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## William Trelease and the Macaronesian flora: an introduction to his trips, works and collections

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**ABSTRACT:** William Trelease (1857-1945) was the first director of Missouri Botanical Garden and one of the most important botanists in the history of the United States. He visited the Azores (in 1894 and 1896), Madeira (in 1896), and the Canaries (in 1932). His expeditions to the two Portuguese archipelagos are well-known and resulted in: (1) a floristic monograph for the Azores (published by Trelease in 1897) and (2)

taxonomic treatments for the native mosses of Madeira and the Azores [published by the French bryologist Jules Cardot (1860-1934) in 1897]. From his writings it seems that his two expeditions to the Azores were inspired by Darwin's work and findings in the Galapagos Islands. His three month visit to the Canaries (Tenerife) did not yield any particular publication and has not been the subject of historical research. Ba-

sed on documents and photos housed in the University of Illinois at Urbana-Champaign Archives we found details of the stay that William Trelease and his wife [Julia J. Trelease, (ca. 1860-?)] had in Tenerife between ca. January 27 and April 3, 1932. These documents show that dried plant specimens were shipped to the herbarium of University of Illinois at Urbana-Champaign (ILL).

During his voyages to the Azores he interacted with two of the most important naturalists from these islands, Bruno Tavares Carreiro (1857-1911) and Francisco Afonso Chaves (1857-1926), with whom he exchanged correspondence. In contrast, it appears that during his stay in the Canaries, Trelease did not meet any natural history specialist from these islands.

**KEY WORDS:** oceanic islands / Macaronesia / botanical history / plant exploration / Museu Carlos Machado / Canary Island gardens.

**RESUMEN:** William Trelease (1857-1945) fue el primer director del Jardín Botánico de Misuri y uno de los botánicos más importantes en la historia de los Estados Unidos. Visitó las Azores (en 1894 y 1896), Madeira (en 1896) y Canarias (en 1932). Sus expediciones a los dos archipiélagos portugueses son bien conocidas y dieron lugar a un tratamiento monográfico para la flora de las Azores [publicada por Trelease en 1897] y a estudios taxonómicos para los musgos nativos de Madeira y las Azores [publicados por el briólogo francés Jules Cardot (1860-1934) en 1897]. Por las publicaciones de Trelease, parece que sus dos expediciones a las Azores se inspiraron en los trabajos de Darwin de las Islas Galápagos. Su visita de tres meses a Canarias (Tenerife) no produjo ninguna publicación en particular y no ha sido objeto de investigaciones

históricas. Documentos y fotografías de los archivos de la Universidad de Illinois de Urbana-Champaign tienen detalles de la estadía que William Trelease y su esposa Julia J. Trelease, (ca. 1860-?) tuvieron en Tenerife entre el aproximadamente el 27 de enero y el 3 de abril de 1932. Estos documentos muestran que especímenes de herbario se enviaron a la Universidad de Illinois en Urbana-Champaign (ILL). Durante sus viajes a las Azores, William Trelease tuvo contactos con dos de los naturalistas más importantes de estas islas, Bruno Tavares Carreiro (1857-1911) y Francisco Afonso Chaves (1857-1926), con quienes intercambió correspondencia. Sin embargo, parece que durante su estancia en Canarias, Trelease no interactuó con ningún especialista en historia natural de estas islas.

**PALABRAS CLAVE:** islas oceánicas / Macaronesia / historia botánica / exploración de plantas / Museu Carlos Machado / jardines canarios.

## INTRODUCTION: PIONEER NORTH AMERICAN BOTANISTS WORKING IN MACARONESIA

Most of the foreign plant taxonomists who visited Macaronesia (i.e., Azores, Canaries, Cabo Verde, Madeiras, and Selvagens) and studied its flora came from Europe. However, recent historical research has shown that starting in the second third of the 19<sup>th</sup> century a few North American botanists also showed interest in this region. For instance, in 1833 (from 10 August through ca. 14 October) Daniel Jay Browne (1804-1867) travelled to Tenerife. Apparently, this New Hampshire naturalist did not have any formal college degree, although he took a few courses at Harvard University, and eventually became the agricultural clerk in the United States Patent Office. He was also the first accredited United States agricultural “explorer” collecting plants and seeds in Europe between 1845 and 1855 (Ryerson, 1933; Russell, 1953). It seems that during his trip to the Canaries Browne did not botanize, he wrote, however, an extensive travelogue that was published shortly after he returned to the United States (Browne, 1834). This diary was translated into Spanish recently and it contains details pertinent both to the society and natural history of the Canary Islands (Browne, 2005).

It appears that among the first naturalists from North America who collected plant material in Macaronesia was Charles Wright (1811-1885). Born in the state of Connecticut, he was one the most important plant collectors from the United States, Wright is well-known particularly because of his extraordinary plant collections from Cuba, but he also was engaged in plant exploration endeavours in Australia, the Far East, Hispaniola, Nicaragua, South Africa, and the United States (Anonymous, 1881; Howard, 1988). Between 1853 and 1855 Wright joined the U.S. North Pacific Exploring Expedition as botanist and collected herbarium specimens both in the islands of Madeira and Santiago (Cabo Verde) in 1853 (Francisco-Ortega *et al.*, unpublished).

A naturalist from North America, Thomas Wentworth Higginson (1823-1911), also collected plant material in Macaronesia by the middle 19<sup>th</sup> century. This Unitarian minister, military officer, one of the founders of the Intercollegiate Socialist Society and essayist was a native of Cambridge (Massachusetts). He visited the Azores (Faial and Pico) between November 1855 and May 1856. His wife, Mary Potter Thatcher, suffered from poor health and they decided to spend the winter season somewhere with a mild climate (Bowen, 1915; Wells, 1963; Monteiro, 2007; Dillard, 2013). During their stay in the Azores, Higginson made a few collections of lichens, fungi and mosses that were sent to John Lewis Russell (1808-1873), resulting in a publication that highlighted aspects of the non-vascular

flora of Faial (Russell, 1862). Upon his return to the United States, Higginson (1860) published an extensive account on the Azores mostly focusing on traditional religious practices that he observed during this visit. John Lewis Russell was also a Unitarian minister who had a strong interest in botany (Willson, 1874).

Alice Carter Cook (1868-1943) was a North American botanist of historical importance as, in 1888, she was the first United States woman to obtain a PhD degree in botany [from Syracuse University, New York (Creese, 1998)]. Alice Carter Cook and her husband, Orator Fuller Cook, (1867-1949), botanized in the Canary Islands (Tenerife and Gran Canaria) between November 1893 and January 1894 and also between February and October 1897 (Francisco-Ortega *et al.*, unpublished). These two trips took place during Orator Cook's tenure as president of Liberia College in West Africa from 1895 to 1899 (Dunn *et al.* 2001). As result of these visits Alice Carter Cook published two papers focusing on plants from the Canaries (Cook, 1898a, 1898b) and one on the pre-European native inhabitants of these islands (Cook, 1900; González Cruz, 2011). She also collected herbarium material during these visits and these specimens are housed in several United States herbaria (Lanjouw & Stafleu, 1954). The specimens represent the earliest known plant collections made by any North American naturalist in the Canaries.

During the first half of the 20<sup>th</sup> century two other well-known North American botanists also made visits to the Canaries: David Fairchild (1869-1954) from USA (in 1903, 1925, 1926 and 1927) and Brother Marie-Victorin (1885-1944) from Canada in 1929. The latter was the founder of the Botanical Garden of Montreal, and he stopped-over Gran Canaria and Tenerife during nine days as part of a 7-month trip to Africa, the Middle East and Europe. No material was collected by him. This distinguished botanist from Quebec, however, made hundreds of photographs and also wrote a diary that has been recently published and translated from French into Spanish and English (Francisco-Ortega *et al.*, 2017). Furthermore, Brother Marie-Victorin wrote an account of this visit that was published six years after his return to Canada (Marie-Victorin, 1936). David Fairchild can be considered as the pioneer of plant genetic resources studies and exploration of the USA. During his four field trips to the Canaries he made herbarium and seed collections. He visited the islands of Gran Canaria, Lanzarote, Tenerife and La Palma. Details of Fairchild's plant hunting expeditions to these islands were also published by him in a book and two popular magazine articles (Fairchild, 1928, 1930a, 1930b).

Kornelius Lems (1931-1968) was a botanist affiliated to North-American institutions who undertook early plant research in the region. A Dutch native, Lems can be considered as the pioneer of plant evolutionary ecology studies for Macaronesia. He developed both his graduate and faculty careers in USA

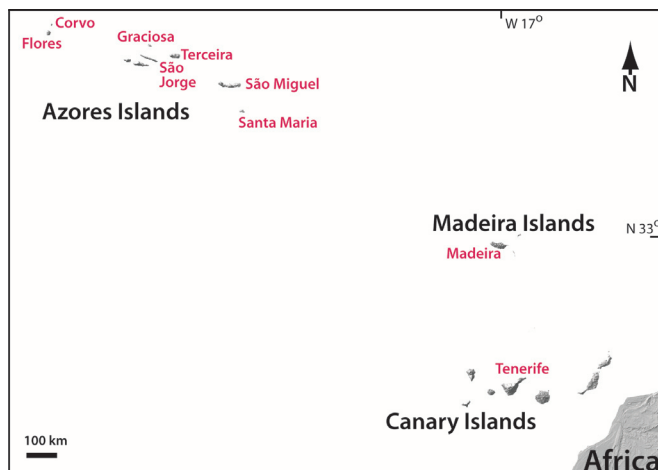




**Figure 1.** Portrait of William Trelease taken in 1933. Courtesy of the Hunt Institute for Botanical Documentation.

universities and conducted several botanical studies in the Canaries (e.g., Lems, 1958a, 1960, 1968; Lems & Holzappel, 1971). His PhD project was also based on the study of plants from this archipelago (Lems, 1958b). Lems died in a car accident when he had an academic position as an Assistant Professor of Ecology at Goucher College, Baltimore (Anonymous, 1968).

Among these early North American botanists, who conducted research in Macaronesia, William Trelease (1857-1945, Fig. 1) clearly provided the most relevant contributions to the flora of these Atlantic islands. Born in New York (Mount Vernon), he became the first director of the Missouri Botanical Garden (thereafter MO) in 1889 holding this position until 1912. Subsequently he had an appointment as professor and head of the Department of Botany of the University of Illinois from which he retired in 1926 (Buchholz, 1945; Kunkel, 1961). William Trelease was a versatile botanist, we should say biologist, and just a brief look at his early publications list demonstrated the enormous range of subjects he covered. His doctoral thesis from Harvard University was in cryptogamic botany (Buchholz, 1945). He conducted research on plant diseases including remedies for cotton insects (Trelease, 1879a). He had an early interest in entomology (Trelease, 1880a, 1880b). Trelease (1879b, 1879c) and carried out studies of fertilization and pollination in North American plants including *Lobelia* L. (Campanulaceae) and



**Figure 2.** The nine Islands visited by William Trelease during his expeditions to the Azores (1894 and 1896), Madeira (1896), and the Canaries (1932).

*Poinsettia* Graham (Euphorbiaceae). He published papers on fungi (Trelease, 1884) and also wrote on nectar and humming bird pollination (Trelease, 1880c) – what would be called in modern terms reproductive biology. As a plant systematist Trelease named and described over 2,500 new species and varieties of plants (Buchholz, 1945) and was an authority on the taxonomy of the Piperaceae, oaks and the Santalaceae genus *Phoradendron* Nutt. (e.g., Trelease, 1927, 1929a; 1929b). Furthermore, he worked in the Caribbean Islands where his most relevant work was a monograph of *Agave* L. (Asparagaceae; Trelease, 1913).

Regarding his Macaronesian studies (Fig. 2), Trelease visited the Azores (in 1894 and 1896), Madeira (in 1896) and the Canaries (in 1932). In this contribution to *Vieraea*, issued to celebrate the career of our colleague Lázaro Sánchez-Pinto, we provide an introduction of the work that William Trelease carried out in these Atlantic islands. To conduct our study, research in archives and herbaria was undertaken and we also examined the content of his publications. The present contribution aims to give the reader an introduction to Trelease's activities in Macaronesia. He published an extensive illustrated catalogue of plants for the Azores, collected many herbarium specimens in the three archipelagos that he visited and exchanged correspondence with Azorean naturalists. However, a full study of these letters, herbarium collections and floristic catalogue will be the subject of additional research and will not be part of this paper. In this contribution we follow Thiers [continuously updated] for acronyms of herbaria where relevant material is housed. As a working taxonomy we follow González Mancebo *et al.*

(2009), Gabriel et al. (2010), Silva et al. (2010), Menezes de Sequeira et al. (2012), and Moura et al. (2015a, 2015b).

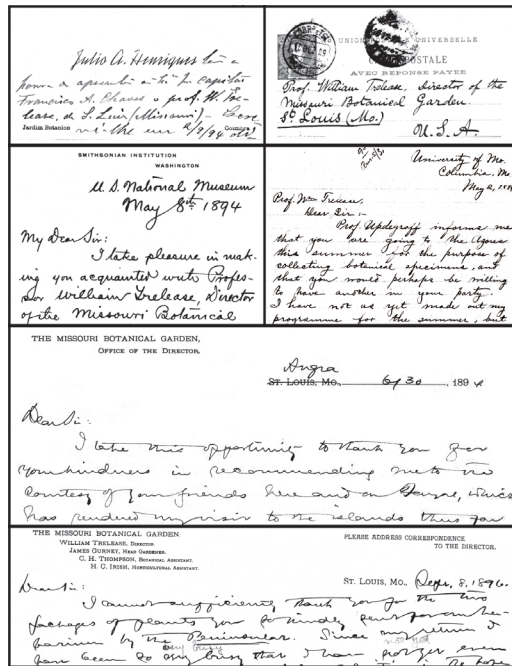
## WILLIAM TRELEASE IN THE AZORES AND MADEIRA

### AZORES

Trelease travelled to the Azores during the summers of 1894 and 1896 and only one year after these visits he published a long and relevant monograph on the flora of this archipelago (Trelease, 1897; thereafter *Botanical Observations*). This floristic treatment presented a catalogue of a total of 1,005 taxa and also has an extensive account of the phytogeography, agriculture, and botanical history of the archipelago. The list of species documented by Trelease was based on his own records and collections, the study of previous floras [i.e., Seubert & Hochstetter (1843), Watson (1843, 1844, 1847, 1870), Seubert (1844), and Drouet (1866)] and the examination of specimens collected by four other natural historians [i.e., Calvin S. Brown (1866-1945), Bruno T. Carreiro (1857-1911), Carlos Gomes Machado (1828-1901), and José A. N. Sampaio (1827-1900)]. In order to study some of these collections Trelease visited herbaria in the Azores.

Among these four naturalists, Calvin Smith Brown was another USA native who visited Macaronesia in the 19<sup>th</sup> century. A professor of literature and languages at the University of Mississippi, he also had a broad interest in plants and botanized in the Azores in 1894 (the same year that Trelease made his first visit to these islands, see below further discussion) and in Central America and Mexico (Lanjouw & Stafleu, 1954; Lloyd, 1981). The University of Illinois at Urbana-Champaign Archives has one relevant letter from Calvin S. Brown dated 2 May 1894 (archive reference: Record Series 15/4/22, Box 4) in which he asked about the possibility of travelling with Trelease to the Azores in the summer of 1894 (Fig. 3). From the specimen labels of Brown's collections accessioned in MO it is clear that both he and Trelease visited the Azores at the same time; however, it is not certain if they traveled and collected together, as in *Botanical Observations* there is no mention of any joint botanizing during this trip. Furthermore, the herbarium records show that Brown collected in Faial and Pico but, apparently, these two islands were not visited by Trelease.

The three other naturalists, whose collections were studied by Trelease, were all medicinal practitioners from the Azores. The first of them, Bruno Tavares Carreiro, was a doctor and journalist, born in São Miguel and a strong advocate for botanical studies of these islands. He was appointed principal of the *Liceu*



**Figure 3.** Fragments of letters which are relevant to the visits of William Trelease to the Azores. **Top row left:** recommendation letter for William Trelease sent by Julio A. Henriques to Afonso Chaves on 10 May 1894. **Top row right:** card sent to William Trelease by Bruno Tavares Carreiro on December 1899. **Second row left:** recommendation letter for William Trelease sent by Frederick W. True to Afonso Chaves on 8 May 1894. **Second row right:** Letter sent to William Trelease by Calvin S. Brown on 2 May 1894. **Third row:** Letter sent to Francisco Afonso Chaves by William Trelease on 30 June 1894. **Bottom row:** Letter sent to Bruno Tavares Carreiro by William Trelease on 8 September 1896. All letters by courtesy of *Biblioteca Pública e Arquivo Regional de Ponta Delgada* except those on the top row right and second row right positions that are by courtesy of the University of Illinois Archives at Urbana-Champaign.

de *Angra do Heroísmo* in 1884 and assembled an important collection of plant specimens that eventually were housed in the *Museu de História Natural de Ponta Delgada* where he was director of the *Secção de Botânica* until 1911 (Agostinho, 1958; Côrtes-Rodrigues et al., 1958; Tavares, 2007; Jorge et al., 2011). A Terceira native, José Augusto Nogueira Sampaio collected herbarium material in the Azores (Almeida, 2009; Schaefer, 2002). Finally, Carlos Gomes Machado was a strong

supporter of natural history studies of the archipelago. He was born in São Miguel, and in 1876 was one of the founders of the *Museu de História Natural de Ponta Delgada* (also known as *Museu Açoreano de História Natural de Ponta Delgada* or *Museu Açoreano*, currently under the name of *Museu Carlos Machado*). Machado was a devoted plant collector who sent material to specialists all over the world (Arruda, 1998; Jorge et al., 2011).

Of these three Azorean botanists, Trelease maintained correspondence with Carreiro (six letters found in the University of Illinois at Urbana-Champaign Archives, Record Series 15/4/22, Box 4, dates range from 30 December 1897 through 26 November 1909; and 17 letters housed in the *Biblioteca Pública e Arquivo Regional de Ponta Delgada*). The dates range from 8 September 1896 through 27 October 1909 (Fig. 3). Furthermore, he also exchanged letters with Francisco Afonso Chaves (1857-1926), an army officer from Lisbon who belonged to a family with a long tradition and history in the Azores (Jorge et al., 2011). Chaves is famous for his studies on Azores meteorology (Agostinho, 1927) but he is also well-known as the first Portuguese to study freshwater algae from the archipelago (Jorge et al., 2011). Correspondence between Trelease and Chaves (58 letters) is accessioned at *Biblioteca Pública e Arquivo Regional de Ponta Delgada* (archive reference: PT/BPARPD/PSS/FAC/001-191; dates range from 30 June 1894 through 2 February 1905, Fig. 3).

Two additional letters found in these Ponta Delgada archives provide insights regarding into the logistics of Trelease's first trip to the Azores. They were sent to Chaves by Julio Augusto Henriques (letter dated on 10 May 1894, archive reference: PT/BPARPD/PSS/FAC/001-087/000007, Fig. 3), and by Frederick William True (letter dated 8 May 1894, archive reference: PT/BPARPD/PSS/FAC/001-192/000005, Fig. 3). Júlio Augusto Henriques (1838-1928) was the founder of the *Sociedade Broteriana* and director of the Botanic Garden and Herbarium of the University of Coimbra (Cabral, 2008). Frederick William True (1858-1914) was the first head curator of the Department of Botany of the United States National Museum, Smithsonian Institution, Washington DC (Ososky & Pyenson, 2015). These two letters introduced and recommended Trelease to Chaves and informed him about the plant exploration trip that the North American botanist was planning to carry out in the Azores (Fig. 3). Chaves was co-director of the *Museu Municipal de Ponta Delgada*, between 1901 and 1911. He became the director of this museum in 1911, and held this position until 1926. Furthermore, Chaves, Carlos Machado and Bruno Carreiro were members of its administrative committee between 1890 and 1901 (Agostinho, 1958; Côrtes-Rodrigues et al., 1958; Tavares, 2007). Chaves was, therefore, an important and influential contact who was able to facilitate Trelease's

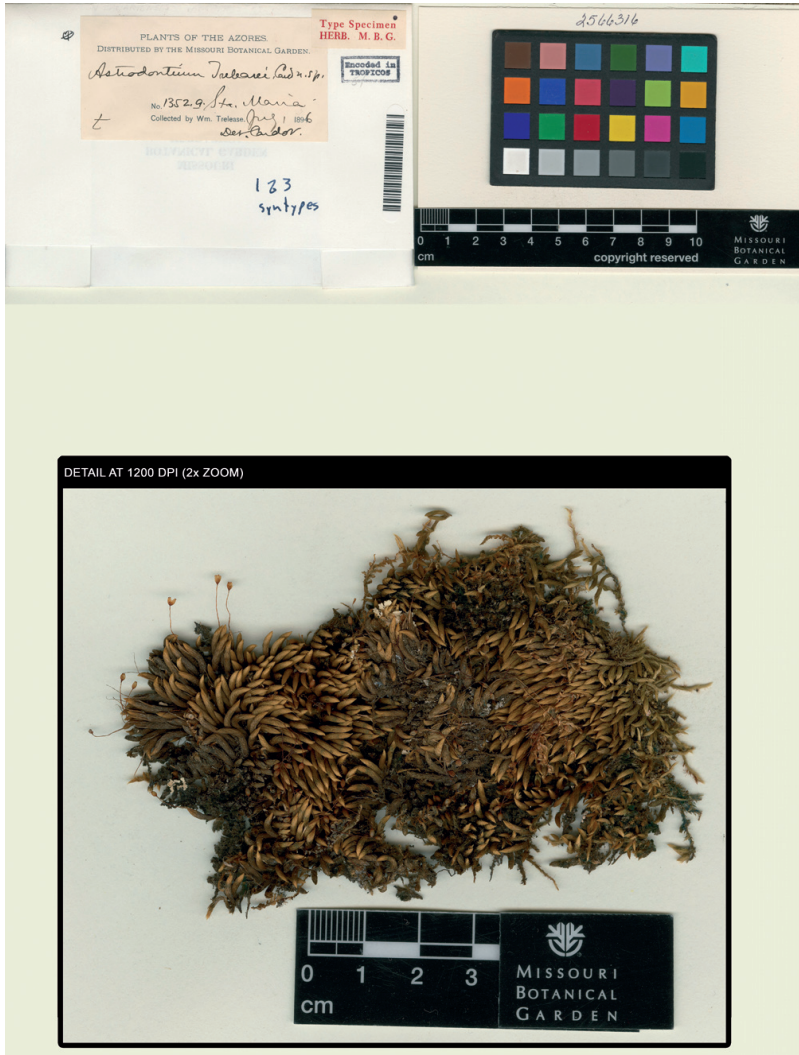
research in the archipelago. The first letter that Trelease sent to Chaves (dated 30 June 1894) was written on letterhead paper from Missouri Botanical Garden. However, it was sent from Angra do Heroísmo, Terceira (Fig. 3). In this letter Trelease thanks Chaves for the help he received during his visit to the archipelago and informs him about plans to travel to the islands of Corvo, Graciosa and São Jorge during this trip.

The floristic monograph for the Azores published by Trelease (1897) is wide and comprehensive, including flowering plants (556 taxa), gymnosperms (four taxa), pteridophytes (45 taxa), bryophytes (137 taxa), lichens (89 taxa), algae (131 taxa), and fungi (43 taxa). He made specimens for taxa belonging to all these groups during his two expeditions. From this floristic account we know that Trelease visited seven of the Azores islands (i.e., Corvo, Flores, Graciosa, Santa Maria, São Jorge, São Miguel, and Terceira, Fig. 2). Apparently, he did not travel to Faial and Pico as there are no records for herbarium material collected by him on these islands. Unfortunately, his *Botanical Observations* do not give precise information on the actual localities that were visited or the collecting dates so until a full study of his collections is made we cannot provide a full detailed itinerary of his expeditions.

It is worth mentioning that Trelease's collections of bryophytes were studied shortly after his return by the famous French botanist and bryologist Jules Cardot (1860-1934) in a paper devoted to mosses of the Azores (Cardot, 1897a). The reader can find a biographical account of Cardot in Bertèmes (1934). Cardot's (1897a) contribution was included in the same issue of the *Missouri Botanical Garden Annual Report* in which Trelease's *Botanical Observations* was published. In this work Cardot (1897a) described eight new taxa with two of them, *Astrodonium treleasei* Cardot [accepted name *Leucodon treleasei* (Cardot) Paris, Leucodontaceae] (González Mancebo *et al.*, 2009); Figs. 4-5) and *Hyophila treleasei* Cardot [accepted name *Trichostomum brachydonium* Bruch, Pottiaceae] (Gabriel *et al.*, 2010)] dedicated to Trelease.

During these two expeditions Trelease made over 1930 collections which are currently housed in the MO herbarium (Trelease, 1897, Fig. 6) with duplicates in the herbarium of *Museu Carlos Machado* at Ponta Delgada, São Miguel (Jorge *et al.*, 2011, Fig. 7). As a result of his floristic research he described two new species and three new varieties. Furthermore, he made new taxonomic combinations for two Azorean endemics.

Regarding the two new species that he described, *Chaerophyllum azoricum* (Figs. 5, 7-8) is an endemic found the islands of Flores, São Jorge, São Miguel, and Pico, and it is threatened because of habitat loss (Pedro *et al.*, 1999; Silva *et al.*, 2009). This species has a relatively high conservation priority and mostly grows in *Erica*



**Figure 4.** Specimen of *Leucodon treleasei* (Cardot) Paris (Leucodontaceae) housed in MO (MO407443) that was collected by William Trelease in Santa Maria on 1 July 1896. The basionym (*Astrodontium treleasei* Cardot) was published by Cardot (1897a) based on material collected by Trelease and C. S. Brown in the Azores. The species name honors W. Trelease. Courtesy of the Herbarium of Missouri Botanical Garden.





**Figure 5.** Plant species found in the Azores that were recorded, collected, or described by William Trelease. All photos made in habitat. **Top left:** *Chaerophyllum azoricum* Trel. (Apiaceae). **Top right:** *Lactuca watsoniana* Trel. (Asteraceae). **Bottom left:** *Viburnum treleasei* Gand. (Adoxaceae). **Bottom right:** *Leucodon treleasei* [Cardot] Paris (Leucodontaceae). Photo credits: all photos by Mónica Moura, except that of *L. treleasei* that was made by Paulo Borges.





**Figure 6.** Lectotype of *Viburnum treleasei* Gand. (Adoxaceae), designated by Moura et al. (2015b). The specimen was collected by William Trelease in Flores on 4 August 1895 and it is housed at MO (MO1679100). Courtesy of the Herbarium of Missouri Botanical Garden.



**Figure 7.** Specimen of *Chaerophyllum azoricum* Trel. (Apiaceae) housed in AZ that was collected by William Trelease in Flores on 6 August 1894. Courtesy of the Herbarium of *Museu Carlos Machado*.





**Figure 8 (image on the left).** Reproduction of the drawing of the Azorean endemic *Chaerophyllum azoricum* Trel. (Apiaceae) that was made by Grace E. Johnson (Trelease, 1897). Courtesy of the Library of *Jardín Botánico Viera y Clavijo*.



**Figure 9 (image on the right).** Reproduction of the drawing of the Azorean endemic *Lactuca watsoniana* Trel. (Asteraceae) that was made by Grace E. Johnson (Trelease, 1897). Courtesy of the Library of *Jardín Botánico Viera y Clavijo*.

scrubland, natural forests and meadows, pioneer scrublands, and roadsides (Silva et al., 2009). The other Azorean endemic species that he described was *Lactuca watsoniana* (Figs. 5, 9). Named after the British botanist Hewett Cottrell Watson (1804-1881) who had visited the Azores during three months in 1842 (Egerton, 2003), this species has major conservation concerns (Silva et al., 2009), and is regarded as Endangered according to the latest IUCN red listing conservation categories (Schaefer, 2011). Recently this Azorean endemic has been the subject of molecular systematic studies (Dias et al., 2018). It is reported for the islands of Faial, Pico, São Jorge, São Miguel and Terceira, (Silva et al. 2010), it is likely to be extinct in São Jorge. This endemic lettuce occurs in moist places and also in deep and narrow ravines, craters, steep slopes, natural meadows, *Erica* scrublands and *Juniperus* forests (Silva et al. 2009).

Among the three new varieties published by Trelease there is *Viburnum tinus* var. *obcordatum* [current accepted name *Viburnum treleasei* (Moura *et al.*, 2015a), Figs. 5-6, 10]. This Azorean endemic is commonly found in clearings and marginal habitats of several of the plant communities of the islands. The second one was *Cardamine caldeirarum* var. *amplifolia* from the island of São Miguel; currently,



**Figure 10.** Reproduction of the drawing of the Azorean endemic *Viburnum treleasei* Gand. (Adoxaceae) that was made by Grace E. Johnson (Trelease, 1897). Courtesy of the Library of *Jardín Botánico Viera y Clavijo*.

however, this taxon is merged within the Azorean endemic *C. caldeirarum*. The third variety that he described was *Tolpis nobilis* var. *petiolaris* [current accepted name *T. azorica*, an Azorean endemic (Silva et al., 2010)].

The two new combinations (i.e., *Ammi seubertianum* and *A. trifoliatum*) made by Trelease (1897) involved transferring two endemic species placed in *Petroselinum* Hill to *Ammi* L. (Fig. 11). He indicated that these taxonomic changes followed the generic concepts established by Bentham & Hooker (1867).

Trelease's floristic monograph also included 55 plates with drawings of 52 taxa. All of these drawings are for plants from the Azores except those of *Deschampsia argentea* from Madeira and *Raphanus raphanistrum* ssp. *landra* from the mainland. Furthermore, drawings of morphs of *Rapistrum rugosum* from the Azores and from the continent are presented in a single plate. A selection of the illustrations published by Trelease (1897), for the Azorean endemics *Chaerophyllum azoricum*; *Lactuca watsoniana*; and *Viburnum treleasei*, are reproduced in here (Figs. 8-10). Table 1 presents a list of the depicted taxa, updated with current accepted names. Our preliminary taxonomic identities for these illustrations will need further confirmation once the Azores herbarium collections made Trelease are studied. This artwork was made by Grace E. Johnson who served as the "artist" of MO at the time (Trelease, 1896). Unfortunately, we have not been able to locate the original drawings produced by her. The MO archives were only established in the 1970s and over the years many documents and records of this botanical garden were not preserved or catalogued (A. Colligan, pers. comm.). Likewise, during our research we could not locate any documents in pertinent to the visits that Trelease made to the Azores and Madeira. The archives of the Division of Rare and Manuscript Collections of Cornell University and of the University of Illinois at Urbana-Champaign Archives house many of Trelease's documents, correspondence, and photos. These two archives, however, do not have the records for the plant exploration expeditions that Trelease made to these Portuguese islands either.

We consider that his broad biological, ecological and evolutionary background led Trelease to turn towards island floras and especially those of some of the Macaronesian Islands. From the introduction of his *Botanical Observations* it appears that during his visits to the archipelago, Trelease was looking for an island with varied vegetation, clear geographical isolation, and, as a consequence, with peculiar and highly differentiated species. In this sense he was rather disappointed as in the same work he made this comment: *One of the most interesting parts of a study of a limited and isolated flora is its ecology. In this respect the flora of the Azores is particularly disappointing [...] primarily because of the small number of truly endemic species.*





**Figure 11.** Azores endemic species that were combined in *Ammi* L. (Apiaceae) by Trelease (1897). All photos made in habitat. **Top:** *Ammi seubertianum* (H.C.Watson) Trel. **Bottom:** *Ammi trifoliatum* (H.C.Watson) Trel. Photo credits: Mónica Moura.

During these two visits to the Azores, Trelease had hoped to find good examples of island biological evolution similar to those that Darwin had described from the Galapagos Islands. This is clearly inferred from the *Botanical Observations: Though it might be expected, no differentiation has yet been shown comparable with that seen in plants of the different islands of the Galapagos group where specific or varietal differentiation is strongly marked*. It appears that like almost all 19<sup>th</sup> century biologists Trelease was strongly influenced by Darwin's ideas, and, therefore, it is not surprising that one of the ultimate aims of his visits to the Azores was to find additional evidence for Darwin's evolutionary paradigm: *the origin of species by natural selection*. The reality is that Trelease was too far north in Macaronesia to be able to find what he was looking for because the evolutionary phenomena and examples that he mentioned can all be found more extensively further south within the Canary Island flora.

Trelease (1897) had a keen interest in plant conservation and wrote: *the endemic flora of the Azores appears to be undergoing a gradual reduction, partly because of the utilization of all available land for agricultural purposes. In some of the islands, even the high-lying pasture lands are being restocked with forage plants from the European and American continents, in the belief that they are more valuable than those native to the islands and the truly native flora, which evidently has always been scanty, has clearly suffered so greatly through the inroads of man and domesticated animals, since the settlement of the Azores*.

## MADEIRA

Trelease never wrote any account on his trip to Madeira; his bryophyte collections were, however, studied by Cardot (1897b). Among the 19 taxa listed by Cardot (1897b), he described a new species: *Bryum serrulatum* Cardot [accepted name *B. canariense* Brid., Bryaceae]. Cardot's (1897b) work on Madeiran mosses has details of the sites where the collections were made and this allowed us to trace the route Trelease took during his expedition to this island. He went north from Funchal, through Monte and to Ribeiro Frio; the latter is a humid forested valley with many moss-covered cliffs. From here he travelled north-west into the densely forested area of Caldeirão Verde and Caldeirão do Inferno where he probably followed the water canals beneath the humid cliffs. He also visited sites located towards the west (Ribeira Brava) and east (Santa Cruz) of Funchal. From the specimen database of MO, we also know that during his stay in Madeira collections were made for vascular plants [specimen numbers 028082 and 923250 are for *Aeonium glandulosum* Webb & Berthel. (Crassulaceae) and *Poa annua* L.

(Poaceae), respectively. They were collected in Ribeira Brava (923250) and Santa Cruz (028082)].

## WILLIAM TRELEASE IN THE CANARY ISLANDS

There is, in the University of Illinois Urbana-Champaign Archives (archive references: Record Series 15/4/22, Box 7, Folder 1932), ample documentation and numerous photographs of the expedition that William Trelease and his wife (Julia J. Trelease) made to the Canaries. Our historical research on their visit to these islands is mostly based on the study of this archive material. The Treleases only visited Tenerife where they stayed in the Hotel Pino de Oro in the capital of the island, Santa Cruz de Tenerife (Figs. 12-13). This hotel was a famous landmark for botanists as its courtyard had a large, famous individual of *Dracaena draco* (L.) L. (Asparagaceae, Fig. 13) that survived until 2005 when the Canaries were hit by the hurricane Delta (Francisco-Ortega *et al.*, 2017) long after the hotel was demolished to be replaced by residential buildings in the late 1960s. The senior author of this contribution stayed in this hotel during the first nights of the very first trip that he made to the Canaries in 1964. He was able to witness the magnificence of this particular dragon tree.

Unfortunately, Trelease did not prepare any publications pertinent to his only visit to the Canaries so a reconstruction of this stay has been made based on the material found in the archives. The Treleases traveled from New York (on January 11) to Tenerife on board the USA vessel *West Lashaway*, with a stop in the port of Horta, Azores Islands (Fig. 14). We have not found information on when this ship reached Santa Cruz de Tenerife. However, from the Pino de Oro hotel invoices we know that by January 27 they were already staying on Tenerife. They left from this island to Cádiz on board the ship *Villa de Madrid* on April 3. After a short stay in Andalucía they returned from Málaga to New York on board the Spanish steamer *Marqués de Comillas* on May 10.

Forty-two photos from Tenerife were located, many of them poorly labeled by Trelease and a few are of low quality; however, because of their historical value five of them are presented in our contribution. This collection of photographs has images for: the Hotel Pino de Oro (Figs. 12-13), the well-known dragon tree of Icod (Figs. 15-16), Puerto de la Cruz (Fig. 17), Mount Teide, the Anaga mountains, La Laguna, Punta del Hidalgo, the harbor of Santa Cruz de Tenerife, and gullies near Santa Cruz de Tenerife. Additional pictures of plants were also taken and they include: *Carica papaya* L. (Caricaceae), a woody *Echium* sp. (Boraginaceae), *Euphorbia canariensis* L. (Euphorbiaceae), a woody *Euphorbia* sp., *Ficus microcarpa* L. (Moraceae), and *Plocama pendula* Aiton (Rubiaceae).

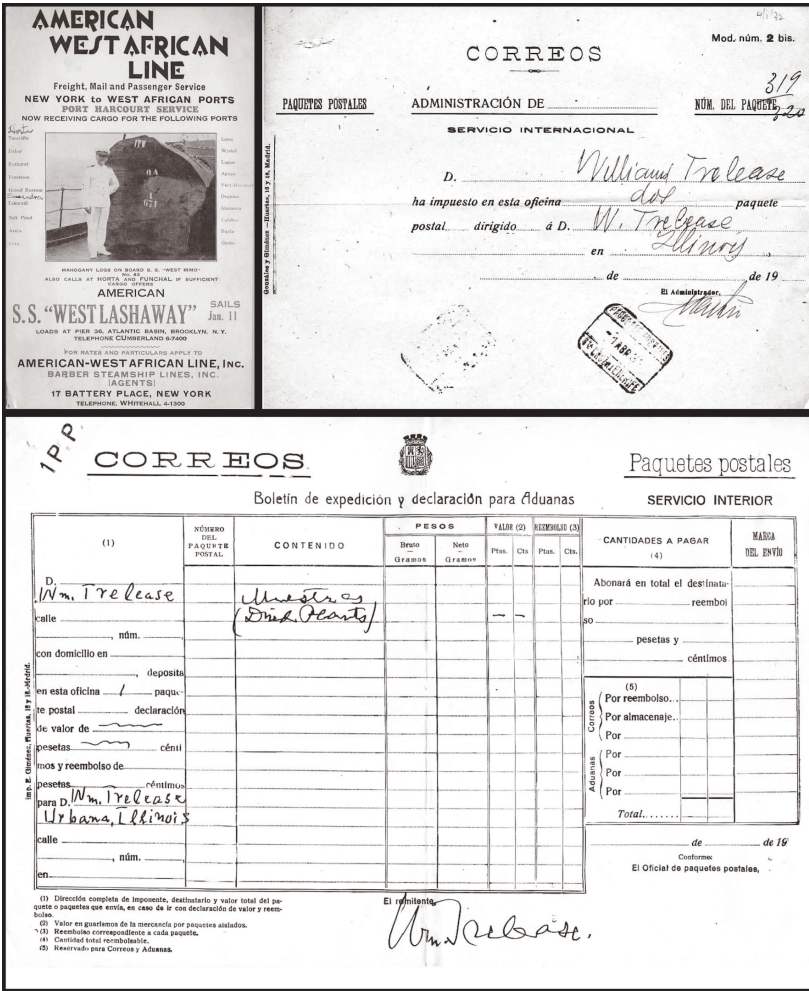




**Figure 12.** Entrance to the Hotel Pino de Oro. Image 0007724, courtesy of the University of Illinois Archives at Urbana-Champaign.



**Figure 13.** Courtyard of Hotel Pino de Oro with the famous individual of *Dracaena draco* (L.) L. (Asparagaceae). Image 0007735, courtesy of the University of Illinois Archives at Urbana-Champaign.



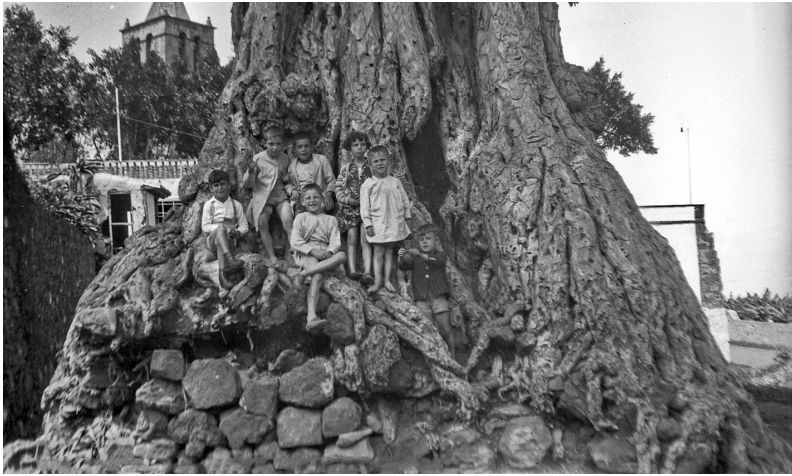
**Figure 14.** Documents pertinent to the visit of William and Julia Trelease to Tenerife in 1932. **Top row left:** advert flier for the departure of the steamship *West Lashaway* from New York to West Africa on January 11, 1932. William and Julia Trelease were among her passengers when they travelled to the Canaries in 1932. **Top row right and bottom row:** packing slips from the Spanish postal office (Santa Cruz de Tenerife branch) for the shipment of dried plant specimens to the herbarium of University of Illinois at Urbana-Champaign. Courtesy of the University of Illinois Archives at Urbana-Champaign (archive reference: Record Series 15/4/22, Box 7, Folder 1932).



**Figure 15.** Base of the trunk of the famous individual of *Dracaena draco* (L.) L. (Asparagaceae) located in Icod. We believe that the person sitting inside the taxi cab is Julia J. Trelease. Image 0007739, courtesy of the University of Illinois Archives at Urbana-Champaign.

We have not found any herbarium specimens collected by Trelease during his trip to the Canaries. On the other hand, among the documents found in the archives we located invoices (dated April 1, 1932) issued by the Spanish postal office of Santa Cruz de Tenerife regarding a shipment of two parcels with “Muestras (Dried Plants)” made by William Trelease to Urbana, Illinois (Fig. 14). However, these specimens are merged with the rest of the general collections of ILL and to locate the Canary Island material exhaustive searches are needed in the herbarium.

Interestingly, during this visit it appears that the Treleases neither visited the Botanic Garden of La Orotava nor contacted any of the resident botanists working in Tenerife. For instance, there are no photos of this botanical institution. Furthermore, among the many business cards that are part of the archive documents, none of them is for local Spanish botanists such as Juan José Bolinaga y Guezala (1881-1962) who was the Head Gardener of this Garden when Trelease was in Tenerife. During his tenure in the Botanic Garden of La Orotava, Bolinaga actively interacted with, and helped foreign botanists who visited the Canaries such as David Fairchild (Francisco-Ortega et al., 2012), Brother Marie-Victorin (Francisco-Ortega et al., 2016, 2017), Thomas A. Sprague (1877-1958) and John Hutchinson (1884-1972) from Britain (Sprague & Hutchinson, 1913) and Leonard Lindinger (1879-1956)



**Figure 16.** Base of the trunk of the famous individual of *Dracaena draco* (L.) L. [Asparagaceae] located in Icod. Image 0007738, courtesy of the University of Illinois Archives at Urbana-Champaign.



**Figure 17.** Sea cliff of Martiánez, Puerto de la Cruz. On top of these cliff there is *Finca La Paz*. This was one of the most famous places visited by Alexander Von Humboldt (1769–1859) in June 1799 when he and Aime Bonpland (1773–1858) stopped in Tenerife during their trip to the New World. Image 0007752, courtesy of the University of Illinois Archives at Urbana-Champaign.



from Germany (Lindinger, 1911, 1918). Likewise, during the first half of the 20<sup>th</sup> century the German naturalist Oskar Burchard (1863-1949) lived in Tenerife and described several new Canary Island endemic species of plants (Sánchez-Pinto, 1993; Lee, 2012). Burchard also provided botanical and field guidance to visitors such as the Crassulaceae taxonomist Robert Lloyd Praeger (1865-1953) from Ireland in 1924 and 1926 (Bramwell, 2013) and the members of the 1908 German-Swiss expedition (Lee, 2012) led by Martin Rikli (1868-1951) and Carl Schröter (1855-1939).

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**Table 1.** Ink illustrations of Azores plants made by Grace E. Johnson and published by Trelease (1897). Taxa are arranged in the same order as they were presented by Trelease (1897).

Accepted name	Taxon as published by Trelease	Plate number	Remarks made by Trelease	Notes
** <i>Ranunculus cortusifolius</i> Willd. ssp. <i>cortusifolius</i> (Ranunculaceae)	<i>Ranunculus megaphyllus</i> Stead.	12		
<i>Fumaria bastardii</i> Boreau (Papaveraceae)	<i>Fumaria bastardi</i> Boreau	13-1, 13-2, 13-3		The correct name for the species listed by Trelease is <i>Fumaria bastardii</i> Boreau
<i>Fumaria densiflora</i> DC.	<i>Fumaria officinalis</i>	13-4		The correct name for the species listed by Trelease is <i>Fumaria officinalis</i> L.
<i>Fumaria densiflora</i>	<i>Fumaria densiflora</i> DC.	13-5		
* <i>Cardamine caldeira</i> Um Guthnick ex Seub. (Brassicaceae)	<i>Cardamine caldeirarum</i> Guthn. var. <i>caldeirarum</i>	14, 15	"divided leaved form" (Plate 15)	
* <i>Cardamine caldeirarum</i>	*** <i>Cardamine caldeirarum</i> var. <i>amplifolia</i> Trel.	16		
<i>Rapistrum rugosum</i> (L.) All. (Brassicaceae)	<i>Rapistrum rugosum</i> All.	17-1, 17-2	"Continental form" (Plate 17-1); "Azorean form" (Plate 17-2)	
<i>Rapistrum perenne</i> (L.) All	<i>Rapistrum perenne</i>	17-3		This illustration matches <i>R. perenne</i> ; however, this species has not been recorded in the Azores and we cannot rule out that Trelease was referring to an individual from the European mainland

<i>Rapistrum rugosum</i>	<i>Rapistrum orientale</i> DC.	17-4		The correct name for the species listed by Trelease is <i>Rapistrum orientale</i> (L.) Crantz
<i>Raphanus raphanistrum</i> L. ssp. <i>Landri</i> (Moretti ex DC.) Bonnier & Lavers (Brassicaceae)	<i>Raphanus landra</i> Moretti	17-5	"Continental form"	The correct name for the species listed by Trelease is <i>Raphanus landra</i> Moretti ex DC.
<i>Raphanus raphanistrum</i> L. ssp. <i>raphanistrum</i>	<i>Raphanus raphanistrum</i> L.	17-6, 17-7		
* <i>Spergularia azoica</i> (Kindsb.) Lebel (Caryophyllaceae)	<i>Spergularia macrorrhiza</i>	18	"these would all appear under <i>Tissa</i> ".	The correct name for the species listed by Trelease is: <i>Spergularia macrorrhiza</i> (Req. ex Loisel.) Huynh. <i>Tissa</i> is regarded as a synonym of <i>Pergola</i>
* <i>Hypericum foliosum</i> Aiton (Hypericaceae)	<i>Hypericum foliosum</i> Dryand.	19		
<i>Hypericum elodes</i> L.	<i>Hypericum elodes</i> Huds.	20		
* <i>Ilex azarica</i> Gland. (Aquifoliaceae)	<i>Ilex perado</i> Ait.	21	"two forms of foliage"	
<i>Potentilla anglica</i> Laichard. (Rosaceae)	<i>Potentilla procumbens</i> Sixth.	22		
* <i>Ammi huntii</i> H.C. Watson (Apiaceae)	<i>Ammi huntii</i> Watson	23		
* <i>Ammi seubertianum</i> (H.C. Watson) Trel.	**** <i>Ammi seubertianum</i>	24		Trelease assigned informally the combination <i>Ammi seubertianum</i> to Bentham & Hooker
* <i>Ammi trifoliatum</i> (H.C. Watson) Trel.	**** <i>Ammi trifoliatum</i>	25		Trelease assigned informally the combination <i>Ammi trifoliatum</i> to Bentham & Hooker

* <i>Chaerophyllum azoricum</i> Trel. (Apiaceus)	**** <i>Chaerophyllum azoricum</i> Trel.	26			
* <i>Hedera azarica</i> Carrière (Araliaceae)	<i>Hedera canariensis</i> Willd.	27			
* <i>Viburnum treleasei</i> Gand. (Adoxaceae)	**** <i>Viburnum tinus</i> var. <i>subcordatum</i> Trel.	28			The correct name for the taxon listed by Trelaise is: <i>Viburnum tinus</i> L. var. <i>subcordatum</i> Trel.
* <i>Scabiosa nitens</i> Roem. & Schult. (Dipsaceae)	<i>Scabiosa nitens</i> Roem. & Sch	29			
<i>Chamaemelum nobile</i> (L.) All. (Asteraceae)	<i>Anthemis nobilis</i> L. var. <i>aurea</i> DC.	30			
<i>Coleostephus myconis</i> (L.) Rchb.f. (Asteraceae)	<i>Chrysanthemum myconis</i> ? L.	31			
<i>Delairea odorata</i> Lem. (Asteraceae)	<i>Senecio mikanioides</i> Otto.	32			
* <i>Tolpis azarica</i> (Nutt.) P.Silva (Asteraceae)	**** <i>Tolpis nobilis</i> var. <i>petiolaris</i> Trel.	33			
* <i>Tolpis azarica</i>	<i>Tolpis nobilis</i> Hochst.	34-1, 34-2			"toward <i>T. fruticosa</i> " (Plate 34-2)
*** <i>Tolpis succulenta</i> (Aiton) Lowe	<i>Tolpis fruticosa</i> Schrank.	34-3, 35, 36			"aberrant form" (Plate 34-3); "pectinate form" (Plate 36)
<i>Leontodon saxatilis</i> Lam. (Asteraceae)	<i>Leontodon hirtus</i> L.	37			Illustration 34-3 is difficult to interpret and it seems that it could be an introgressive form between <i>T. azarica</i> and <i>T. succulenta</i>



* <i>Leontodon</i> × <i>carreirai</i> (Gand.) M. Moura & L. Silva	<i>Leontodon hirtus?</i> L.	38		
* <i>Lactuca watsoniana</i> Trel. (Asteraceae)	*** <i>Lactuca watsoniana</i> Trel.	39		
* <i>Vaccinium cylindraceum</i> Sm. (Ericaceae)	<i>Vaccinium cylindraceum</i> Smith	40		
* <i>Myosotis maritima</i> Hochst. ex Seub. (Boraginaceae)	<i>Myosotis maritima</i> Hochst.	41		
<i>Ipomoea imperati</i> (Vahl) Griseb. (Convolvulaceae)	<i>Ipomoea carnosa</i> R. Br.	42		
<i>Solanum pseudocapsicum</i> L. (Solanaceae)	<i>Solanum pseudocapsicum</i> L.	43		
<i>Physalis peruviana</i> L. (Solanaceae)	<i>Physalis peruviana</i> L.	44		
<i>Persicaria decipiens</i> (R.Br.) K.L.Wilson (Polygonaceae)	<i>Polygonum serrulatum</i> Lag.	45		
* <i>Euphorbia stygiana</i> H.C.Watson ssp. <i>stygiana</i> (Euphorbiaceae)	<i>Euphorbia stygiana</i> Watson	46		
* <i>Euphorbia azorica</i> Hochst. ex Seub.	<i>Euphorbia azorica</i> Hochst.	47		
** <i>Carex pilulifera</i> L. ssp. <i>azorica</i> (J. Gay) Franco & Rocha Afonso (Cyperaceae)	<i>Carex azorica</i> Gay	48		
<i>Carex peregrina</i> Link	<i>Carex macrostyla</i> Lapeyr. var. <i>peregrina</i> L.H. Bailey	49		The correct name for the taxon listed by Trelease is: <i>Carex macrostyla</i> var. <i>peregrina</i> (Link) L.H. Bailey ex Trel.

cf. <i>Agrostis x hackeifii</i> Fouill. (Poaceae)	<i>Agrostis verticillata</i> Vill. x [A.] <i>castellana</i> Boiss. & Reut.?	50			
<i>Agrostis castellana</i> Boiss. & Reut.	<i>Agrostis castellana</i> Boiss. & Reut.	51, 52, 53, 54, 55, 56			
* <i>Deschampsia foliosa</i> Hack. (Poaceae)	<i>Deschampsia foliosa</i> Hack.	57			
*** <i>Deschampsia argentea</i> (Lowe) Lowe	<i>Deschampsia argentea</i>	58			This is plate is for a species from Madeira, and it was depicted by Trelease for comparison with <i>D. foliosa</i>
<i>Eleusine tristachya</i> (Lam.) Lam. (Poaceae)	<i>Eleusine barcinonensis</i> Costa	59			
* <i>Festuca francoi</i> Fern. Prieto, C. Aguiar, E. Dias & M. I. Gut. (Poaceae)	<i>Festuca jubata</i> Lowe	60			
* <i>Festuca petraea</i> Guthnick ex Seub.	<i>Festuca petraea</i> Guthn.	61			
<i>Bromus catharticus</i> Vahl (Poaceae)	<i>Bromus unioloides</i> HBK	62			
<i>Pteridium aquilinum</i> (L.) Kunh (Dennstaedtiaceae)	<i>Eupteris aquilina</i> Newman	63			"aberrant form"
<i>Ophioglossum lusitanicum</i> L. (Ophioglossaceae)	<i>Ophioglossum vulgatum</i> L. var. <i>polyphyllum</i> Milde	64			The correct name for the taxon listed by Trelease is: <i>Ophioglossum vulgatum</i> L. var. <i>polyphyllum</i> (A. Braun ex Schub.) Milde. This species does not occur in the Azores

<p><b>**Huperzia suberecta</b> (Lowe) Tardieu and <b>**Huperzia dentata</b> (Herter) Holub (Lycopodiaceae)</p>	<p><i>Lycopodium selago</i> L. var. <i>suberectum</i> Bak. -</p>	<p>65</p>	<p>The correct name for the taxon listed by Trelease is: <i>Lycopodium selago</i> L. var. <i>suberectum</i> (Lowe) Bak. The two upper illustrations of this plate match <i>Huperzia suberecta</i>; however, the lower one appears to belong to <i>H. dentata</i> as it depict an individual with serrate margins in some of the leaves</p>
<p><b>*Isoetes azorica</b> Durieu ex Milde (Isoetaceae)</p>	<p><i>Isoetes azorica</i> Durieu</p>	<p>66</p>	

\*Azores endemic

\*\*Macaronesian endemic

\*\*\*Madeira endemic

\*\*\*\*New taxonomic name published by Trelease (1897)

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