

**TYPIFICATION OF *JUNIPERUS BARBADENSIS* L. AND
J. BERMUDIANA L. AND REDISCOVERY OF
J. BARBADENSIS FROM ST. LUCIA,
BWI (CUPRESSACEAE)**

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Summary

The typification of *Juniperus barbadensis* and *J. bermudiana* is discussed in relation to specimens in the Linnaean collections and specimens recently collected from the type localities. The specimen in LINN numbered 1198.1 is designated as the lectotype of *J. barbadensis* L. The specimen 1198.2 at LINN annotated *J. bermudiana* was apparently added to the Linnaean collection after 1753. The Hermann illustration cited by Linnaeus was not based on *J. bermudiana* and would fail to establish effectively the application of the name. Therefore, a specimen taken from a plant that was contemporary with Linnaeus, *David van Royen* 901.130-394(L), is designated as the neotype for *J. bermudiana*. The rediscovery of *J. barbadensis* is reported from St. Lucia, BWI. This species should be considered threatened on St. Lucia due to its small population of approximately 25 trees that occupy an area of about 10 m by 60 m.

Introduction

Typifications of the names *Juniperus barbadensis* L. and *J. bermudiana* L. have presented significant problems. The current work by Jarvis (in progress, see Cannon et al., 1983) on the production of a catalogue of Linnaean plant names and their typifications, coupled with the recent rediscovery of *Juniperus* from St. Lucia (this paper), now enables us to clarify the problems.

Linnaeus (1753) described three junipers from the New World (*J. virginiana* L., "Virginia and Carolina"; *J. barbadensis*, "America"; and *J. bermudiana*, "America"). Typification of *Juniperus virginiana* has not been a problem. However, Hemsley (1883) equated *J. barbadensis* with *J. bermudiana*, adopting *J. bermudiana* as the name for all the junipers of the Caribbean. Sargent (1902) recognized *J. barbadensis* and said it occurred along the Atlantic coast of Georgia and Florida as well as "on the Bahamas, San Domingo (Dominican Republic), mountains of Jamaica and on Antigua." Britton (1908) recognized *J. lucayana* in the Bahamas and reserved *J. barbadensis* for the plants of southern Georgia, Florida and the rest of the Caribbean. Pilger (1913) equated *J. bermudiana* and *J. barbadensis*, but used *J. barbadensis* for the name of the common juniper of the Caribbean on the grounds that it was listed first by Linnaeus (1753). Carabia (1941) recognized *J. barbadensis*, throughout the Caribbean, *J. bermudiana* on Bermuda and *J. virginiana* in the United States. Gillis (1974) treated the Bahamian junipers as *J. bermudiana*.

Juniperus barbadensis L., Sp. Pl. 2: 1039. 1753. Lectotype (here designated): *Herb.* LINN no. 1198.1.

Linnaeus took his diagnostic phrase-name unchanged from Adriaan van Royen's *Prodrromus* (1740) and presumably had seen some material of it in Leiden during his stay with the author in the winter of 1737-38. Unfortunately we have been unable to trace any relevant material in van Royen's herbarium (L). However, there is a specimen (1198.1, numbers after Savage, 1945) in Linnaeus' herbarium (LINN) which agrees with the diagnosis. This specimen (Fig. 1a) bears "barbadensis 7" in Linnaeus' hand, the number (that of the species in *Sp. pl.*, i.e., *Juniperus* no. 7) indicating that it was almost certainly in his possession by 1753. It shows all leaves appressed (adult), with mucronate tips and a definite hump near the leaf tip, sunken glands, leaf margins smooth at 50×, branchlets square as in *J. bermudiana* but leaves much smaller, and fruit absent. We have not traced any further relevant specimens in the other general Linnaean herbaria (i.e., S, SBT, H, MW).

Linnaeus also cited two polynomials in synonymy. The first is from Plukenet (1700) accompanied

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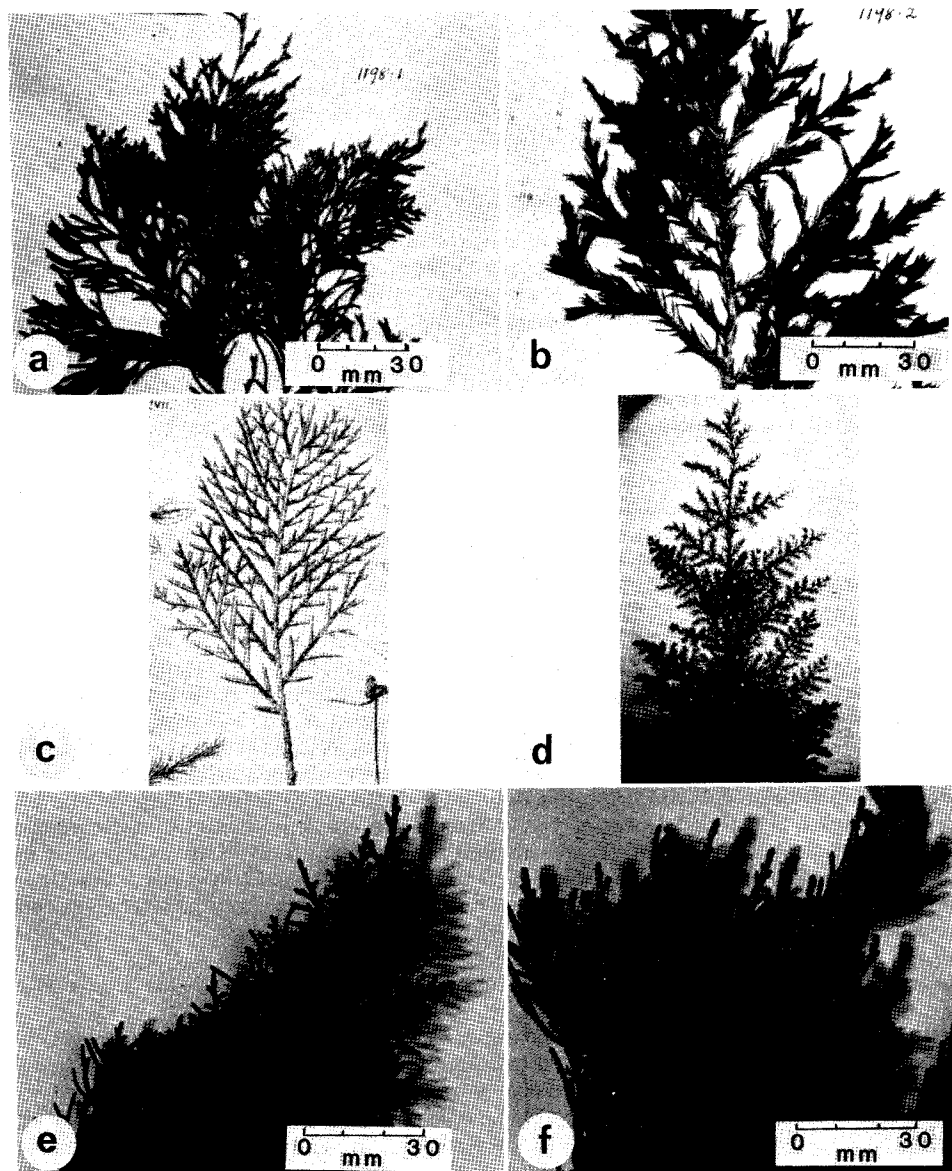


Fig. 1a. Specimen 1198.1 LINN, annotated "7 barbadensis" by Linnaeus, lectotype of *Juniperus barbadensis*. 1b. Specimen 1198.2 LINN, annotated "bermudiana" and "HU" by Linnaeus. Note the juvenile (awn-shaped) foliage. 1c. Figure from Plukenet (Tab. 197, fig. 4, 1700) of "*J. barbadensis, cupressi foliis, ramulis quadratis*". This appears to be *J. bermudiana* not *J. barbadensis*, see text for discussion. 1d. Figure of "*J. bermudiana*" Hermann (1687). Note the very small plant has only juvenile leaves and yet is bearing female cones. 1e. Foliage of *J. barbadensis* (Adams 5368) recently collected from Petit Piton, St. Lucia, BWI. 1f. Foliage of *J. bermudiana* (Adams 2554) collected from Bermuda Island, Dec. 1978.

by an illustration based on Plukenet's specimens which are now in the Sloane Herbarium (96:121; 100:154) at the British Museum (BM). Plukenet notes that he received the dry specimen from Jacob Reed (=James Reed of Howard, 1979: 71) from Barbados Island. This appears to have been between 1692 and 1700 (see Howard, 1979: 71, for a detailed discussion of Plukenet and Reed). Unfortunately Plukenet's diagnosis "... cupressoid leaves, square branchlets" emphasized a character descriptive of the juniper endemic to Bermuda and has, without doubt, led to the confusion of the two species. Plukenet's illustration shows rather stylized quadrifid branchlets (Fig. 1c). The second name cited by Linnaeus as synonymous with *J. barbadensis* was *Juniperus bermudiana* Hort. angl. 42. t. 1. f. 1. *ex figura* (Miller, 1730). This is a figure in a catalogue of plants for sale in London about 1730. The figure is clearly that of *J. bermudiana* not *J. barbadensis*. The specimen illustrated has only adult (scale-like) leaves and Linnaeus, apparently unaware that *J. bermudiana* had both juvenile (awn-shaped) and adult (scale-like) leaves (see discussion below), mistook the illustration for *J. barbadensis*.

Maycock (1830) noted under *Juniperus*, "a tree by no means common at this time in the island (i.e., Barbados) from which it takes its specific name." In correspondence recently discovered at Kew (Adams, 1985, unpublished) from Dr. Maxwell T. Masters (The Gardeners' Chronicle Office, London, Oct. 30, 1898) to D. Morris (Imperial Agricultural Department, Barbados), Masters writes "Plukenet's figure quoted by Linnaeus is more like *J. bermudiana* in the stout branches than the Jamaica or Florida species. No juniper seems to exist now as far as I can find out on Barbados, and it is possible that Plukenet's plant may have come from Bermuda . . .". Morris' reply (Dec. 30, 1898) to Masters stated "Your kind letter of 30th, Oct. has been before me for some time. I have made a careful enquiry (sic) in regard to the Juniper tree growing in Barbados. I fear that there is not much chance of obtaining specimens from really wild trees as the only part of Barbados where the original forest still exists is a small patch about a couple of square miles in extent." We believe *J. barbadensis* did occur on Barbados and at least on St. Lucia, but was already extinct on Barbados by the early part of the eighteenth century.

After examination of the Linnaean specimen 1198.1 (Fig. 1a), the figure cited from Plukenet (see Fig. 1c) and extant material of *J. barbadensis* from St. Lucia (Adams 5383) and *J. bermudiana* from Bermuda (Adams 2554), we formally designate specimen 1198.1 in Linnaeus' herbarium (LINN) as the lectotype of *J. barbadensis* L. The figure cited by Linnaeus for *J. barbadensis* (Tab. 197, fig. 4, Plukenet, 1700) is not typical of extant *J. barbadensis* (cf. Figs. 1c and 1e). It appears that Linnaeus mistook the drawing of Plukenet for *J. barbadensis*. Specimens from extant populations of *J. barbadensis* and *J. bermudiana*, and the two specimens of Plukenet in the Sloane herbarium that were used to prepare the Tab. 197, fig. 4 of Plukenet (1700) were compared. The major vegetative character that separates *J. barbadensis* and *J. bermudiana* is the width of branchlets (ultimate twigs). The average branch widths were 1.19 mm and 1.67 mm in *J. barbadensis* and *J. bermudiana*, respectively. The two specimens of Plukenet's that were used to prepare Tab. 197, fig. 4 (Plukenet, 1700), had 1.55 and 1.76 mm branch widths. Thus, it appears that Plukenet's Tab. 197, fig. 4 was probably based on *J. bermudiana*.

***Juniperus bermudiana* L., Sp. Pl. 2: 1039. 1753. Neotype (here designated):** Bermuda Island, cultivated specimen in Herb. David van Royen 901.130-394 (L!).

As in the case of *J. barbadensis*, Linnaeus took his diagnosis unchanged from van Royen (1740). The specimen (1198.2, Fig. 1b) in the Linnaean herbarium (LINN) which Linnaeus has annotated with the epithet "bermudiana" and the letters "HU" was examined. The letters "HU" indicate that the specimen came from material in cultivation in the Botanic Garden in Uppsala (i.e., Hortus Upsaliensis). The absence of a number written on the sheet by Linnaeus (i.e., 5) makes it almost certain that this specimen was added to Linnaeus' herbarium after 1753. Accordingly it cannot be regarded as a syntype. All of the leaves on 1198.2 are awn-shaped (juvenile), in threes, with leaf margins smooth at 50 \times . Female cones are absent from the specimen. In addition, because the Linnaean specimen is sterile and juvenile-leaved, there are no morphological characters to allow its definitive identification.

The Linnaean herbarium in Stockholm contains a sheet (fiche number 402.7) of *Juniperus* which has been referred to *J. bermudiana*. However, from the vase and cartouche, it is clear that this sheet came originally from the Clifford herbarium and, from Linnaeus' annotations, that he regarded it as belonging to *J. virginiana*. Accordingly it has no relevance for the typification of the name *J. bermudiana*.

A polynomial from Hermann (1687), accompanied by a description and illustration is cited in synonymy. The illustration is either a stylized, composite of cultivated plants or was based on a juniper from the section *Oxycedrus* of *Juniperus*. It is very unlikely that *J. bermudiana*, which achieves adult-leaved foliage in 4–5 years, would be at reproductive age in the juvenile state, at the size shown in the illustration (see Fig. 1d). If the female cones, illustrated, were 6.38 mm in diameter (average from a recent sample from Bermuda, Adams, unpublished), the plant would only be 32 cm tall, far smaller than reproduction size for *J. bermudiana*. One should note, however, that a few individuals with juvenile (awn-shaped) leaves on otherwise mature juniper trees of various species have been observed by the senior author. In examining several thousand trees over the past 20 years, 5 adult trees have been found that had only juvenile leaves. Three of these were bearing female cones: one *J. scopulorum*, approximately 4 m tall, one *J. ashei* approximately 10 m tall and one *J. barbadensis*, approximately 7 m tall. Furthermore, *J. saxicola*, endemic to Pico Turquino in Cuba appears to have been fixed, by neoteny, in the juvenile (awn-blade and stem sheath) -leaved stage (Adams, 5284-85; July 1985). Photographs of recent specimens of *J. barbadensis* (Adams 5368) and *J. bermudiana* (Adams 2567) are shown in Figs. 1e and 1f.

A close examination of Hermann's fig. (cf. Fig. 1d) reveals that the leaves appear to be jointed at the base as in *J. communis* L. section *Oxycedrus*, not with an awn-blade and stem sheath as is characteristic of juvenile leaves of sect. *Sabina* (and *J. bermudiana*). Furthermore, the attachment of the female cones to the woody stem in Hermann's figure is typical of *J. communis* (sect. *Oxycedrus*), in contrast to the attachment of female cones on terminal branchlets in *J. bermudiana*. For these reasons, it appears that the Hermann's figure was likely based on *J. communis* (or a related species in sect. *Oxycedrus*), and not *J. bermudiana*.

It seems clear that Linnaeus, in taking his diagnosis from van Royen, was unaware that he was dealing with both juvenile and adult foliage features. We cannot identify specimen 1198.2 (LINN), which is, in any case, not a syntype, or the Hermann plate (see Figs. 1a, 1c). The latter would therefore make an unfortunate choice of lectotype since it would fail to establish effectively the application of the name (the function of a nomenclatural type under Art. 7). We are fortunate in having a cultivated specimen from the herbarium of David van Royen, who was the successor to his uncle Adriaan, as Director of the Leiden Botanic Garden. It seems extremely likely that these specimens came from the same stock, possibly even the same plant, as that which Adriaan described and upon which Linnaeus based his name. David van Royen's herbarium contains three specimens which agree with Linnaeus' diagnosis. Although two of the specimens have only juvenile (awn-shaped) leaves, the third specimen (David van Royen specimen 901.130-394) has both juvenile leaves and adult (mature, scale) leaves. This specimen (901.130-394) is clearly *J. bermudiana* that is currently endemic and extant on Bermuda Island. Under these unusual circumstances, we formally designate the David van Royen specimen 901.130-394 at L! as the neotype of *Juniperus bermudiana* L.

Current Populational Status of J. barbadensis on St. Lucia

The recent "re-discovery" of *Juniperus* from the Petit Piton on St. Lucia (*Verna Slane & L. Jean-Pierre* 717) in October 1985 instigated a more recent trip (February 1986) to collect and examine the relict population. After examination of the foliage (Fig. 1e) and comparing it with specimen no. 1198.1 (LINN) (Fig. 1a), we conclude that the junipers from Petit Piton on St. Lucia are the same as *J. barbadensis*. An additional specimen [Charles Devaux, in July–August 1911 (K!)] from Petit Piton has also been examined and found to be the same as the Linnaean specimen (1198.1).

An extract from the Agricultural Report for St. Lucia from 1921, regarding the status of *J. barbadensis* (pencil cedar), reads as follows: "The Pencil Cedar used to grow wild all along the South Western coast of the island, but has been nearly all destroyed with the exception of a few trees situated at the top of the small Piton" (Voice, April 29, 1922, p. 6). The status of *Juniperus barbadensis*, on St. Lucia, appears to be confined to one small population of approximately 25 trees, all within 30 m of the summit of Petit Piton. The population is bearing seed and reproduction is evident as two young trees (est. 3–6 years old) were found near the top of the west side. Nevertheless, *J. barbadensis* should be considered as threatened on St. Lucia due to having only one very small population, confined to an area of approximately 10 m by 60 m.

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Literature Cited

- Britton, N. L. 1908. *North American trees*. Henry Holt & Co., New York.
- Cannon, J. F. M., C. E. Jarvis and N. K. B. Robson. 1983. The typification of Linnaean plant names: A project of the Linnean Society of London. *Taxon* 32: 76–78.
- Carabia, J. P. 1941. Contribuciones al estudio del flora Cubana. *The Caribbean Forester* 2: 83–92.
- Gillis, W. T. 1974. Name changes for the seed plants in the Bahama flora. *Rhodora* 76: 67–138.
- Hemsley, W. B. 1883. The Bermuda cedar. *Gard. Chron.* 19(n.s.) May 26, 1883: 656–657.
- Hermann, P. 1687. *Horti academici lugduno-batavi catalogus*. Lugduni Batavorum.
- Howard, R. A. 1979. Early botanical records from the West Indies particularly Barbados: Ligon (1657) to Lord Seaforth (1806). *Bot. J. Linn. Soc.* 79: 65–96.
- Linnaeus, C. 1753. *Species plantarum*. Stockholm.
- Maycock, J. D. 1830. *Flora barbadensis: A catalogue of plants, indigenous, naturalized, and cultivated, in Barbados*. Ridgeway, London.
- Miller, P. 1730. *Catalogus plantarum A catalog of trees, shrubs, plants and flowers for sale in the gardens near London*. Society of Gardeners (*Hortulani Anglici*).
- Pilger, R. 1913. IX. Juniperi species antillanae. *Symbolae Antillanae* 7: 478–481.
- Plukenet, L. 1700. *Almagesti botanici mantissa*. London.
- Royen, A. van. 1740. *Florae leydensis prodomus*. Lugduni Batavorum.
- Sargent, C. S. 1902. *Silva of North America*. Vol. 14 (1947 reprint, Peter Smith, N.Y.).
- Savage, S. 1945. *A catalogue of the Linnaean Herbarium*. Linnean Society, London.