tracings from Plumier’s original, unpublished drawings. Linnaeus’s observations on the “Codex” had a profound impact on his compilation of the Species plantarum specifically because it allowed him to incorporate evidence on the plants found by Plumier in the West Indies (Moroni & al., 2018). This led Gillis & Stearn (1974: 188) to note that in order to make use of the information later, Linnaeus must have made notes on the “Codex” tracings when he was in Leiden but that no notes had been located. Polhill & Stearn (1976: 325), however, highlighted the connection between Boerhaave’s tracings included in the “Codex” and an interleaved copy of the first edition of the Genera plantarum dating from early 1737 and containing detailed polynomials relating to Plumier species that were not published until a few years later in 1753.

After Boerhaave’s death, his copy of the “Codex” was purchased by J. Burman, one of his students, at an auction. In one of the letters between Burman and Linnaeus (SLS, 2016), dated 15 May 1755, Burman stated that after having acquired the “Codex”, he had in mind to reproduce the rarest and most elegant Boerhaave copies at his own expense. Thus, he asked Linnaeus, who had studied the “Codex” with A. van Royen in Leiden in 1738 (as noted by Burman, 1755; Polhill & Stearn, 1976), to examine and review the proof copies before their publication. Then, Burman decided to engrave a series of copper plates and published a selection of 256 illustrations as Plantarum Americanarum (Burman, 1755–1760). Unfortunately, as noted above, the Burman plates, frequently cited by Linnaeus in his later works (Linnaeus, 1759, 1762, 1763), have more commonly been studied than the “Codex” and, in line with this, the widely held supposition that Burman’s plates were studied by Linnaeus before the publication of the first edition of Species plantarum has caused much confusion about the original material of a number of Linnaean names. In this context, Moroni & al. (2018) built the framework to develop a review of ineffective lectotypification statements for several Linnaean names published in 1753 because the lectotypes designated are Burman illustrations that, contrary to previous assumptions, were not available to Linnaeus prior to the publication of Species plantarum. To clarify this subject, it is necessary to return to the correspondence between Linnaeus and Burman. In one of his letters, dated 12 July 1755, Burman enclosed the first set of proof copies presumably belonging to the first fascicle of his Plantarum Americanarum. Even though details are lacking as to the specific identity of the copies, the Linnaean correspondence reveals that proofs of the Burman’s Plantarum Americanarum were not studied by Linnaeus before 1753 and, therefore, cannot be considered original material.

MATERIALS AND METHODS

In order to resolve typifications, we examined the following potential sources of information: (1) the original material of each name, including protologues and published illustrations found in Plumier’s Nova plantarum Americanarum genera; (2) Linnaeus’s interleaved copy of the first edition of Genera plantarum dealing with original notes (BL.49A, available at http://linnean-online.org/120004/); (3) the “Codex Boerhaavianus” (available at http://facsimile.ub.rug.nl/cdm/compoundobject/collection/manuscripts/id/12623/rec/18); and (4) the Burman (1755–1760) plates included in the Plantarum Americanarum. Additionally, key literature was consulted to identify possible prior typifications. To proceed with the typifications, the rules of the ICN (Turland & al., 2018) were followed. Thirteen earlier typifications have been judged to be ineffective because the designated elements were not part of the original material studied by Linnaeus, and these are here properly noted and discussed. Besides, supporting information about the type material of a name (Samyda guidonia) already typified by Robert Kiger is provided.

The type designations and clarifications are presented alphabetically under the relevant Linnaean name with full bibliographic reference. The accepted name is provided in bold. All lectotype illustrations designated here have been carefully evaluated and, in line with this, significant differences were found among Boerhaave’s tracings and the later copies published by Burman (1755–1760). In this context, to make it easier for readers to understand the relationship between Plumier’s 1703 publication (text and plate), that of Burman (1755–1760) and the “Codex”, a comparison between these sources is provided for each name.
TYPIFICATIONS


   “Alpina” in Plumier, Nov. Pl. Amer.: t. 11. 1703 [image!].


   Plumier, Mscr. 5: t. 48 (Paris, Bibliothèque du Muséum national d’Histoire naturelle!).

   The protologue of *Alpinia racemosa* (Linnaeus, 1753: 2) consists of a direct citation to Van Royen (1740: 12) followed by two polynomial names, which had been provided by Plumier (1703) and Marcgraf & Piso (1648). Gagnepain (1903) discussed at length the type material of this name and, as a result, he referred to an illustration (plate no. 20) included in Burman’s (1755) *Plantarum Americanarum* as the “type”.

   Based on Gagnepain’s statement, Jarvis (2007) accepted the plate as the lectotype of the name *Alpinia racemosa*. However, as we have shown, Linnaeus did not actually study Burman’s plates before 1753. Thus, the designated lectotype must be superseded if any of the original material is found, or corrected to neotype in the absence of it. Although Linnaeus (1753) never cited the Boerhaave plates in his protologues, many of them were undoubtedly studied by him prior to the publication of the first edition of *Species plantarum*. Often one can find statements in the protologue that irrefutably originate from the observation of those plates. However, in the present case, the protologue of *A. racemosa* contains nothing to indicate that Linnaeus had seen the Boerhaave tracing (no. 50) currently held in Groningen. In this case, because “Alpina racemosa alba, cannacovi folio” (Plumier, 1703: 26) is the only species in Plumier’s genus, the part of the plate illustrating the generic characters (i.e., t. 11, “Alpina”) can only be depicting this species. Consequently, the illustration is original material for the name and takes precedence for typification purposes. Thus, it is above designated as lectotype of the name.

   It is worth noting that Burman’s plate shows leaf apices curved downwards, while tracing no. 50 from the “Codex” shows the leaf apices to be erect.


   Loureig (1983: 156) typified *Bellonia aspera* with plate no. 47 in Burman’s *Plantarum Americanarum*, and this was accepted by Jarvis (2007). However, this lectotypification must be superseded since that element was not available to Linnaeus before the publication of the first edition of *Species plantarum*. Based on the Linnaean protologue, it seems plausible that Linnaeus based his description on additional material rather than on the phrase-name and illustration provided by Plumier (1703: 19). The illustration in Plumier’s work (Plumier, 1703: t. 31, “Bellonia”) depicts only flower and fruit dissections and does not include details of the leaf and inflorescence morphology. Study of the “Codex” revealed the presence of a tracing, no. 131, associated with the polynomial “Bellonia frutescens, folio melisse aspero”, and in agreement with Linnaeus’s (1753) treatment of *B. aspera* in *Species plantarum*. Additionally, an interleaved copy of *Genera plantarum* annotated by Linnaeus (page no. 109) reveals the presence of a draft of the morphological description for the name that was not published until a few years later in 1753. In line with this, the description of the leaves and inflorescence in the protologue is undoubtedly based on the observation of the illustration in the “Codex”. All the features agree with the phrase-name and allow us to identify the illustration as *Bellonia aspera*. Thus, we conclude that Linnaeus’s protologue was based not only on Plumier’s *Nova plantarum Americanarum* but also on the tracing no. 131 of the “Codex Boerhaavianus”. As such, the latter is designated above as the lectotype of *B. aspera*. Our selection maintains the current application for a species endemic to Hispaniola (Acevedo-Rodríguez & Strong, 2012).

   Interestingly, the Boerhaave tracing no. 131 depicts just a leaf whose abaxial surface seems to be tomentulous. This feature was then depicted in the whole plant by Burman. Additionally, Burman’s plate includes figures A and B, both coming from Plumier’s *Nova plantarum Americanarum*.


   A previous typification by Burger (1993: 26), who proposed a Burman illustration (t. 67, fig. 1) in *Plantarum Americanarum* as lectotype, must be superseded since that element was not available to Linnaeus before the publication of the first edition of *Species plantarum*. Given that Linnaeus (1753) included a quite detailed description of *Bucephalon racemosum*, it seems plausible therefore that he based his species concept on additional material rather than only on Plumier’s (1703) t. 20, “Bucephalon”, which only depicts floral features. A tracing associated with the name “Bucephalon fructo racemoso rubro” was found in the “Codex”, in agreement with Linnaeus’s (1753) description of *B. racemosum* in *Species plantarum*. Besides, Linnaeus’s annotated copy of *Genera plantarum* contains a draft (page no. 776) of the *B. racemosum* treatment. Despite the lack of the pertinent epithet, Linnaeus clearly had prepared a protologue of what was later to become this species. Thus, the tracing no. 177 in the “Codex” clearly supports the author’s concept of *B. racemosum* in the protologue of the species. In light of the evidence assembled, the tracing is above selected as lectotype of the name.

   *Bucephalon racemosum* provides a good example to show the relationship between the “Codex” tracings, the Burman engravings and Plumier’s generic plates. It becomes quite
obvious that Burman (Fig. 1B) resets the original tracing (Fig. 1A) by presenting it alongside a second species, and supplementing the floral details on the tracing of Bucephalon with illustrations from Plumier’s (1703) plate of generic characters (Fig. 1C). Additionally, he also seems to add a figure of a fruit from another unknown source.


Linnaeus (1753) described one species of *Columnea*, *C. scandens*, with two varieties. The protologue (Linnaeus, 1753) described one species of *Columnea*, *C. scandens*, with two varieties. The protologue (Linnaeus,

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**Fig. 1.** A, Boerhaave’s original trace of “Bucephalon fructo racemoso rubro” (image by permission of the Special Collections of the University Library of Groningen); B, Burman’s printed proof of plate no. 67, fig. 1 (image by permission of the Special Collections of the University Library of Groningen); C, Plumier’s illustration (t. 20) included in *Nova plantarum Americanarum genera*. 

4 Version of Record
1753: 638) consists of a description “Caulis, Folia, Corollae villosa. Folia ovata, serrata, petiolata”, two polynomials cited from Plummer (1703) and finally a drawing (Plummer, 1703: t. 33, “Columnnea”). Leeuwenberg (1958: 390), who studied the Gesneriaceae of Guiana, indicated Burman’s plate no. 89 (fig. 1) as the neotype of the species name, with no further discussion. Jarvis (2007: 489) then argued that “there is evidence that proof copies of Burman’s plates were available to Linnaeus before 1753”, and, thus, he accepted Leeuwenberg’s statement as an effective lectotype designation. However, this typification must be revised following Moroni & al. (2018).

The description coined by Linnaeus is quite detailed when compared with the illustration that had been provided by Plummer (1703: t. 33, “Columnnea”). Thus, it seems plausible that Linnaeus based his description on additional material rather than only on the data provided by Plummer. Study of the “Codex” revealed the presence of a single tracing, no. 232, linked to the polynomial “Columnnea scandens, phœniceo flore, fructu albo” and thus depicting the species Linnaeus regarded as “typical”. Additionally, the manuscript copy of the Genera plantarum contains a sketch of what was later to become the protologue of C. scandens. On the basis of the protologue and all the information that supports the fact that Linnaeus studied the above mentioned Boerhaave tracing, it is above selected as lectotype of C. scandens. The tracing agrees with C. scandens var. scandens sensu Morley (1974) and C. scandens sensu Leeuwenberg (1958).

It is worth noting that Boerhaave’s original tracing is mirrored faithfully in the Burman published engraving. However, Burman redaddresses the original tracing by presenting it alongside a second species and supplementing the floral details on the tracing with illustrations from Plummer’s (1703) plate of generic characters.


The protologue of Cupania americana (Linnaeus, 1753: 200) includes the citation of one synonym, “Cupania castanea, fructu sericeo & ramoso”, from Plummer’s (1703: 45 & t. 19, “Cupania”) Nova plantarum Americanarum genera. Finally, a quite detailed description reads “Folia alterna, obovata, oblonga, obtusa, dentato-serrata: nervis transversali-bus crassis. Flores racemosi.” This last shows that Linnaeus based his species concept on additional material, given that Plummer’s (1703) work includes only an illustration (t. 19, “Cupania”) with floral features and, therefore, cannot be the source for describing the leaf and inflorescence morphology of C. americana.

The typification of the name was discussed by Pennington (1993: 40), who designated the plate no. 110 of Burman’s (1757) Plantarum Americanarum as lectotype of the name. However, this is unacceptable since that element was not available to Linnaeus before the publication of the first edition of Species plantarum. Study of the “Codex” revealed the presence of a tracing, no. 284, associated with the polynomial “Cupania castanea folio, fructu sericeo & ramoso” and in agreement with Linnaeus’s (1753) treatment of C. americana in Species plantarum. Besides, Linnaeus’s annotated copy of the Genera plantarum (page no. 716) reveals the presence of a morphological description for this species that was not published until a few years later in 1753. Thus, Linnaeus’s protologue of C. americana was based not only on Plumier’s Nova plantarum Americanarum genera but also on the tracing no. 284 of the “Codex” that is above designated as lectotype of C. americana.

It is worth noting that the tracing found in the “Codex” has all its racemes with fruits, whereas the Burman plate shows one of the racemes with flowers.


Linnaeus’s (1753: 516) protologue includes a reference to the Hortus Cliffortianus (Linnaeus, 1738: 492) followed by the citation of two synonyms: “Mentzelia folis & fructibus aspersis”, from Plumier’s (1703: 41 & t. 6, “Mentzelia”) Nova plantarum Americanarum genera, and “Onagra americana, folio betonicae, fructu hispido”, from Tournefort’s (1700: 302) Institutiones Rei herbariae. Finally, a description of vegetative and inflorescence morphology reads “Folia serrata, alterna. Rami alterni. Flores axillares, solitarii, sessiles.” The typification of Mentzelia aspera was discussed by Weigend (1996: 235), who designated the plate no. 174 from Burman’s (1758) Plantarum Americanarum as lectotype of the name. However, this is unacceptable since that element was not available to Linnaeus before the publication of the first edition of Species plantarum. The citations from Linnaeus (1738) and Tournefort (1700) represent literature sources with no illustration or traceable specimens in this instance. Concerning Plumier’s (1703) work, it has an illustration (t. 6, “Mentzelia”) that only depicts floral features and, therefore, cannot be the source used by Linnaeus when coining the description of M. aspera. It is probable, in this framework, that the species diagnosis was based on a tracing included in Boerhaave’s “Codex” to which Linnaeus had access. All information contained in Linnaeus’s description is found in the Boerhaave tracing no. 656, which is suitable to typify the species’ name since the description included in the protologue is also found in Linnaeus’s copy of the first edition of the Genera plantarum. In light of the above, Linnaeus’s protologue of M. aspera was based not only on Plumier’s Nova plantarum Americanarum genera but also on the tracing no. 656 of the “Codex”. As such, it is designated above as the lectotype of the name M. aspera.

It is worth mentioning that the Burman plate and the “Codex” tracing are quite different. Burman depicted flowers in anthesis with conspicuous corollas, whereas Boerhaave’s version depicts flowers turning into fruit, without corollas.
In addition, Burman’s plate shows a detail of fruit and seeds absent in the “Codex” tracing, but present in Plumier’s (1703: t. 6, “Mentzelia”) *Nova plantarum Americanarum*.


Linnaeus’s (1753: 637) protologue comprised a synonym from Plumier (1703: 11 & t. 24, “Validia”, “Validia cardui folio, fructu subcaeruleo”), “Habitat in America meridionali” and a brief description of leaves and inflorescence features. Yuan & al. (2010) discussed at length the type material linked to *O. spinosa* and designated the plate no. 256 included in Burman’s (1760) *Plantarum Americanarum* as the lectotype, arguing that “Burman sent proof copies to Linnaeus ahead of their publication, and it seems clear that Linnaeus must have received this one prior to 1753.” However, based on the arguments provided by Moroni & al. (2018), we do not accept it as original material.

The description coined by Linnaeus is quite detailed when compared with that which had been provided by Plumier (1703: 11); thus, it seems plausible that Linnaeus based his description on additional studied material. Linnaeus’s description states “Folia opposita, petiolata, oblonga, dentata. Flores corymbosi”, which agrees very well with the morphology of the leaves depicted on the Boerhaave tracing held in Groningen. Additionally, Linnaeus’s copy of the *Genera plantarum* (page no. 126) contains a draft of the *O. spinosa* treatment. Despite the lack of an epithet, Linnaeus clearly had prepared a protologue of what was later to become the species here discussed. In line with this, it is certain that Linnaeus had seen the copy made by Aubriet, the tracing no. 987 of the “Codex”, which is above designated as lectotype of the name.

Boerhaave’s original tracing is not faithfully reproduced on the Burman published engraving. Anthers on the Boerhaave tracing lack details shown in the Burman plate, which is also supplemented with details from Plumier’s (1703) plate of generic characters.


Linnaeus’s (1753: 286) protologue of *Renealmia paniculata* includes a diagnostic phrase-name, “RENEALMIA folis radicalibus brevissimis, caule subnudo, ramos subdivisius adscendentibus” followed by the citation of one synonym, “Renealmia ramossissima, folia variegatis & circinatis”, from Plumier’s (1703: 37 & t. 38, “Renealmia”) *Nova plantarum Americanarum* genera. The typification of this name was discussed by Smith & Downs (1974), who designated the plate no. 237 from Burman’s (1760) *Plantarum Americanarum* as lectotype of the name. The same choice of lectotype was subsequently made by Beaman & Judd (1996), apparently unaware that it had already been designated. However, this choice is unacceptable since the selected material was not available to Linnaeus before the publication of the first edition of *Species plantarum*.

The description of the leaf morphology and habit of *R. paniculata* coined by Linnaeus in the diagnosis shows that he based the species concept on further material apart from Plumier’s (1703) work, which only includes an illustration (t. 38, “Renealmia”) of floral features. Study of the “Codex” reveals the presence of a single tracing, no. 868, in agreement with Linnaeus’s (1753) treatment of *R. paniculata* in *Species plantarum* and linked to Linnaeus’s annotated copy of *Genera plantarum* in which he had clearly prepared a protologue of what was later to become this species (page no. 719). Thus, Linnaeus’s protologue of *R. paniculata* was based not only on Plumier’s *Nova plantarum Americanarum* genera but also on the tracing no. 868 of the “Codex Boerhaavianus”, which is above selected as lectotype of the name.

Boerhaave’s original tracing is faithfully reproduced in Burman’s published engraving. It is worth noting that there is some confusion as to the pagination number of Plumier’s polynomial since Linnaeus (1753: 286) erroneously referred to page no. 27 instead of no. 37.


The Linnaean concept of *Rondeletia americana* (Linnaeus, 1753: 172) has its roots in Plumier (1703), borrowing from this work the only element found in the protologue. *Rondeletia americana* was lectotypified by Howard (1989: 455) on Burman plate no. 242, fig. 1, a choice accepted by Jarvis (2007). However, Linnaeus did not actually study Burman’s plates before 1753 (Moroni & al., 2018) and hence, this illustration cannot be original material for the name and is not eligible to serve as lectotype. A potential source of original material was found in Groningen, on which the original diagnosis may have been based. Linnaeus’s (1753) description of *R. americana* in *Species plantarum*, “Arbusculae Folia opposita, sessilia, lanceolata. Pedunculi communes solitarii, longissimae, nudi, apice formantes corymbum dichotomum; in cuius singula dichotomia Flos sessilis, cum involucro diphyllo” is quite detailed when compared with that which had been provided by Plumier (1703: 11 & t. 12, “Rondeletia”). Closer scrutiny of Linnaeus’s annotated copy of *Genera plantarum* revealed that Linnaeus had prepared a protologue of what was later to become *R. americana*, and the copy (page no. 126) includes the description of vegetative characters that correspond to those later published in the first edition of *Species plantarum*. Consequently, the protologue was certainly also based on the tracing no. 886 included in Boerhaave’s “Codex”. This illustration is in agreement with, and clearly supports, the author’s concept of the species in the protologue. Thus, the tracing no. 886 is above designated as the lectotype of *R. americana*. 
Despite Boerhaave’s original tracing being faithfully reproduced in the Burman published engraving, this name provides another good example to show the relationship between the “Codex” tracings, the Burman engravings and Plumier’s generic plates. It becomes quite obvious that Burman resets the original tracing by presenting it alongside two other species.


*Samyda guidonia* was lectotypified by Pennington (1981: 265) with Burman’s plate no. 147, fig. 2, a choice accepted by Jarvis (2007). However, Linnaeus did not actually study Burman’s plates before 1753 (Moroni & al., 2018) and hence, the material cannot be original material for the name and is not eligible to serve as lectotype. Linnaeus (1753) mentioned two phrase-names in the protologue of *S. guidonia*, referred to as “Guidiaon, nucis juglandis folio, major” and “Guidonia, nucis juglandis folio, minor”, that coincide with two tracings (no. 435 and 436, respectively) found in Boerhaave’s “Codex”. Kiger (1984), who discussed at length the story behind this Linnaean name and analyzed the Boerhaave tracings, explicitly cited one of these plates, “Guidiaon, nucis juglandis folii, major”, as lectotype of the name *Samyda guidonia*. His use of the term “lectotype” is effective since his work was published prior 2001, when the words “designated here” or an equivalent were not required. The current lectotype agrees with *S. guidonia* sensu Pennington & Clarkson (2013).

Boerhaave’s original tracing is faithfully reproduced in the Burman published engraving. However, Burman resets the original tracing by presenting it alongside a second species.


The elements in the protologue of *Thalia geniculata* (Linnaeus, 1753: 1193) to take into consideration are Van Royen’s (1740) generic description and the citation of synonyms from Plumier (1703), Sloane (1696, 1707), Ray (1693), Pluknet (1696), Marcgraf & Piso (1648), Ray (1704) and Bauhin (1623). The citations from Bauhin (1623), Marcgraf & Piso (1648), Ray (1693, 1704) and Pluknet (1696) represent literature sources with no illustration or traceable specimens. On the contrary, the Sloane (1707) phrase-name is linked to original material for the name. However, Swartz (1791: 9) asserted that the element cited by Linnaeus from Sloane’s account must be excluded from the concept of *T. geniculata* since it depicts a plant identifiable as *Maranta arundinacea* L.

Andersson (1981) was the first author to discuss at length the typification of the name *T. geniculata*. He asserted that plate number 108, fig. 1 from Burman’s (1757) *Plantarum Americanarum* was studied by Linnaeus when compiling *Species plantarum*. However, Linnaeus did not actually study Burman’s plates before 1753 (Moroni & al., 2018) and, therefore, Andersson’s lectotype must be overturned since it is not original material. It is probable, in this framework, that the species diagnosis was coined from the Boerhaave’s “Codex” to which Linnaeus had access. All information contained in Linnaeus’s description is found in Boerhaave illustration no. 274 held in Groningen. Besides, Linnaeus’s annotated copy of *Genera plantarum* contains a draft (page no. 763) of the *T. geniculata* treatment. Despite the lack of the pertinent epithet, Linnaeus clearly had prepared a protologue of what was later to become this species. Thus, we conclude that Linnaeus’s protologue of *T. geniculata* was based not only on Plumier’s *Nova plantarum Americanarum genera* but also on the tracing no. 274 of the “Codex”. As such, Boerhaave’s tracing no. 274 is designated above as the lectotype of *T. geniculata*.

Boerhaave’s original tracing is faithfully depicted in the Burman published engraving. However, Burman readdresses the original tracing by presenting it alongside a second species, and supplementing the floral details on the tracing with illustrations from Plumier’s (1703) plate of generic characters.


The protologue of *Tillandsia serrata* (Linnaeus, 1753: 286) includes the brief diagnostic phrase-name “TILLANDSIA folis superne dentato-spinosis”, and the citation of one synonym, “Caraguata clava & spicata, folii serratis”, from Plumier’s (1703: 10 & t. 33, “Caraguata”) *Nova plantarum Americanarum genera*. The provenance of the species was given as “Habitat in America meridionali”. Therefore, the protologue encompasses the diagnostic phrase-name from Plumier (1703), plus a description of the leaves. This last shows that Linnaeus based his species concept on additional studied material given that Plumier’s (1703) work only includes an illustration (t. 33, “Caraguata”) of floral features, and therefore cannot be the source for describing the leaf morphology of *T. serrata*. According to Howard (1979: 406), the plate no. 75, fig. 1 from Burman’s (1756) *Plantarum Americanarum* was studied by Linnaeus when compiling *Species plantarum*. However, there is strong evidence that this element was not studied by Linnaeus prior to the publication of the name, and as such does not constitute original material. Study of Boerhaave’s “Codex” revealed the presence of a tracing, no. 199, associated with the name “Caraguata clava & spicata, folii serratis”, and in agreement with Linnaeus’s (1753) treatment of the species in *Species plantarum* and linked to Linnaeus’s copy of the *Genera plantarum* in which Linnaeus (page no. 209) had clearly prepared the protologue of what was later to become *T. serrata*. In light of the above, the tracing is above designated as the lectotype of the name.

Boerhaave’s original tracing is faithfully depicted in the Burman published engraving. However, Burman readdresses
the original tracing by presenting it alongside a second species, and supplementing the floral details on the tracing with illustrations from Plumier’s (1703) plate of generic characters.


The protologue of Tournefortia hirsutissima (Linnaeus, 1753: 140) consists of a phrase-name “TOURNEFORTIA foliis ovatis petiolatis, caule hirsuto, spicis ramosissimis terminalibus” linked to an illustration included in Plumier’s (1703: 5, t. 3) Nova plantarum Americanarum genera. Although Johnston (1949: 133) noted the existence of original material in the Netherlands, he did not designate it as type. However, Jarvis (2007) considered that T. hirsutissima was in fact lectotypified with Burman plate no. 229 by Johnston (1949). This typification is here judged to be ineffective because the designated element was not part of the original material studied by Linnaeus. The study of the protologue of Tournefortia hirsutissima discloses that the phrase-name coined by Linnaeus (1753) originated on the observation of tracing no. 806 of Boerhaave’s “Codex”, which clearly depicts its features. Additionally, closer scrutiny of Linnaeus’s annotated copy of Genera plantarum revealed that Linnaeus had prepared a protologue of what was later to become T. hirsutissima and the manuscript (page no. 118) includes the description of morphological characters which correspond to those later published in the first edition of Species plantarum. Thus, Linnaeus’s protologue was based not only on Plumier’s Nova plantarum Americanarum genera but also on the tracing found in Groningen. As such, it is above designated as the lectotype of T. hirsutissima. It is worth noting that the new lectotype designation conflicts with the current element (Burman’s t. 229) that appears in the International Code of Nomenclature for algae, fungi, and plants as the conserved type of the binomial involved. However, given that the new type choice is taxonomically identical with the conserved type of the binomial involved, we consider that no practical purpose would be served to make a formal proposal for consideration by the Nomenclature Committee.

It must be emphasized that Boerhaave’s tracing depicts the basal portion of the stem pubescent. This feature, however, was then depicted in the whole stem by Burman.


The protologue of Tournefortia humilis (Linnaeus, 1753: 141) includes the diagnostic phrase-name “TOURNEFOR-TIA foliis lanceolatis sessilibus, spicis simplicibus recurvus lateralibus”, and the citation of one synonym, “Pittonia humilis, anchuse folio”, from Plumier’s (1703: 5 & t. 3, “Pittonia”) Nova plantarum Americanarum genera. The typification of this name was discussed at length by Miller (2004: 804), who designated the plate number 227 (fig. 2) included in Burman’s (1760) Plantarum Americanarum as lectotype of the name. However, this is unacceptable since that element was not available to Linnaeus before the publication of the first edition of Species plantarum.

The protologue of T. humilis encompasses a detailed description of the species’ leaves and inflorescence. Plumier’s (1703) work has an illustration (t. 3, “Pittonia”) that only depicts floral features and, therefore, cannot be the source used by Linnaeus when describing the morphology of T. humilis. Study of Boerhave’s “Codex” revealed the presence of a tracing, no. 803, associated with the designation “Pittonia humilis, anchuse folio”, and in agreement with Linnaeus’s (1753) treatment of T. humilis in Species plantarum. Additionally, Linnaeus’s copy of the Genera plantarum contains a draft (page no. 118) of the T. humilis treatment. Despite the lack of an epithet, Linnaeus had clearly prepared a protologue of what was later to become the species here discussed. Thus, Linnaeus’s protologue of T. humilis was based not only on Plumier’s Nova plantarum Americanarum genera but also on the tracing no. 803 of the “Codex Boerhaavianus” that is above designated as lectotype of T. humilis. It is worth noting that an epitype (Hahn 416, BM) currently exists in support of the Burman plate. Thus, in rejecting Miller’s type choice, the pertinent epitype must necessarily also be rejected.

Boerhaave’s original tracing is faithfully reproduced in the Burman published engraving. However, Burman redresses the original tracing by presenting it alongside a second species, and removing the floral details on the Boerhaave tracing.

■ AUTHOR CONTRIBUTIONS

PM conceived the study and wrote the manuscript with the help of AM, MGN and NOL. To properly proceed with the typifications, MGN gathered information concerning the original annotations of Linnaeus in the copy of the first edition of the Genera plantarum. All authors contributed to the nomenclatural discussions and the search for original material and literature. — PM, https://orcid.org/0000-0001-5306-476X; AM, https://orcid.org/0000-0002-4768-664X; MGN, https://orcid.org/0000-0002-9809-7183; NOL, https://orcid.org/0000-0001-7414-3416

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LITERATURE CITED


