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## Honoring Sabin Berthelot: Nomenclature and botanical history of *Berthelotia* DC. (Asteraceae, Inuleae)

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**Abstract.** The genus *Berthelotia* DC. (presently a synonym of the accepted name *Pluchea* Cass.), Asteraceae, Inuleae has been regarded as comprising two species, *B. lanceolata* DC. and *B. sericea* (Nutt.) Rydb. It honors the French naturalist Sabin Berthelot (1794–1880) for his contribution to the studies of the flora and fauna of the Canary Islands. Under the leadership of Philip B. Webb (1793–1854), Berthelot co-authored the most important work pertinent to the natural history of this archipelago: *Histoire Naturelle des Îles Canaries*. The nomenclature of *Berthelotia* and its associated names are revisited here. The holotype of *Polypappus sericeus* Nutt. (K000974653) was located, and lectotypes were assigned to *B. lanceolata* (G00450458) and *B. lanceolata* var. *senegalensis* DC. (G00452584). Phylogenetic analyses based on nucleotide sequences of the nrDNA ITS were conducted focusing on members of what is known as the Clade J of the Inuleae. A well-supported clade (100% P.P.) that we have labeled as “Clade I” was uncovered, and it is composed of three species that belong to the *Pluchea indica* Clade plus *P. dioscoridis* and *P. ovalis*; but this lineage did not support a previous hypothesis to include *P. lanceolata*. The two species of *Berthelotia* did not form a monophyletic group and seem to be distantly related; furthermore, none of these two taxa is sister to

*Tessaria*, a South American genus that has been suggested to be a close relative to *Berthelotia*. Ethnobotanical uses of *B. lanceolata* and *B. sericea* are reviewed.

**Keywords:** Asteraceae, *Berthelotia*, Canary Islands, India, Sonora Desert, Mexico, USA, Nomenclature, Phylogeny, Sabin Berthelot, Philip Barker Webb, Taxonomy.

## INTRODUCTION

The botanical history of the Canary Islands has been highly influenced by the British botanist Philip B. Webb (1793–1854) and the French naturalist Sabin Berthelot (1794–1880; Figure 1). They were the editors and main authors of the *Histoire Naturelle des Îles Canaries* (thereafter “*Histoire Naturelle*”), a multivolume work published between 1835 and 1850, that includes the *Phytographia Canariensis* (thereafter “*Phytographia*”), the most important single work ever published on plant taxonomic diversity of the Canaries (Webb and Berthelot 1835–1850).

The journal *Webbia* honors Webb in recognition for establishing in his will that his extensive herbarium, botanical documents, and personal house located in Paris were to be bequeathed to the Grand Duke of Tuscany Leopold II of Lorraine (1797–1870). After the demise of Webb, his house in Paris was sold to establish an endowment for the curation of the archives and herbarium collection that he donated to Tuscany. Currently, Webb’s specimens are a central part of the FI herbarium of the *Sezione Botanica “F. Parlatore”* of the Natural History Museum of the University of Florence, constituting the *Herbarium Webbianum*. His entire library and archives are kept in the *Biblioteca di Scienze – Fondi di Botanica* and *Fondi Archivistici*, also at the University of Florence.

In a recent work published in the journal *Webbia*, a botanical history and nomenclature study was presented, including a discussion of the description of the genus *Webbia* by three different botanists who published this name independently, referring to three taxa belonging to different families (Asteraceae, Hypericaceae) or tribes within Asteraceae (Astereae and Vernonieae). Francisco-Ortega et al. (2022) recognized the legacy of this outstanding British botanist, and the research that we are presenting in this issue of *Webbia* is in many aspects a follow up of the work that we previously published on the genus *Webbia*, as it provides nomenclature and historical insights into *Berthelotia* DC. (Asteraceae, Inuleae), a genus that the Swiss botanist Augustin Pyramus de Candolle (1778–1841, Figure 1) dedicated to Sabin Berthelot encompassing two species, *B. lanceolata* DC. and *B. sericea* (Nutt.) Rydb.

There have been a few extensive studies pertinent to the life of Sabin Berthelot (e.g., Zerolo 1881; Drouin 2007;

Instituto de Estudios Canarios 1980; Santos-Guerra 2016; Le Brun 2016, 2020), and he also wrote autobiographical accounts (1838–1840, 1980) that help to reconstruct the most relevant aspects of his life. Therefore, a full biog-



**Figure 1.** Portraits of relevant botanists involved in the botanical history of *Berthelotia* DC. (Asteraceae, Inuleae). (A) French naturalist Sabin Berthelot to whom *Berthelotia* is dedicated. (B) Swiss botanist Augustin Pyramus de Candolle who described *Berthelotia* and *B. lanceolata* (accepted name *Pluchea lanceolata* (DC.) C.B. Clarke). (C) British botanist Thomas Nuttall who described *Polyppappus sericeus* (accepted name *Pluchea sericea* (Nutt.) Coville). (D) Swedish-American botanist Per A. Rydberg author of the combination *Berthelotia sericea* (Nutt.) Rydb. (A) Courtesy of the *Museo Municipal de Bellas Artes*, Santa Cruz de Tenerife, image kindly provided by Carlos Gaviño de Franchy. (B) Courtesy of the Royal Botanic Gardens, Kew. (C) Courtesy of Harvard Art Museums. (D) Courtesy of Hunt Institute for Botanical Documentation.

raphy regarding his achievements and challenges are outside the scope of this contribution. However, information pertaining to his botanical contributions should be reviewed in order to fully understand why one of the most important plant taxonomists of the 19<sup>th</sup> century, Augustin P. de Candolle, described the genus *Berthelotia* to honor him. An overview of Berthelot's biography and botanical work is therefore presented below.

#### *Sabin Berthelot: A biographical sketch*

Unlike Webb, Berthelot did not have any formal academic training in biological disciplines. Born in Marseille (April 4, 1794), between 1804 and 1809 he only undertook secondary education studies in the Liceum of Marseille (also known as *Lycée Impérial*). Afterwards, he served in the French Navy from 1809 to 1814. Berthelot was uninterested in formal academic studies, and this could explain why he never pursued higher education (Le Brun 2016: 64–65). After this military service, he started to work as a civil sailor in 1816, and little is known about his professional activities between this year and 1819 (Le Brun 2016: 70–71). He arrived in the Canary Islands (Tenerife) in 1820. Berthelot (1838–1840: 11–14) indicated that he reached the Canaries by coincidence, as a trip he took to Senegal had several misfortunes that caused the vessel in which he travelled to change route to Tenerife. Once in the Canaries, in May 1824 he opened a high school in the city of La Orotava under the name of *Liceo de la Orotava*, but this initiative was halted in April 1825 by the Catholic clergy as they opposed the establishment of liberal education centers in Tenerife (Le Brun 2016: 120). During this time he was also connected with the Botanic Garden of La Orotava through its founder Alonso de Nava y Grimón (*VI Marqués de Villanueva del Prado*). During this time, in his publications, Berthelot (1827a, 1827b, 1828a, 1828b) cited his job title as the “Director” of the garden; however, he never had any official appointment for this or any position in this garden (Le Brun 2016: 121). Founded in 1788, it is the oldest botanic institution of Macaronesia and the second oldest of Spain. It was part of a network of *Jardines de Aclimatación* (acclimation gardens) that the Spanish Crown had in the Canaries and mainland Spain (Puerto Sarmiento 1988: 201; 2002: 34; Cioranescu 2010: 150–151). Berthelot (1844) had an interest in plant acclimation protocols to cultivate plants into temperate regions, and this could explain Alonso de Nava's interest in having him associated with this botanic garden.

In 1828, eight years after his arrival to the archipelago, he met Webb in one of the gorges located near the main harbor of the island in Santa Cruz de Tenerife.

It seems that they met by chance when they were botanizing in this area (Santos Guerra 2007); importantly, this casual meeting led to a massive joint project that resulted in the afore-mentioned work entitled *Histoire Naturelle des Îles Canaries*. Webb's original plan was to continue his travel to Brazil to study its natural history; however, his plans were cancelled, and for two years Webb and Berthelot travelled through the archipelago, with Berthelot employed by Webb as his field assistant. Together they collected natural history specimens and gathered information pertinent to the Canarian flora, fauna, geography, and geology; with the exception of La Gomera and El Hierro, they visited all islands (including La Graciosa) (Relancio Menéndez and Breen 2006: 38, 56, 61). In 1830, Webb and Berthelot traveled back to Europe aiming to produce an extensive account on the natural history of the Canaries. After this long trip across the continent, they arrived in Paris in 1833.

Webb and Berthelot had several disagreements regarding the structure and focus of this work that was exacerbated by 1841 when their partnership collapsed (Suárez Martín 2018: 169–170). Webb's vision was to follow the approach done in other well-known natural history or flora projects that were published by naturalists such as Ruiz and Pavón (1794) in their *Florae Peruvianaes, et Chilensis* or Augustin de Saint-Hilaire (1829–1833) in his *Flora Brasiliae Meridionalis*. These were based mostly on solid taxonomic treatments and were richly illustrated with color plates. In contrast, Berthelot preferred that an important component of the work to be written in French, mostly including aspects pertinent to the ethnography, society traditions, and history of the Canaries. These topics were rarely covered in other books that followed a scientific approach to the natural history of a particular area during this time. The volume-parts of the *Histoire Naturelle* that had Berthelot as the single author were written in French and did not have any formal plant taxonomic components (Berthelot 1835–1842, 1836–1839, 1838–1840, 1840–1842). Regarding Berthelot's botanical contributions to this project, he was the sole author of the *Geographie Botanique*, totaling 181 pages and represents the first part of Volume 3 of this work (Berthelot 1835–1842).

All taxa described in the *Phytographia* that involved Berthelot had him as the second author and Webb as the first author. Authorship of this extensive floristic and taxonomic treatment and of the *Géographie Botanique* was one of the reasons behind the intense arguments that they had in 1841 and 1842 (Suárez Martín 2018: 171, 213, 219), and it is likely that they also pertained to the author order of the new taxa included in the *Phytographia*. As far as we are aware, prior to his involve-

ment in the *Histoire Naturelle*, Berthelot (1827b) validly published only a single new species by himself, the Tenerife endemic *Viola teydea* Berthel. (alternative name *V. canariensis* Berthel.); however, this is a heterotypic synonym of the previously validly published species *V. cheiranthifolia* Bonpl. in 1807<sup>1</sup>. Unlike Berthelot's background, Webb had a solid botanical training acquired in Oxford, with expertise in classical Greek and Latin languages, and importantly a good understanding of taxonomic methods and protocols. After their split in 1842, Berthelot followed other endeavors that included traveling across the Western Mediterranean to perform fisheries studies for the French government (Le Brun 2016: 285–291). Eventually, he returned to Tenerife in 1847 to start working in the French Consulate of the island, where in due course he was appointed First Class Consul in 1874 (Le Brun 2016: 360).

After 1842, several parts of the *Phytographia* were published until the project ended in 1850. Between 1842 and Webb's death (31 August 1854) they exchanged nine letters (Suárez Martín 2018: 38–39, 216–239, pers. comm.). However, only one of the letters (October 11, 1844) makes reference to galley proofs revised by Berthelot and discussions regarding the meaning of common plant names from the Canaries, suggesting that in spite of the intense arguments they had in 1842, Berthelot was still somehow associated with the *Histoire Naturelle* project.

Based on his life-time publication record, it is evident that the vast majority of Berthelot's single-author publications were devoted to the general public and had a wide range of topics. Appendix 1 lists the 29 botanical publications authored by Berthelot, 17 of them focused on the Canary Islands and the rest covered introductory works to Caribbean plants, ivies, larches, *Orchilla* lichens, palms, violets, and the importance of plant acclimation. These popular publications were important outreach initiatives aimed at generating interest in the general public, particularly those published in Spanish for Canary Islands magazines such as *Revista de Canarias*, *Eco de Comercio*, and *El Amigo del País* contributed to increase public awareness for the study and conservation of the botanical history heritage of these islands.

The importance of Berthelot's contributions to the botanical research history of the Canary Islands cannot be understated as he assisted Webb to make his floristic

and taxonomic assessments. As Webb's project employee, Berthelot was actively involved in organizing the herbarium collections that were used for the extensive floristic component of this work, and there is no doubt that they had discussions pertinent to the identification of the plant material that was examined for the *Phytographia*. Indeed, when Candolle (1836: 375) described the sunflower genus *Berthelotia* as a homage to Berthelot's, he states "Fruticulum elegantem dicavi cl. [clarissimus] Berthelot florae faunaeque Canariensis strenuo illustratori" [I have dedicated this elegant small shrub to honorable Berthelot, an active interpreter of the flora and fauna of Canary Islands], acknowledging the importance of Berthelot's input in the *Histoire Naturelle* to the study of the unique flora and fauna of these islands.

#### BOTANICAL HISTORY AND SYSTEMATICS

When Webb and Berthelot worked on the publication of the *Histoire Naturelle des Îles Canaries*, they were able to interact with some of the most prominent botanists from Europe. A total of 15 of the family treatments found in this work were written by some of these distinguished plant taxonomists (Relancio Menéndez and Breen 2006: 176; Santos-Guerra 2018). Among them was the Swiss botanist Alphonse Pyramus de Candolle (1806–1893), who prepared the revision of Myrsinaceae (currently merged within the Primulaceae). He was the son of Augustin Pyramus de Candolle who was the founder of the Candolle's botanical dynasty, a family based in Geneva which provided consequential botanical research contributions during four consecutive generations, with the last member of this lineage being Richard Émile Augustin de Candolle (1868–1920).

Augustin P. de Candolle did not write any text for the *Histoire Naturelle*, but he and Webb had extensive correspondence that included 38 letters housed in the *Conservatoire et Jardin botaniques de Genève– Archives* (22 letters) and in the University of Florence– Science Library (16 letters). Candolle exchanged with Berthelot only four letters, which are currently housed in the Archives of the Botanic Garden of Geneva. The content of these numerous letters includes many botanical inquires pertinent to the seminal work of Webb and Berthelot on the Canary Island flora, and it is unclear why this prominent Swiss botanist was not involved in preparing any of the plant taxonomy accounts of the *Histoire Naturelle*. Plausible reasons were that he already had a large commitment with the publication of his *Prodromus*, and that he suffered poor health during his last years of life and eventually passed away in 1841, when

<sup>1</sup> Alexander von Humboldt (1769–1859) and Aimé Bonpland (1773–1858) have been usually considered as the coauthors of the species name *Viola cheiranthifolia*; however, Bonpland alone is credited for the text of the two volumes of *Plantae aequinoctiales* (title page: "in Ordinem Digest: Amatus Bonpland"); Stafleu and Cowan (1979: 367, #3141) also mentioned that Bonpland is the author of the text. Therefore, the correct authorship for this species name is: *Viola cheiranthifolia* Bonpl. as indicated in the websites [www.ipni.org](http://www.ipni.org) and [plantsoftheworldonline.org/](http://plantsoftheworldonline.org/)

the *Phytographia* was still in progress. This section of the *Histoire Naturelle* was by far the largest (1403 pages and 287 plates) of this multivolume enterprise, and it was published in 106 independent *livraisons* (booklets) ranging from 1835 to 1850 (Stearn 1937).

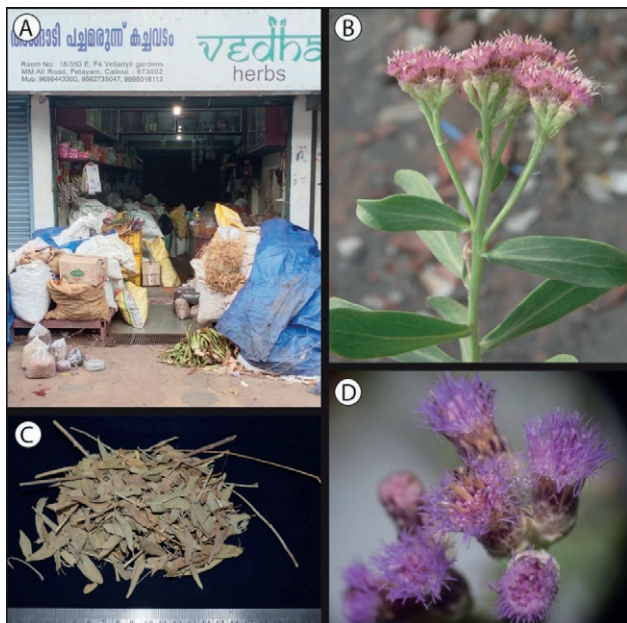
Augustin de Candolle's autobiography has a few details regarding his interactions with Webb and Berthelot that confirm that they sought his help as they were preparing the *Phytographia* (Candolle 2004: 459). As already mentioned, in 1830 they moved from the Canaries to continental Europe to prepare the *Histoire Naturelle*. However, before reaching their final destination in Paris in 1833, they travelled extensively for three years in North Africa, the French Mediterranean region, Italy, and Switzerland. According to Candolle (2004: 459), during this journey Webb and Berthelot spent a few months in Geneva where they shared herbarium specimens with, and studied Canarian collections that were made by botanists who visited these islands, particularly Pierre M. Auguste Broussonet (1761–1807) from France, Antoine Courant from Switzerland, and Christen Smith (1785–1816) from Norway. Evidently, Berthelot had high respect for Candolle, and one year after he and Webb settled in Paris, he wrote a biographical account on him (Berthelot 1834) that was one of the few published biographies produced before Candolle passed away in Geneva in 1841 (Candolle 1862: 588). During his life Berthelot (1839a, 1839b) wrote only two other botanical biographies; they were for the French botanists Joseph P. Tournefort (1656–1708) and Valmont de Bomare (1731–1807).

It is worth mentioning that Augustin de Candolle's descriptions of *Berthelotia* and *Webbia* were published in volume 5 of his monumental *Prodromus* (Candolle 1836: 72, 375–376). Although, both genera belong to Asteraceae, *Berthelotia* is a member of the tribe Inuleae, whereas *Webbia* is placed within the tribe Vernonieae. The contents of two of the letters that Candolle exchanged with Webb and Berthelot reveal that he had other sunflower plants in mind to pay homage to his French and British friends. One of these letters is located in the University of Florence– Science Library (dated 13 April 1833, from Candolle to Webb, document #73.9.1–73.9.6), the second one is housed in the Archives of the library of Botanic Garden of Geneva (dated 12 July 1833, from Berthelot and Webb to Candolle, unnumbered document). The second of these letters has a more extensive account regarding Candolle's plans to describe *Berthelotia* than the other one. Therefore, an annotated translation of the latter is presented in Appendix 2, since it also deals with the taxonomic identity of Asteraceae specimens that Webb and Berthelot examined for their Canary Island flora work.

These two letters indicate that Candolle's original plan was to describe *Webbia* based on plants growing in Greece (Francisco-Ortega et al. 2022). However, Candolle (1836: 72) eventually described *Webbia* based on collections from Africa and not from the eastern Mediterranean. Nevertheless, *Webbia* DC. is illegitimate, as it is preceded by the earlier name *Webbia* Spach (Guttiferae = Hypericaceae). Therefore, those species that were placed in *Webbia* DC. are currently accommodated in the Vernonieae genera *Crystallopollen* Steetz or *Hilliardiella* H. Rob. (Francisco-Ortega et al. 2022; J.C. Manning pers. comm.; Manning and Govaerts in prep.).

The information found in these two letters is also relevant to the botanical history of *Berthelotia*. From these letters it appears that, at least initially, Candolle wanted to publish the new genus *Berthelotia* to accommodate both the Canarian-Salvagen endemic *Chrysocoma sericea* L.f., and a new species, restricted to Gran Canaria, that was going to be named "*B. glaberrima*." It seems that when Candolle exchanged these letters, he was unaware of *Schizogyne* Cass. (Asteraceae), which was published earlier by Cassini (Cuvier 1828). *Schizogyne*, endemic to the Canary and Savage islands, is the taxonomic choice to transfer *Chrysocoma sericea* to a different genus and to accommodate the new taxon to which Candolle assigned the species epithet of "*glaberrima*." Later, Candolle (1836: 75) was aware of *Schizogyne* as the taxonomic option for these rearrangements, because in the same work in which he described *Berthelotia* (Candolle 1836: 375–376), he made the new combination *S. sericea* (L.f.) DC. and validly published *S. glaberrima* DC. as a new species (Candolle 1836: 473). Candolle's plans to dedicate a genus name to Berthelot did not change, and he still described *Berthelotia*, but it was not based on Canary Islands plants but on a species that he named *B. lanceolata* DC. (Candolle 1836: 376, Figures 2-3), which has a relatively widespread distribution in India, Pakistan, Afghanistan, and Tropical Africa (Figure 4; King-Jones 2001: 82–84).

Following the well-known treatment of Bentham and Hooker (1873) on the classification of Compositae plant genera, taxonomists have not recognized *Berthelotia* as a distinct genus, and currently *Berthelotia* is treated as part of *Pluchea* Cass. (Compositae Working Group – CWG 2022). Bentham and Hooker's (1873) generic concepts for the Asteraceae have been greatly influential in the taxonomic history of this family (Cronquist 1977); however, from their work it is not readily evident whether Bentham and Hooker (1873: 291) recognized *Berthelotia* (printed in small cap font) as part of *Pluchea* but without any taxonomic rank, or they (1873: 550) proposed *Berthelotia* [printed in italics and regular font] to be a section



**Figure 2.** Selection of photos pertinent to *Berthelotia lanceolata* DC. (accepted name *Pluchea lanceolata* (DC.) C.B. Clarke). (A) Shop where Ayurveda medicinal plants are commonly sold, Kozhikode, Kerala, India. (B) Flowering branch. (C) Leaf fragments as sold in medicinal plant shop. (D) View of capitula in full flowering through stereomicroscope. Photo credits: Rahul R. Pathirickal (A, C, D), and D.S. Rawat (B).

of *Pluchea*. Nevertheless, it was not Bentham and Hooker, but Clarke (1876: 94) who first made the legitimate transfer of *Berthelotia* to *Pluchea* when he published the combination *P. lanceolata* (DC.) C.B. Clarke. *Berthelotia* can be distinguished from other species of *Pluchea* s. str. by their lack of resin ducts, flattened filament collar cells, and divided styles (Anderberg 1991b).

*Pluchea lanceolata* has ample ethnobotanical use in India (Shanker and Srivastava 2017; Figure 2; see section on ethnobotany below), and it can also be a noxious weed (Inderjit et al. 1998). Because of its medicinal properties and widespread distribution, this species has been the subject of phytochemical (e.g., Srivastava and Shanker 2012; Pandey 2018), in vitro culture (e.g., Kumar et al. 2004), and ecological (e.g., Inderjit 1998, 2002) studies.

*Pluchea sericea* (Nutt.) Coville is a species restricted to arid parts of northeastern Mexico and western United States (Figures 5–7). This species is isolated among North American *Pluchea*, with its woody perennial habit and densely arranged waxy eglandular leaves, and Nesom (2006) stated that “*Pluchea sericea* is more similar to the segregates than to the herbaceous American groups [of the genus].” In 1848, it was originally described as *Polypappus sericeus* Nutt., and in 1906 this



**Figure 3.** Illustration of *Berthelotia lanceolata* DC. (accepted name *Pluchea lanceolata* (DC.) C.B. Clarke) published by Delessert and Candolle (1840). Drawn by Jean-Christophe Heyland (1791–1866) and engraved by Eugenia Tailland (?-?). Courtesy of the Linnean Society of London.

species was accommodated in *Berthelotia* (as *B. sericea* (Nutt.) Rydb.) by the Swedish-American botanist Per Axel Rydberg (1860–1931, Figure 1) who was the first curator of the New York Botanical Garden herbarium (NYBG 2005). The species is the type of Aven Nelson’s genus *Eremohylema* A. Nelson.

*Pluchea sericea* has also ethnobotanical applications, and among Native Americans it was used both as material for building mud houses and to make arrows (Moerman 2022). Its roots have therapeutic properties to treat diarrhea, and indigestion as well as eye and dermatological inflammations. However, this species does not have any documented wide ethnobotanical use as compared to *P. lanceolata* in India.

Both *Pluchea sericea* and *P. lanceolata* are shrubs/subshrubs with white sericeous branches and sessile lanceolate leaves. Their floral parts are similar as well, with pink to purplish phyllaries, campanulate involucre, and



**Figure 4.** Distribution map of *Berthelotia lanceolata* DC. (accepted name *Pluchea lanceolata* (DC.) C.B. Clarke). Map is based on King-Jones (2001) and was created using QGIS 3.26 in conjunction with base maps from MapTiler.

pink to purplish corollas. These two species mainly differ in their growth habit, with *P. sericea* reaching up to 5 m in height (Barkley et al. 1993), while *P. lanceolata* usually reaches 1.5 m in height (King-Jones 2001). They also differ slightly in their leaves, with *P. sericea* characterized by narrower leaves (1–5 x 0.2–1 cm) than *P. lanceolata* (1–7.5 x 0.4–1.5 cm).

#### Molecular phylogenetics

*Pluchea* has been circumscribed to comprise taxa lacking the characteristic features of other smaller genera in the tribe Inuleae. Using floral micro-characters, Anderberg (1991b) found that *Pluchea* is not monophyletic. The genus as a whole lacks any diagnostic apomorphic characters; instead, it is defined by absence of characters found in related groups.

King-Jones's (2001) monograph for the Old World species of *Pluchea* included a phylogenetic analysis based on morphological data. This previous study suggested that *P. lanceolata* belongs to a monophyletic group with

seven species that she informally named the “*Pluchea indica* Clade” and that was weakly supported with a low jackknife value of 63%. Additional taxonomic relationships pertinent to *Berthelotia* have been suggested by Nesom (1989, 2006), who indicated that the placement of *Tessaria* is relevant to understand the actual arrangement of *Berthelotia* in the Inuleae.

The polyphyletic nature of the genus was further reiterated by Nylinder and Anderberg's (2015) molecular phylogenetic studies based on nucleotide sequences of ITS and ETS (nuclear ribosomal DNA) and three chloroplast genome regions. In this work, *Pluchea* species are found in several different places in the recovered phylogeny, and many of the smaller genera of the tribe, such as the South American monotypic genus *Tessaria* Ruiz & Pav. (Anderberg 1994; Anderberg and Eldenäs 2007) became ingroups related to different *Pluchea* groups. Therefore, *Pluchea* as presently circumscribed is a diverse polyphyletic grade which is poorly understood and needs major taxonomic revisions.

*Tessaria* (one species; *Tessaria integrifolia* Ruiz & Pav.), *Pluchea indica* (L.) Less., and *P. sericea* belong

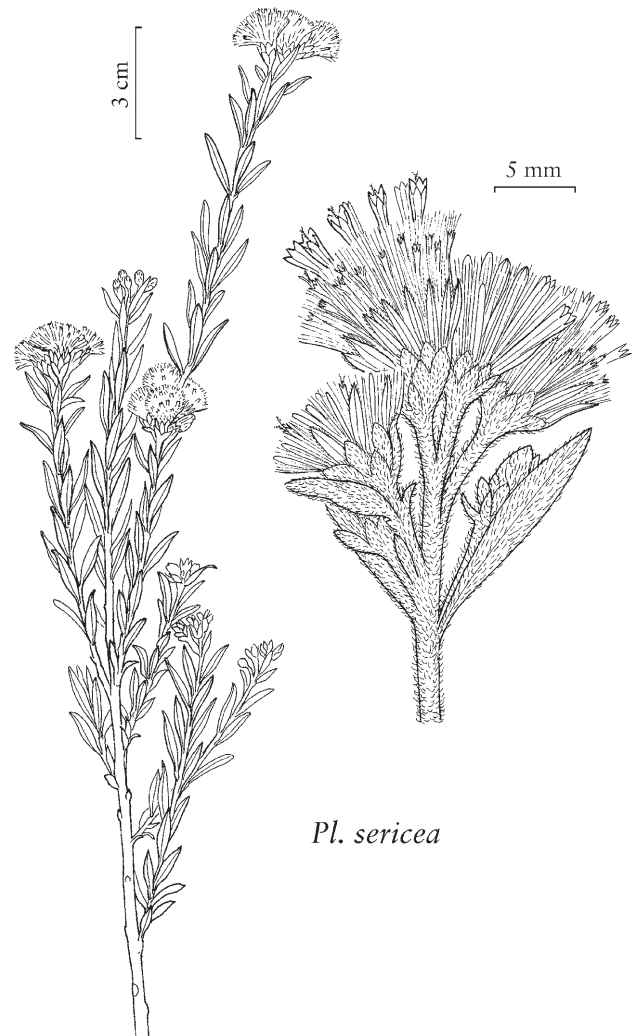


**Figure 5.** *Berthelotia sericea* (Nutt.) Rydb. (accepted name *Pluchea sericea* (Nutt.) Coville) in USA. (A) Plants in habitat in Dead Valley National Park, California. (B) Informative panel highlighting the ethnobotanical use of the species among Native Americans and its importance as a landmark species for the landscapes of Dead Valley National Park. (C) Young stems showing capitula in early developmental stages. (D) Capitula at different developmental stages. Photo credits: Mike Duran (A, B), Ron Vanderhoff (C, D).

to “Clade J” as recovered in Nylinder and Anderberg’s (2015) molecular phylogeny; however, this study did not include *P. lanceolata*. As a result, we aimed to analyze relationships across New and Old World members of Clade J of *Pluchea* to better understand relationships between the two *Berthelotia* taxa with *P. indica* and monotypic *Tessaria* as putative relatives of them.

#### MATERIAL AND METHODS

We chose ITS nucleotide sequences of 19 species representing two main clades of the Inuleae uncovered in recent literature, as part of Clade J in Nylinder and Anderberg (2015). They belong to the genera *Allopter-*

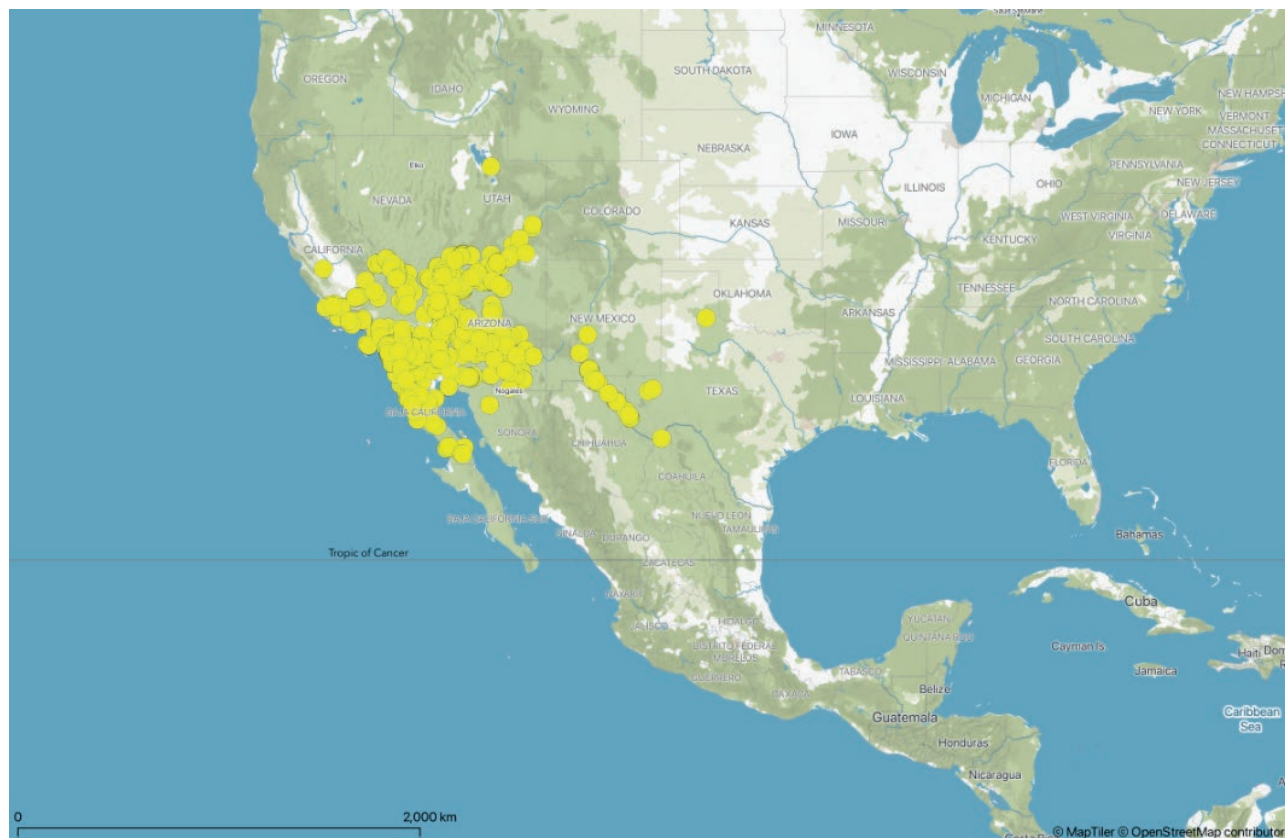


**Figure 6.** Illustration of *Berthelotia sericea* (Nutt.) Rydb. (accepted name *Pluchea sericea* (Nutt.) Coville). Courtesy Flora of North America Association, Volume 19; Barbara Alongi, illustrator; published by Nesom (2006).

*igeron*, *Coleocoma*, *Epaltes*, *Pluchea*, *Streptoglossa*, *Tessaria*, and *Thespidium*, as our ingroups (including the two species described as *Berthelotia* as well as *P. indica*). Two species of *Epaltes*, which were found to be sister to Clade J (Nylinder and Anderberg 2015), are used as outgroup. For each species selected, ITS sequences were downloaded from GenBank (accessions in Table 1); all of them were previously published by Nylinder and Anderberg (2015) except that of *P. lanceolata* the unpublished one which was obtained by Rahul Pathirickal et al. in 2017. ETS data were not available for *Pluchea lanceolata*; therefore, we did not include this marker in our study.

Alignments were performed in MAFFT v.7 (Katoh and Standley 2013) for ITS. Matrices were visually





**Figure 7.** Distribution map of *Berthelotia sericea* (Nutt.) Rydb. (accepted name *Pluchea sericea* (Nutt.) Coville). Map was created using QGIS 3.26, in conjunction with base maps from MapTiler

inspected in order to check for false homologies. Phylogenetic analyses were performed across maximum likelihood and Bayesian methods. For the maximum likelihood analysis, the ITS gene tree was inferred for each of the individual gene alignments using RAxML v.8 (Stamatakis 2014), with 100 bootstraps (BS) using the GTRGAMMA model. For the Bayesian analysis, MrBayes was run for 1 million generations under the GTRGAMMA model, with 20% burn-in removed.

## RESULTS AND DISCUSSION

The aligned length of the concatenated 21-sample, ITS matrix was 844 bp. For our Bayesian analysis, we recovered strong phylogenetic signal in the ancestral nodes of the ingroup, with low support for the clade including the members of *Tessaria* and *Pluchea* from both the New and Old World (68% posterior probability, P.P.). An additional clade with strong posterior probability support, identified here as “Clade I”, was recovered. Clade I is composed of three species of the *Pluchea indi-*

*ca* Clade (i.e., *P. indica*, *P. bojeri*, and *P. lyciodes*) plus *P. dioscoridis* and *P. ovalis* (Figure 8). The latter two species were placed inside the “*Pluchea discoridis* clade” by King-Jones (2001). *Allopterigeron filifolius*, *P. carolinensis* and *P. sericea*, formed a polytomy with the clade that has the rest of the species included in our analyses (Figure 8). Clade I exhibited equally high support (100% P.P., Figure 8) and the lineage composed of *P. sagittalis* and *Coleocoma centaurea* was also strongly supported (90% B.S.). Therefore, our analyses did not support the *Pluchea indica* Clade as a monophyletic group as defined by King-Jones’s (2001) treatment. Maximum likelihood analysis of our ITS dataset showed similar results to our Bayesian analyses, with Clade I members resolved with high bootstrap support (99 B.S.). Almost all of the other shallower nodes in the ingroup had very low support.

In comparison to previous phylogenetic studies of the Inuleae and *Pluchea* (Anderberg 1991b; King-Jones 2001; Nylinder and Anderberg 2015), we found similarly low resolution at shallow nodes, however, our inclusion of *P. lanceolata* here reveals that: (1) the two species of *Berthelotia* are perhaps more distantly related than pre-

**Table 1.** Species included in the ITS phylogenetic analyses, along with their GenBank accession numbers, and their voucher specimen numbers (with herbaria acronyms). All sequences published by Nylinder and Anderberg (2015) except that of *Pluchea lanceolata* (MG273761) that is published by us in this contribution.

Species	GenBank	Vouchers
<i>Allopterigeron filifolius</i> (F.Muell.) Dunlop	LN607417	Short & Dunlop 4758 (DNA)
<i>Coleocoma centaurea</i> F.Muell.	LN607432	Albrecht 10563 (S)
<i>Epaltes australis</i> Less.	LN607444	Anderberg & Anderberg 7938 (S)
<i>Epaltes divaricata</i> (L.) Cass.	LN607446	Bremer et al. 43 (S)
<i>Epaltes gariepina</i> (DC.) Steetz	LN607447	Wanntorp & Wanntorp 769 (S)
<i>Pluchea bojeri</i> (DC.) Humbert	LN607514	Malcomber & Leeuwenberg 1137 (S)
<i>Pluchea dentex</i> Benth.	LN607516	Crawford 1076 (CANB)
<i>Pluchea dioscoridis</i> (L.) DC.	LN607516	Ryding & Ermias 1279 (UPS)
<i>Pluchea dunlopii</i> Hunger	LN607519	Hunger & Kilian 3948 (B)
<i>Pluchea fastigiata</i> Griseb.	LN607520	Beck & Lieberman 9613 (S)
<i>Pluchea indica</i> (L.) Less.	LN607524	Kilian et al. NK 4601 (S)
<i>Pluchea lanceolata</i> (DC.) C.B.Clarke	MG273761	S.P. Geetha 8769 (CMPR)
<i>Pluchea lycioides</i> (Hiern) Merxm.	LN607528	Smook 765 (WIND)
<i>Pluchea ovalis</i> (Pers.) DC.	LN607534	Gilbert & Thulin 328 (UPS)
<i>Pluchea sagittalis</i> (Lam.) Cabrera	LN607539	Chung & Anderberg 1171 (S)
<i>Pluchea sericea</i> (Nutt.) Coville	LN607542	Davis & Lightowers 66328 (B)
<i>Pluchea yucatanensis</i> G.L. Nesom	LN607546	Jones & Jones 12656 (TEX)
<i>Tessaria integrifolia</i> Ruiz & Pav.	LN607592	Daly et al. 6392 (S)
<i>Thespidium basiflorum</i> (F.Muell.) F.Muell.	LN607593	Cowie & Dunlop 3923 (S)

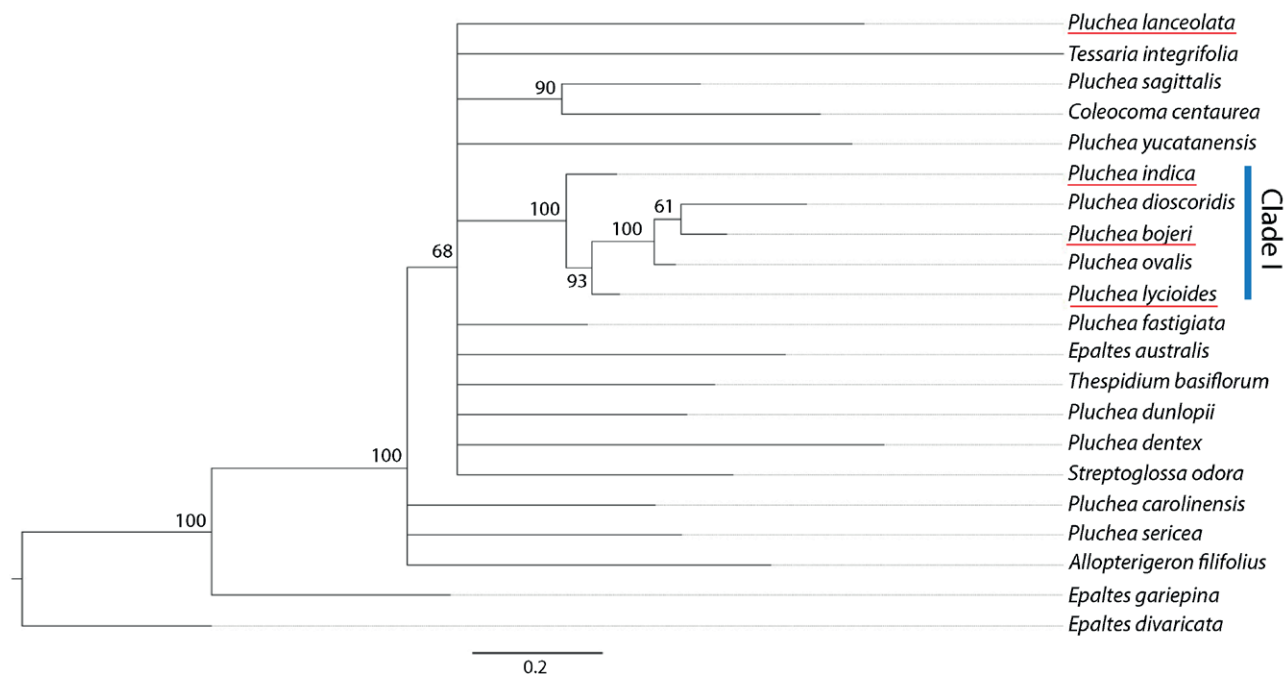
viously thought, (2) *P. lanceolata* is not as closely related to *P. indica* as suggested by the morphological studies of King-Jones (2001), and (3) the *Pluchea indica* Clade is paraphyletic with *P. lanceolata* placed in a weakly supported polytomy (68% P.P.) made up of (1) eight additional species of *Pluchea*, *Epaltes*, *Thespidium*, and *Streptoglossa*; (2) Clade I; and (3) the assemblage composed of *P. sagittalis* and *Coleocoma centaurea*.

As indicated above, the monotypic genus *Tessaria* is placed in a weakly supported clade (68% P.P.) that has all the sampled species of *Pluchea*, except *P. carolinensis* (Jacq.) G. Don and *P. sericea* (Figure 8). If future studies confirm these relationships with greater phylogenetic resolution, this will have a profound impact on the taxonomy of the group, as the name *Tessaria* (described in 1794) holds precedent over the younger name *Pluchea*, which was only described in 1817. *Tessaria* also has priority over *Berthelotia* (described in 1836) and the other genera of Clade J (*Allopterigeron*, described in 1981; *Coleocoma*, described in 1857; *Epaltes*, described in 1818, *Thespidium*, described in 1862; and *Streptoglossa*, described in 1863). Even if a large number of *Pluchea* species were renamed within a larger *Tessaria*, the latter genus would still likely be polyphyletic under current taxonomic definitions, and because of the phylogenetic placement of other genera that compose the Inuleae;

therefore, this would require extensive nomenclatural modifications in order to have a species-rich monophyletic *Tessaria* (Nylinder and Anderberg 2015). Within the J Clade several ways of dealing with these generic mismatches can be proposed once nodes of these clade are better resolved; one of them would involve reinstating genera such as *Berthelotia* as described by Candolle (1836) and creating new monophyletic genera (likely most of them with few species). Such a solution could lead to consider *B. sericea* as a monotypic genus, in that case it will need to be treated as *Eremohylema sericea*. With *Tessaria* currently restricted to *T. integrifolia*, another solution would be for *Tessaria* to be expanded more broadly to include the two species listed within *Berthelotia* (*P. sericea* and *P. lanceolata*) and the other members of the J Clade.

#### ETHNOBOTANY AND MEDICINAL USE OF *PLUCHEA LANCEOLATA*

The ethnobotanical use of *Pluchea lanceolata* in India has its roots in the ancient Ayurveda, a natural system of medicine still widespread in the country (Figure 2), which originated more than 3,000 years ago and was part of the Vedic sacred literature of India (Padma 2005). The age of Ayurveda has been traced back



**Figure 8.** Bayesian topology for *Pluchea* species and related genera belonging to Clade J sensu Nylinder & Anderberg (2015) with *Epaltes divaricata* and *E. gariepina* as the outgroup. Species underlined in red were previously described as belonging to the “*Pluchea indica* Clade” (King-Jones, 2001). Node labels refer to Posterior Probability scores.

between 4500 and 600 BC (Kapoor 1990). The Ayurvedic plant naming structure does not have a binomial system of nomenclature as in Western botany, but it is based on polynomials, where one plant can be defined by a group of synonyms (one to fifty), each relating to its characters; such as morphology, habit, habitat, qualities, biological actions, therapeutic use, etc. Sometimes a synonym can be given to more than one plant resulting in a therapeutic “taxonomy” that helps an Ayurvedic physician in selecting a plant for its medicinal use (Viswanathan et al. 2003). This has also led to confusions, as technically precise descriptions of plants are not given. Therefore, this system of having numerous names for a single medicinal plant does not provide any morphological features sufficient for establishing its botanical identity. India is a place of diversity in all its forms including use of various languages/dialects in different regions, many tribal practices and folklore medicines contributing to use more than one name for the same plant, and sometimes different plants are having same names in different states of the country.

Only five species of *Pluchea* have widespread use as medicinal plants (Shanker and Srivastava 2017: 35–39). Three of them are from the New World (i.e., *P. carolinensis* (Jacq.) G. Don, and *P. odorata* (L.) Cass., *P. sagittalis* (Lam.) Cabrera), and at least one of them has been the

subject of ethnobotanical field studies (Hodges and Bennett 2006). The aforementioned *P. indica* also has medicinal value in India and Southeast Asia (Shanker and Srivastava 2017: 35). Eleven additional species are also reported to have ethnobotanical interest, among them is *Pluchea sericea* (Shanker and Srivastava 2017: 35, 39).

Though plants of *Pluchea lanceolata* are commonly known as “rasna” in northern parts of India, they are also known by many other names in different regions of the country [i.e., rayasana, phaar (Hindi), rasnapat (Assam), chithramoolaka, dumme-rasna (Kannada), rasna, rashna, rayasana (Marathi), sanna rashtramu (Telugu), reshae, raasana, reshamee-sunnai, ra-sunna (Punjab)]. The word “rasna” means “the process of tasting” or “perceptible by tongue”. The species has been described in Sanskrit using many synonyms such as elaparni, mukta, rasna, rasya, sreyasi, sugandha, surabhi, surasa, suvaha, yukta. Consequently, the Ayurvedic text (Sanskrit) for rasna has been interpreted in different ways. The term “elaparni” could be interpreted for plants that have their leaf shape similar to the shape of Cardamom fruits (*Elettaria cardamomum* (L.) Maton), as considered by the northern Indian Ayurvedic physicians (Vaidyas). However, it can also be interpreted as plants bearing leaves whose shape is similar to the leaf shape of Cardamom, as it usually occurs in southern parts of India.

The words “sugandha” and “suvaha” can refer to tubers having fragrance, which can be found in different species of plants. Thus, while the leaves of *P. lanceolata* are mostly used in northern India, the rhizomes of *Alpinia galanga* (L.) Willd. (Zingiberaceae) are widely utilized in the Southern parts of India. They both share the Ayurvedic name of rasna and have similar therapeutic properties. Notwithstanding the controversy regarding the identity of the species, the Ayurvedic Pharmacopeia of India (API 2001) has recognized *P. lanceolata* as the plant “rasna” whose leaves (Figure 2) and roots are recommended for preparation of various herbal formulations, and *A. galanga* as the approved substitute in the Ayurvedic Formulary of India (AFI 2003).

In practice, the leaves of *Pluchea lanceolata* are usually traded as rasna, rasnapatti, vaaya-surai, or baisurai, while its roots are mostly traded as rasnamoola. However, at least 17 other plant species have their parts traded under the name rasna in various parts of the country (Viswanathan et al. 2003; Khare 2007; FRLHT Database 2016). A few examples of them include plants whose rhizomes or roots have medicinal use [e.g., *Alpinia galanga*, *A. calcarata* (Andrews) Roscoe, *Leucoblepharis subsessilis* Arn. (Asteraceae); and *Vanda tessellata* Roxb. (Orchidaceae)]; and others whose leaves exhibit similar therapeutic properties (e.g., *Dodonaea viscosa* (L.) Jacq., Sapindaceae). This medicinal plant classification system has made identification of the right material for Ayurvedic medicine preparation a daunting task. Some of the important Ayurvedic formulations containing rasna (*P. lanceolata*) are dasamularishta, devadarvarishta, karpasasthyadi taila, rasnadi kvatha churna, rasnairandadi kvatha churna. Some of these formulations are for ingestion (arishta/churna) and some are for external applications (taila/churna) (Shanker and Srivastava 2017). However, drug formulations containing rasna (*P. lanceolata*) are all indicated for treatment of inflammation, rheumatism, asthma, fever, dyspepsia, skin diseases, rheumatoid arthritis, gout, etc. Other of the widespread ethno-botanical uses associated with *P. lanceolata* in India include its action as a laxative, nerve tonic, uterine relaxant, and pain relief from scorpion stings. In the former Sind region of British India, the species was known as koura-sana or koura-sunna. Its leaves were used as aperient medicine, and the roots were regarded as an excellent purgative (Murray 1881; Dymock et al. 1891; Khare 2007).

In the traditional Ayurvedic treatments and literature there are references for the use of *Pluchea lanceolata* in poly-herbal formulations as it was never recommended as a single herb. Nevertheless, there has been a steadily increasing trend for naturopathic herbal compa-

nies to promote the use of single-herbs (such as rasna) that come from traditional Ayurvedic medicine. These companies are also making new combinations of Ayurvedic drug formulations, resulting in Ayurvedic medicinal patents that are associated with property rights (Patwardhan 2016). Products such as rasna churna (churna translates as powder), rasna capsules, and rasna tablets, which are not prescribed in the Ayurvedic classical medicine texts, fall in this category. They are marketed as herbal dietary supplements and advertised as having similar beneficial attributes as rasna formulations that have been used in India for millennia.

#### TAXONOMY & NOMENCLATURE

*Berthelotia* DC.<sup>2</sup> (Asteraceae, Inuleae).

*Berthelotia* DC., Prodr. 5: 375. 1836.

(≡) *Pluchea* Cass. subgen. *Berthelotia* (DC.) A. Gray, Syn. Fl. N. Amer 1(2): 225. 1884.

Type: *Berthelotia lanceolata* DC., Prodr. 5: 375–376. 1836.

(=) *Eremohylema* A.Nelson, Univ. Wyoming Publ. Sci., Bot. 1(3-4): 54. 1924, *nom. superfl. & illegit.* for *Berthelotia* DC.

Type: *Eremohylema sericea* (Nutt.) A.Nelson, Univ. Wyoming Publ. Sci., Bot. 1(3-4): 54. 1924 [Basionym: *Polypappus sericeus* Nutt., Proc. Acad. Nat. Sci. Philadelphia 4: 22. 1848].

(=) ***Pluchea*** Cass., Bull. Sci. Soc. Philom. Paris 1817: 31. 1817.

Type: *Pluchea marilandica* (Michx.) Cass. in F.Cuvier, Dict. Sci. Nat., ed. 2 42: 2. 1826.

[‘*marylandica*’] [Basionym: *Conyza marilandica* Michx. Fl. Bor.-Amer. 2: 126. 1803].

*Berthelotia lanceolata* DC., Prodr. 5: 376. 1836.

(≡) *Berthelotia lanceolata* var. *indica* DC., Prodr. 5: 376. 1836.

(≡) ***Pluchea lanceolata*** (DC.) C.B.Clarke, Compos. Ind.: 94. 1876.

<sup>2</sup> Accepted names indicated in bold font.

(≡) *Pluchea lanceolata* (DC.) Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3: 329. 1877, *isonym*.

(≡) *Conyza lanceolata* Wall., Numer. List n. 2991. 1831, *nom. nud.*, *inval.*

Type: “*Conyza lanceolata* Wall.! Cat. et herb. n. 2991. comp. n. 101”. N. Wallich 101, *Conyza lanceolata* Wall. in herb. / 1830 [Lectotype designated here, G [G00450458 (photo!)]]; isolectotypes, G [G00450438 (photo!)], K [K000974690 (photo!)], E [E00098190].

(=) *Conyza rubra* Buch.-Ham. in Wall., Numer. List n. 2991B. 1831, *nom. nud.*, *inval.*

(=) *Saussurea mucronata* Spreng. ex DC., Prodr. 5: 376. 1836, *pro syn.*, *inval.*

(=) *Berthelotia lanceolata* var. *senegalensis* DC., Prodr. 5: 376. 1836.

(=) *Conyza proteifolia* Perr. ex DC., Prodr. 5: 376. 1836 [“*proteiformis*”], *pro syn.*, *inval.*

Type: [Senegal] “In arenosis circa Lamsar [Lampsar] et Gandiole mense junio legit cl. Perrottet. *Conyza proteifolia* (“*proteiformis*”) Perr.! in litt. Folia infer. ex Perr. in litt. magis serrata. (v.s. comm. a cl. inv.)” (sic). Lectotype designated here: 15-June-1825, G.S. Perrottet 2 /*Conyza proteifolia* nob.: G [G00452584 (photo!)]

#### Typification notes

*Berthelotia* DC. is typified by *B. lanceolata* DC.; Nelson (1924: 55) erroneously treated *Berthelotia* as a later homonym (non *Bertholletia* Bonpl. 1807) and included *Berthelotia* as a synonym of *Eremohylema* A.Nelson, and thus the latter genus name was superfluous and illegitimate when published. Nevertheless, Nelson cited *E. sericea* (Nutt.) A.Nelson as the type of *Eremohylema*. Therefore, *Eremohylema* was published as the name of a new genus, has its own type, and is not typified by the type of *Berthelotia* (see Shenzhen Code Art. 7.5).

Candolle (1836: 375–376) treated *Berthelotia* as a monospecific genus, and he included two varieties, viz., *B. lanceolata* DC. var. *indica* DC., and var. *senegalensis* DC. He did not include *B. lanceolata* DC. var. *lanceolata* or var. *typica*, or any such autonym. He did not cite any type collection for the species name *B. lanceolata*, but he did cite collections for vars. *indica* and *senegalensis*. His specific description for *B. lanceolata* was limited to a short text stating: “*frutic. pedalis. An species forsan duae admittendae?*”, which indicates Candolle’s belief that

the species was composed of two morphs (var. *indica* and var. *senegalensis*). Nevertheless, Candolle inadvertently created the autonym *B. lanceolata* DC. var. *lanceolata* (vide Art. 26.3).

In the above situation, one may question whether either var. *indica* or var. *senegalensis* is homotypic with var. *lanceolata*, and if so, whether such a varietal name is valid. In this regard, Art. 26.1 of the Code states that “The name of any infraspecific taxon that includes the type of the adopted, legitimate name of the species to which it is assigned is to repeat the specific epithet unaltered as its final epithet [...]”. It is ascertained here that since the species name *B. lanceolata* remained untypified at the time of its publication, neither var. *indica* nor var. *senegalensis* included the type of *B. lanceolata*, that Art. 26.1 does not apply here, and that the two varietal names were validly published. We add that theoretically, even if the names *B. lanceolata* and var. *indica* were typified with the same specimen and made homotypic, the validity of the varietal name *indica* would not be affected (cf., Art. 26.2 Ex. 4).

Prior to our study, King-Jones (2001: 82) provided nomenclatural assessments for these varietal names; however, we do not concur with two of her conclusions, as addressed below. King-Jones’s treatment did not include any discussion on the nomenclature of *Berthelotia*; therefore, her reasoning behind a few of her nomenclatural conclusions is not clear.

Regarding the typification of the name *Berthelotia lanceolata* var. *senegalensis*, Candolle referred to a gathering collected in Senegal (in Lampsar and Gandiole) by George S. Perrottet (1793–1870), a Swiss-French botanist who performed field work in this country from 1824 to 1829 (Stafleu & Cowan 1983: 175). One specimen housed in G (G00452584) fits the protologue quite well and is designated here as the lectotype for the variety. The protologue of this variety includes a reference to the name “*Conyza proteiformis* Perr. in litt.!” (sic). The published epithet “*proteiformis*” may imply resemblance to the habit of the genus *Protea*. The designated lectotype specimen sheet, however, shows Perrottet’s annotation as “*Conyza proteifolia* nob.”, which suggests that he intended to allude resemblance to foliage of *Protea*. It is evident that there was a typographical error of the epithet spelling, which was overlooked by Candolle in the publication. In our assessment, we treat “*Conyza proteiformis*” as a typographical error.

Furthermore, King-Jones’ (2001: 82) conclusion pertaining to the typification of *Berthelotia lanceolata* needs to be revisited. She mentioned that Clarke (1876: 94) typified this name (“-Lectotype (designated by Clarke, Compos. Ind.: 94. 1876): [India], Cawnpur [= Kanpur 26°28’N, 80°21’E], 1830, Wallich 2991/101 (E!, G!)”).

However, Clarke's treatment of this species shows "*Pluchea lanceolata* i.e., *Berthelotia lanceolata* DC. V. p. 376 *Conyza lanceolata* Wall. Cat. 2991 ... Hab. Ad ripam Gangis prope Cawnpore in 1820 coll. Wallich. In omni Oude, India boreali-occidentali, Punjab et Afghanistan communis. Cl. Bth. in Gen. Pars. II. p. 291 *Berthelotiam lanceolatam* DC. cum *Pluchea wallichiana* DC. conjunxit. *Berthelotia lanceolata* est vera *Pluchea* sed *Conyza lanceolata* Wall. Cat. No. 2991 a *Conyza sessilifolia* Wall. Cat. No. 3029 longe discrepat, videl ..." (sic). Clarke did not indicate the type element by direct citation of the term "type" (typus) or an equivalent and thus did not meet the mandatory requirement needed for a typification of a previously validly published name. (see Art. 7.11).

Although King-Jones (2001) cited a lectotype for the name *Pluchea lanceolata*, she did not inadvertently lectotypify the name because she did not use the phrase "designated here" (*hic designatus*) or an equivalent, which is required for typifications made from 1 January 2001 (Art. 7.11). Therefore, neither Clarke nor King-Jones typified the name, and we herewith designate the lectotype (G00450438; isoelectotypes: K000974690, E00098190) of this taxon.

The protologue of *Berthelotia lanceolata* var. *indica* refers to three different specimens collected by the Danish physician and botanist Nathaniel Wallich (1786–1854) or the Scottish physician and botanist Francis Buchanan-Hamilton (1762–1829). The former lived in India during 1814–1846 (Stafleu and Cowan 1988: 37), and most of his career was associated with the Royal Botanic Garden, Calcutta. Buchanan-Hamilton also resided in India (between 1795 and 1815), and worked for the Botanic Garden of Calcutta, but for a shorter period (1814–1815; Stafleu and Cowan 1979: 35). According to the protologue, these three specimens were annotated as "*Conyza rubra* Ham." (G00452579), "*Conyza lanceolata* Wall." (G00450438, G00450458), and "*Saussurea mucronata* Spreng." (P01816057). Of the preceding three names, *S. mucronata* was proposed as a pro synonym of *B. lanceolata* var. *indica* by Candolle (1836: 376) and is invalid. The two other names are found in Wallich Catalogue (<http://wallich.rbge.info/node/13421>) without a description; they were treated by Candolle (1836: 376) as synonyms of *B. lanceolata* var. *indica*.

Since Candolle used the specific epithet *lanceolata* to coin for his new species name *B. lanceolata*, and since he did not cite any collection for his new species, it is construed here that his inclusion of the name "*Conyza lanceolata*" as a pro synonym of var. *indica* implies that he intended to treat this variety as the typical variety of the species. Thus, among the three specimens suitable for lectotypification we have designated G00450458 as the

lectotype of *B. lanceolata* and of *B. lanceolata* var. *indica* (isoelectotypes: G00450438, K000974690, E00098190).

*Polypappus sericeus* Nutt., Proc. Acad. Nat. Sci. Philadelphia 4: 22. 1848.

(=) *Tessaria borealis* Torr. & A.Gray, Mem. Amer. Acad. Arts ser. 2, 4(1): 75, adnot. 1849, *nom. superfl. & illegit.* for *Polypappus sericeus* Nutt.

(=) *Pluchea borealis* A. Gray, Proc. Amer. Acad. Arts and Sci. 17: 212. 1882, *nom. superfl. & illegit.* for *Polypappus sericeus* Nutt.

(=) ***Pluchea sericea*** (Nutt.) Coville, Contr. U.S. Natl. Herb. 4: 128. 1893.

(=) *Berthelotia sericea* (Nutt.) Rydb., Bull. Torrey Bot. Club 33: 154. 1906.

(=) *Eremohylema sericea* (Nutt.) A.Nelson, Univ. Wyoming Publ. Sci., Bot. 1: 54. 1924.

(=) *Tessaria sericea* (Nutt.) Shinnery, Sida 3: 122. 1967. Type: "In Upper California, towards the Rocky Mountains". *W. Gambel Polypappus sericeus* [I] Eastern California [I] I have only one bad [?] specimen [holotype, K: K000974653 (photo)].

#### Typification notes

*Polypappus sericeus* was described by the British botanist and ornithologist Thomas Nuttall (1786–1859, Figure 1), who lived in USA during 1808–1841, and 1847–48 (Beidleman 1960; Graustein 1967), based on material collected in "Upper California, towards the Rocky Mountains" by botanist William Gambel (1823–1849), who actively collected especially in California and New Mexico (Graustein 1967: 342–344; Fischer, 2001: 26–27); Gambel also collected plant materials for Nuttall (Graustein 1967: 350).

Regarding Nuttall's herbarium and type specimens, Stafleu and Cowan (1981: 781) stated that "The Nuttall herbarium (5,750 species, acquired in 1860) is at BM. However, it would appear that up to the publication of the 'Genera [of North American plants]...' in 1818 he kept few or no specimens for himself, presenting a complete series of his plants to the Academy of Natural Sciences (PH) so that there repose his early types" (Pennell 1936). Further Nuttall specimens are found in CGE, DUKE, DWC, E, F, FI, G, GH, K, LIV, MANCH, MO, NY, OXF." Since Nuttall published the name *Polypappus*

*sericeus* in 1848, it is reasonable to look for the Gabel's collection in the preceding herbaria. In our internet searches, we located only a single specimen, which is housed at the herbarium of the Royal Botanic Gardens, Kew (K000974653). Furthermore, in a personal communication, John Pruski (MO) informed us that he checked the PH microfiche for the name *P. sericeus* and did not find any specimen.

The Kew specimen, which we have identified as the original material, was examined and annotated by Nuttall. The specimen label shows the remark "I have only one bad[?] specimen" indicating that this was the only one specimen available for Nuttall to describe this species; the preceding remark also makes it clear that other herbaria do not have Gabel's collection for this species. Therefore, we recognize the K specimen as the holotype of *P. sericeus* Nutt. Two of the names (*Tessaria borealis* Torr. & A. Gray and *Pluchea borealis* A. Gray) that are relevant for our research were superfluous for *Polypappus sericeus* and illegitimate when published. Finally, "*Berthelotia borealis* Wooton", one of the names associated with the accepted *Pluchea sericea*, is not valid; Wooton (1913) provided a description for the genus *Berthelotia* but not for the listed species, *B. borealis*.

#### ACKNOWLEDGEMENTS

We dedicate this publication to Carlos Gaviño de Franchy in recognition for his contributions as publisher of books centered in the humanities of the Canary Islands. Nomenclature conclusions were part of the workshop and graduate course "Advanced Latin American and Caribbean Island Workshop on Plant Taxonomy and Nomenclature" (25–29 April 2022) jointly sponsored by Montgomery Botanical Center and the Kimberly Green Latin American and Caribbean Center of Florida International University (FIU), Miami and delivered by GC (Griffith et al. 2022). Javier Francisco-Ortega is grateful for the support received by the Montgomery Botanical Center to conduct botanical research projects in summer 2022. Our gratitude to Tammy Charron (Missouri Botanical Garden), Andrea Deneau (Linnean Society of London), Sylvie Rivet (*Société de Géographie*, France), Stephen Sinon (Hunt Institute for Botanical Documentation), and Jeff Steward (Harvard Art Museum) for their help in locating relevant bibliography and/or historical images. Andrés Delgado (*Asociación de Amigos del Museo de Naturaleza y Arqueología*, Tenerife, Spain) helped with the layout of historical photos. Jean Philippe Chassot (G) kindly located for us relevant letters housed in the *Conservatoire et Jardin botaniques*

*de Genève– Archives*. John Pruski (MO) checked PH microfiche for Gabel's collection of *Polypappus sericeus* Nutt., and confirmed the absence of original material at the PH herbarium. We thank Arne Anderberg (S) for his correspondence and advice on Inuleae systematics. Our gratitude to Guy L. Nesom (TEX) and Fred Stauffer (G) for critically reading the paper.

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#### APPENDIX 1.

##### Single-author botanical publications of Sabin Berthelot<sup>3</sup>

Berthelot S. 1826. Allegemeine bemerkungen über die Canarische Inseln, besonders naturgeschichtlichen inhalts. Isis von Oken. 18–19: 960–975.

Berthelot S. 1827. Observations sur le *Dracaena draco* L. Nova Acta Academiae Caesareae Leopoldino-Carolinae Germanicae Naturae Curiosorum. 13: 775–788.

Berthelot S. 1827. Description d'une nouvelle espèce de *Viola*. Mémoires de la Société Linnéenne de Paris. 50: 418–420.

Berthelot S. 1827. Projet d'établissement d'un jardin de naturalisation aux Îles Canaries. Annales de la Société Linnéenne de Paris. 6: 491–496.

Berthelot S. 1828. Observations sur le *Dracaena draco* L. Annales des Sciences Naturelles. 14: 137–147.

Berthelot S. 1828. Observations sur le *Boehmeria arborea*. Nova acta Academiae Caesareae Leopoldino-Carolinae Germanicae Naturae Curiosorum. 14: 943–952.

Berthelot S. 1832. Observations sur l'accroissement et la longévité de plusieurs espèces d'arbres des environs de Nice. Bibliothèque Universelle des Sciences, Belles-Arts et Arts. 50: 280–293.

Berthelot S. 1832. Sur la longévité et l'accroissement des arbres. Bibliothèque Universelle des Sciences, Belles-Arts et Arts. 51: 365–390.

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Berthelot S. 1836. Coup d'Oeil sur les Forêts Canariennes, sur Leurs Changements et Leurs Alternances. Béthune, Paris.

Berthelot S. 1837. Lierre. In: Dictionnaire de la Conversation et de la Lecture. Volume 35. Belin-Mandar, Paris. Pp. 199–200.

Berthelot S. 1837. Mancenillier. In: Dictionnaire de la

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Berthelot S. 1837. Mélése. In: Dictionnaire de la Conversation et de la Lecture. Volume 37. Belin-Mandar, Paris. Pp. 433–434.

Berthelot S. 1837. Orseille. In: Dictionnaire de la Conversation et de la Lecture. Volume 41. Belin-Mandar, Paris. Pp. 220–221.

Berthelot S. 1837. Palme. In: Dictionnaire de la Conversation et de la Lecture. Volume 42. Belin-Mandar, Paris. Pp. 26–29.

Berthelot S [as "S. B-t."]. 1837. Palme. In: Dictionnaire de la Conversation et de la Lecture. Volume 42. Belin-Mandar, Paris. Pp. 29–31.

Berthelot S [as "S. B."]. 1837. Palmiste. In: Dictionnaire de la Conversation et de la Lecture. Volume 42. Belin-Mandar, Paris. P. 33.

Berthelot S. 1839. Violette. In: Dictionnaire de la Conversation et de la Lecture. Volume 52. Belin-Mandar, Paris. Pp. 225–226.

Berthelot S. 1844. Considérations sur l'Acclimatation et la Domestication. Béthune et Plon, Paris.

Berthelot S. 1846. Note sur le mocan. Bulletin de la Société de Géographie. Série 3. 5: 334.

Berthelot S [as Anonymous author]. 1853. De algunos árboles célebres. Eco del Comercio. 100: 1–2

Berthelot S [as "Un Amigo del País"]. 1855. Montes de Canarias. Eco del Comercio. 297: 1–2; 298: 1–2; 299: 1; 302: 1–2.

Berthelot S. 1859. De l'acclimatation en Algérie des principales essences forestières des Îles Canaries. Bulletin de la Société de Géographie. Série 4. 18: 329–344.

Berthelot S. 1862. Sur les essences forestières des Canaries et la réorganisation du Jardin d'Acclimatation d'Orotava. Bulletin de la Société Impériale Zoologique d'Acclimatation. 9: 684–688; 778–786.

Berthelot S. 1866. Memoria dirigida a Gobernador Civil de las Islas Canarias en 1862 sobre la reorganización del Jardín de Acclimatación de La Orotava. El Amigo del País. Periódico de la Sociedad Económica de Santa Cruz de Tenerife. [1866]: 195–205.

Berthelot S. 1868. Montes. El Amigo del País. Periódico de la Sociedad Económica de Santa Cruz de Tenerife. [1868]: 102–105.

Berthelot S. 1879. Árboles y bosques (páginas de un libro inédito). Revista de Canarias. 15: 226–230; 16: 249–250; 17: 257–259; 19: 290–293; 20: 310–313; 21: 329–330.

Berthelot S. 1880. Necesidad de la conservación y repoblación de los bosques y de la plantación de arbolados en la cuenca de Santa Cruz de Tenerife. Revista de Canarias. 29: 37–39; 30: 49–51.

<sup>3</sup> Publications pertinent to agriculture or cultivated plants are not included. Likewise, contributions made to the *Histoire Naturelle des Îles Canaries* are not listed either.

## APPENDIX 2.

Translation of the letter that Sabin Berthelot sent to Augustin Pyramus de Candolle on July 12, 1833. Notice that the last paragraph of this letter was written by Philip Barker Webb. Original letter is in French. Footnote bibliographies are listed within the Reference section of this contribution. Courtesy of *Conservatoire et Jardin botaniques de Genève–Archives*. Translation by Piero G. Delprete.

[Page 1]

Dear Sir,

In the hope of finding you in Paris, we are answering the interesting letter that you wrote at the eve of your departure from Geneva. When it arrived here, we learned with sadness that you left a few days before. We are sorry about this, which we are remembering as much unfortunate for us, and we are hasting to write to reply to your several questions and observations related to our Canarian Compositae.

The species about which you are asking some explanations and is with n° 3 bis in the collection of our radiate, is not cited in our catalogue and we have reasons to believe that this specimen cannot be other than a duplicate of n° 3, which following your announcement hereafter will be *Berthelotia glaberrima*<sup>4</sup>. We encountered this species only in Gran Canaria, in the volcanic peninsula called La Isleta<sup>5</sup> [and it] can be considered as the principal population, although in this locality is quite rare. This plant grows in this locality with *Berth. sericea*<sup>6</sup>, which is found in abundance. We never observed intermediary stages between the two species; the first one was always with glabrous leaves, green, almost lucid and a little fleshy, characters which make it remarkable even from a distance; whereas the other is constantly conserved on hers [its leaves] with silky hairs that distinguish it and a grayish-green. Unfortunately, this brilliant color that gives to *Berth. glaberrima* a physiognomy so characteristic is lost during desiccation [when plants are dried] and despite all our cares we were unable to prevent our specimens from blackening.

Before passing to another subject, being the most inter-

esting part, I should not finish this one without proper thanks. I accept with gratitude the dedication that you made for me for the new genus *Berthelotia*; it is unfortunate that the botanical laws oblige you in this case to maintain the old specific name *sericea*<sup>7</sup>, because *villosa*, or even *pilosa* would be more in agreement, as both these adjectives would have alluded (more divi Linnée) to the more evident external character of my individual [plant] and that we could have been referred to that [the leaf indumentum character] of the species type. But I know too well that your decisions are final judgements, therefore leave to me these reflection on the silky hairs of my species and make the case that it deserves. Mr. Webb will also be very charmed of seeing his name dedicated to a genus from Greece<sup>8</sup>; you say that you have one [name] in reserve near *Berthelotia*; that one will establish a sort of confraternity between the two friends, they will be delighted of this friendship and they will feel glorified of being registered on the golden book under the auspices of such celebrated patron<sup>9</sup>. I can count on the gratitude of this new godson<sup>10</sup>. Regarding the other genus *Webbia*, which we have discussed in Geneva, it is true that Pavón<sup>11</sup> had the intention of publishing it and he also traced the characters in a manuscript; but certainly, the Spanish botanist published nothing on it<sup>12</sup>.

My n° 6 is *Erigeron inuloides* Willd.<sup>13</sup> and the *Chrysoco-*

<sup>7</sup> It refers to *Chrysocoma sericea* L.f. (Asteraceae, Inuleae), which is the basionym of *Schizogyne sericea* (L.f.) DC. See note 6.

<sup>8</sup> The genus *Webbia* DC. (Asteraceae, Vernoniaeae; *nom. illeg.*, non *Webbia* Spach, Hist. Nat. Veg. Phan. 5: 408 June 1836) does not occur in Greece and it is restricted to Africa. Therefore, Augustin Pyramus de Candolle did not refer to an Eastern Mediterranean species when he described *Webbia*. See further details on the botanical history of *Webbia* in Francisco-Ortega et al. (2022), as under this name three different genera were described by three plant taxonomists independently.

<sup>9</sup> It seems that in this sentence Berthelot is referring to a close association between *Berthelotia* (suggested in the letter as a Canary Island genus) and *Webbia* (suggested in the letter as a Greek genus) as both genera were described by Augustin Pyramus de Candolle. See additional details in note 8.

<sup>10</sup> Berthelot seems to metaphorically “treat” the genus *Berthelotia* as a close family relative of him.

<sup>11</sup> It refers to the Spanish botanist José Antonio Pavón Jiménez (1754–1840) who together with Hipólito Ruiz López led one of the most important botanical endeavors of the Spanish Crown: The *Expedición Botánica al Virreinato del Perú*. Some of the specimens of this expedition reached Webb’s herbarium (Steinberg 1977).

<sup>12</sup> See Francisco-Ortega et al. (2022) regarding Pavón’s plans to dedicate the genus *Webbia* to Webb.

<sup>13</sup> We did not find the name “*Erigeron inuloides* Willd.” (Asteraceae, Inuleae) in the consulted taxonomic literature, and we initially interpreted that Berthelot referred to *Erigeron inuloides* Poir. (accepted name *Pulicaria inuloides* (Poir.) DC.). The protologue of *E. uniloides* Poir. is for a perennial herbaceous species that was collected by Pierre M. A. Broussonet [see additional details on Broussonet in note 16] in the Canaries (Poir. 1817: 464). Unfortunately, no original material collected by Broussonet has been

<sup>4</sup> It refers to *Schizogyne glaberrima* DC. (Asteraceae, Inuleae). The species was described by Augustin Pyramus de Candolle in the same work in which he described the genera *Berthelotia* and *Webbia*. *Schizogyne* Cass. (two species) is endemic to the Canary and Salvage Islands and was described by the French botanist Alexandre de Cassini in 1828. Candolle never described “*B. glaberrima*.” *Schizogyne glaberrima* is endemic to Gran Canaria.

<sup>5</sup> It refers to the small peninsula of La Isleta located in the main city of the island, Las Palmas de Gran Canaria.

<sup>6</sup> It refers to *Schizogyne sericea* (L.f.) DC. (Asteraceae, Inuleae). The species is found in the Savage Islands and in the Canaries (all islands except Lanzarote; <https://www.biodiversidadcanarias.es/biota/>). Candolle did not ever describe “*Berthelotia sericea*”. See additional details in note 4.

*ma dichotoma*<sup>14</sup>, Canaries, according to our research in the herbarium of Mr. Bouchet<sup>15</sup>. The label was written by him and dictated by Broussonet<sup>16</sup>.

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In the same herbarium we found only *Carlina sulphurea*<sup>17</sup> with the habitat of Tanger and with no species of this genus with the name of *simplex*.

We also did not see any *Carthamus rigidus*<sup>18</sup> from Gibraltar cited by Broussonet<sup>19</sup> or by Durand<sup>20</sup>.

The *Carlina xeranthemoides*<sup>21</sup> in the Brouss. [Broussonet] herbarium is only a variety with large leaves of *Carlowitzia salicifolia*<sup>22</sup>. This plant is found in the collection of Mr. Bouchet with two labels written by him and

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found that allow us to properly interpret this name. *Pulicaria arabica* (L.) Cass. ssp. *hispanica* (Boiss.) Murb. is the only Canary Island native species of the genus to which this taxon could refer to. However, the text of this line of the letter can also be interpreted as Broussonet treating “*Erigeron inuloides*” as a synonym of *Chrysocoma dichotoma* L.f. We cannot rule this second possibility, because the account of *C. dichotoma* (as *Allagopappus dichotomus* (L.f.) Cass.) presented by Schultz Bipontinus (1844–1850: 224) in Webb and Berthelot’s *Histoire Naturelle des Iles Canaries* lists *Conyza inuloides* Aiton as a synonym of *A. dichotomus*. There is a chance that Berthelot had an oversight and wrote “*Erigeron inuloides* Willd” instead of “*Conyza inuloides* Willd;” interestingly, Willdenow (1803: 1938) did list *C. inuloides* Aiton for the island of Tenerife.

<sup>14</sup> It refers to *Chrysocoma dichotoma* L.f. (accepted name *Allagopappus canariensis* (Willd.) Greuter, Asteraceae, Inuleae). *Allagopappus* Cass. (two species) is endemic to the Canaries, with *A. canariensis* occurring in Gran Canaria, La Gomera, and Tenerife. See note 13 for additional details on the interpretation of this line of the letter.

<sup>15</sup> It refers to the French botanist Dominique Bouchet (1770–1845) whose collections are housed at MPU (*Herbier de l’Université de Montpellier II*) and includes the herbarium of Pierre-Auguste-Marie Broussonet (Stafleu and Cowan 1976: 290; Le Brun 2018). See additional details on Broussonet in note 16.

<sup>16</sup> Pierre-Auguste-Marie Broussonet (1761–1807) was a French botanist and director of the Botanical Garden of Montpellier between 1803 and 1807. He lived in the Canary Islands between 1799 and 1803 where he was appointed French Commissioner for Trade. During this period, he actively botanized in this archipelago. Between 1794 and 1795, he exiled to the Iberian Peninsula where he was supported by botanists and friends from Spain, Britain, and Portugal (Motte 1970; Caillé 1972).

<sup>17</sup> *Carlina sulphurea* Desf. (accepted name *C. racemosa* L., Asteraceae, Cardueae) is restricted to the Western Mediterranean (including Morocco) and does not reach the Canary Islands (López Martínez and Devesa 2014; [http://www.floraiberica.es/PHP/generos\\_lista.php](http://www.floraiberica.es/PHP/generos_lista.php)).

<sup>18</sup> *Carthamus rigidus* Willd., nom. illeg. (Asteraceae, Cardueae) refers to *Carduncellus arborescens* (L.) Sweet a species restricted to the Western Mediterranean that does not reach the Canary Islands (López González 2014a; [http://www.floraiberica.es/PHP/generos\\_lista.php](http://www.floraiberica.es/PHP/generos_lista.php)).

<sup>19</sup> See note 16.

<sup>20</sup> It refers to the French priest and botanist Philippe Durand (1795–1815) who collected in southern Spain and Morocco. He worked in the Botanical Garden of Montpellier as Conservateur des Collections de Botanique (Veldkamp 2001; Michaud 2018).

<sup>21</sup> *Carlina xeranthemoides* L.f. (Asteraceae, Cardueae) is a species endemic to Tenerife.

<sup>22</sup> *Carlowitzia salicifolia* (L.f.) Moench (accepted name *Carlina salicifolia* (L.f.) Cav., Asteraceae, Cardueae) is a species endemic to the Canary Islands and Madeira.

dictated by Broussonet. Mr. Bouchet confirmed that all the specimens of *Carlina xeranthemoides*<sup>23</sup> sent to other botanists by Broussonet, passed by his hands and they are all duplicates of the specimen that belongs to him. Therefore, our *Carlina xeranth.* [*xeranthemoides*] is not present in the Broussonet herbarium. In this case the herbaria of Linnaeus and Banks<sup>24</sup> could be useful in clarifying the doubts that we have about this species.

The *Centaurea calcitrapa*<sup>25</sup> is indigenous of to the Canaries; we can find it very frequently in the field surrounding the cities and in almost whole of the maritime region. We can say the same for *Galactites tomentosa*<sup>26</sup> [*tomentosus*] and *Silybum marianum*<sup>27</sup>.

Regarding *Carthamus tinctorius*<sup>28</sup>, this species is cultivated only in the Canaries [Canary Islands] and the *Carthamus teneriffae* Steud.<sup>29</sup>, which we do not know, is probably just a variety of *C. tinctorius*<sup>30</sup> caused by the climate and that some good German could have considered as an indigenous plant.

During my visit at Montpellier, I made a drawing of your *Gonospermum elegans*<sup>31</sup> that probably I have in my herbarium as a variety, this drawing is the copy of that in the collection of the garden. If you wish to have it, I can send it to you, otherwise I will publish it with mine. Here is, more or less, all the information that I can supply on the several species that you mentioned in your letter; if you wish that I do other searches on this subject or on other plants, you only have to indicate this to me, and with pleasure I will try to satisfy your desire. I will remain here another fifteen days and then I will leave for London where I will stay for about one month to check the conditions of my collections and give a glance at the Banks<sup>32</sup>

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<sup>23</sup> See note 21.

<sup>24</sup> It refers to the herbarium of Sir Joseph Banks (1743–1820) who was the unofficial director of the Royal Botanic Gardens, Kew and one the most prominent figures in the history of science of his era. His herbarium is part of the collections of Natural History Museum of London (BM).

<sup>25</sup> *Centaurea calcitrapa* L. (Asteraceae, Cardueae) is a Mediterranean species that reaches the Canaries where it is found in all islands except La Palma (Devesa 2014a).

<sup>26</sup> *Galactites tomentosus* Moench (Asteraceae, Cardueae) is a Macaronesian-Mediterranean species, it is found in all Canaries except Fuerteventura and Lanzarote (Devesa 2014b).

<sup>27</sup> *Silybum marianum* (L.) Gaertn. (Asteraceae, Cardueae) is a species with a widespread distribution that reaches the-Canary Islands (Devesa 2014c).

<sup>28</sup> *Carthamus tinctorius* L. (Asteraceae, Cardueae) has an unknown biogeographical origin and it is cultivated in the Canaries (López González 2014b).

<sup>29</sup> This is a *nomen nudum* (Steudel 1821: 164) and we are not certain of the taxonomic identity of this species. It could refer to *Carthamus lanatus* L. (Asteraceae, Cardueae) or *C. tinctorius* L.

<sup>30</sup> See notes 28 and 29.

<sup>31</sup> *Gonospermum elegans* DC. (accepted name *Gonospermum canariense* Less, Asteraceae, Anthemideae) is endemic to La Palma and El Hierro. The genus is restricted to the Canary Islands and it has seven species.

<sup>32</sup> See note 24.

herbarium for comparing the Canarian species collected by Masson<sup>33</sup>. I will then return to Paris to start working on my publications. I already finished the editing of several families and I hope that at my return to England Hayland<sup>34</sup> will have almost finished the drawings of the plants that I gave him in Lyon, as well as of our more important Compositae that you would give him for this purpose.

Here is the list:

*Centaurea canariensis* Brouss. Willd<sup>35</sup>

*Carduus clavulatus*<sup>36</sup>

*Centaurea cynaroides*<sup>37</sup>

*Conyza canariensis* Willd = *Jasonia dichotoma* DC. in Litt.<sup>38</sup>

*Buphthalmum laevigatum* Brouss. = *Jasonia laevigata* DC. in litt.<sup>39</sup>

*Conyza gouanii* Willd.<sup>40</sup>

*Conyza sericea* = *Berthelotia sericea* DC. in litt.<sup>41</sup>

*Conyza glaberrima* = *B. glaber*. DC. in litt.<sup>42</sup>

*Phagnalon scariosum*<sup>43</sup>

*Conyza sordida* n°1 bis in herb. Willd. B = *Phagnalon umbelliforme* DC. in litt.<sup>44</sup>

<sup>33</sup> It refers to the Scottish botanist Francis Masson (1741–1805), first official collector of the Royal Botanic Gardens, Kew who performed field work in the Azores, Canaries and Madeira between 1776 and 1779 (Francisco-Ortega et al. 2008).

<sup>34</sup> It refers to the German artist Jean-Christophe Heyland (1791–1866).

<sup>35</sup> It refers to *Centaurea canariensis* Brouss. ex Willd. (accepted name *Cheirolophus canariensis* (Brouss. ex Willd.) Holub, Asteraceae, Cardueae). This is a species endemic to Tenerife.

<sup>36</sup> *Carduus clavulatus* Link (Asteraceae, Cardueae) is a species endemic to the Canary Islands.

<sup>37</sup> It refers to *Centaurea cynaroides* Buch (accepted name *Rhaponticum canariense* DC., Asteraceae, Cardueae), a Tenerife endemic.

<sup>38</sup> These two names refer to *Conyza canariensis* Willd. and *Jasonia dichotoma* (L.f.) DC. (accepted name for both of them: *Allagopappus canariensis* (Willd.) Greuter, Asteraceae, Inuleae, see note 14).

<sup>39</sup> These two names refer to *Buphthalmum laevigatum* Brouss. ex Willd. and *Jasonia laevigata* (Brouss. ex Willd.) DC. (accepted name for both of them: *Vieraea laevigata* (Brouss. ex Willd.) Sch.Bip., Asteraceae, Inuleae). The genus *Vieraea* is monotypic and endemic to Tenerife.

<sup>40</sup> It refers to *Conyza gouanii* (L.) Willd. (accepted name *Erigeron gouanii* L., Asteraceae, Inuleae). This is primarily a continental African species (Morocco, Cameroon, eastern Africa, South Africa) that is also found in the Canaries (La Gomera, Gran Canaria, Tenerife, and La Palma). See <https://africanplantdatabase.ch/en/nomen/97596>.

<sup>41</sup> These two names refer to *Conyza sericea* (L.f.) W.T. Aiton and "*Berthelotia sericea* DC." (both with accepted name *Schizogyne sericea* (L.f.) DC., Asteraceae, Inuleae). See note 6 as the name "*B. sericea*" was never published by Candolle.

<sup>42</sup> The names "*Conyza glaberrima*" and "*Berthelotia glaberrima*" were never published; however, they both clearly refer to *Schizogyne glaberrima* DC. (Asteraceae, Inuleae). See note 4.

<sup>43</sup> It refers to *Phagnalon scariosum* DC. ex Lowe (Asteraceae, Gnaphalieae), species published by the British botanist Richard Thomas Lowe (1802–1874) using the name and brief description provided by Augustin Pyramus de Candolle. This is a poorly known species that seems to be morphologically similar to *Phagnalon rupestre* (L.) DC. (Lowe 1868: 443) The latter is a native (no-endemic) species in the Canary Islands.

<sup>44</sup> These two names refer to *Conyza sordida* L. (accepted name *Phagnalon sordidum* (L.) Rchb., Asteraceae, Gnaphalieae) and *P. umbel-*

*Gonospermum fruticosum*<sup>45</sup>  
[*Gonospermum*] *multiflorum*<sup>46</sup>

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and finally, the *Carlowizia xeranthemoides*<sup>47</sup>.

I still did not have decided anything on my method of publication. I have great need of your advice on this, and your departure from Paris at the moment when I arrived to profit from your advice is for me a fatality. Is it better to deal with the same publisher for the different parts that I wish to publish on the natural history of the Canaries so that the parts are published successively with the same format that will be the same of our drawings? And which is, according to you, the publisher that I should prefer?

As I presume that you will not answer from Paris immediately, as you will be without doubt on the road towards Lugano at the reception of my letter, I am giving you the address of Mr. Webb in England.

Farewell, my dear Mister, please convey my compliments to all your family and rest assured of my sincere attachment.

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<sup>48</sup>I join my kinds regards to those of Berthelot, & should you have anything to make out in the herbaria of Linnaeus, Banks<sup>49</sup> or Lambert<sup>50</sup> beg leave to offer my humble services [illeg.] in London. My address is at my Brother's Milford House near Godalming, Surrey. I wish you a pleasant excursion to Italian Switzerland. Parolini<sup>51</sup> writes me that he shall send you hither our Greek Composite.  
P. B.W.

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*liforme* DC., respectively. The latter is a Canary Island endemic that occurs in all islands except Fuerteventura and Lanzarote. According to the protologue of *P. umbelliforme*, this specie is closely related to *P. sordidum* (Candolle 1836: 396), and this could explain why Berthelot listed *Conyza sordida* and *Phagnalon umbelliforme* together in this entry.

<sup>45</sup> It refers to *Gonospermum fruticosum* (Buch) Less. (Asteraceae, Anthemideae). This species is restricted to the islands of La Gomera, El Hierro, and Tenerife. See note 31 regarding biogeography of *Gonospermum*.

<sup>46</sup> It refers to *Gonospermum multiflorum* DC. (accepted name *G. fruticosum* (Buch) Less., Asteraceae, Anthemideae). See note 31 regarding biogeography of *Gonospermum* and note 45 on the distribution of this species in the Canary Islands.

<sup>47</sup> We have not found "*Carlowizia xeranthemoides*" in the taxonomic literature; however, this entry clearly refers to *Carlina xeranthemoides* L.f. (Asteraceae, Cardueae). See note 21.

<sup>48</sup> This part of the letter was written by Philip Barker Webb, and it is in English.

<sup>49</sup> See note 24.

<sup>50</sup> It refers to the British naturalist Aylmer Bourker Lambert (1761–1842) who was of the first fellows of the Linnean Society of London and owner of the largest private herbarium in Europe at that time (Miller 1970).

<sup>51</sup> It refers to the Italian botanist Alberto Parolini (1788–1867), a close friend of Webb to whom he dedicated the Canary Island endemic genus *Parolinia* (Brassicaceae), see further details in Francisco-Ortega et al. (2022).