



ARTÍCULO INVITADO

## THE GOUJAUD BONPLAND BROTHERS: TWO COMPLEMENTARY APPROACHES OF BOTANICAL KNOWLEDGE

Los hermanos Goujaud Bonpland: dos enfoques complementarios del conocimiento botánico

FRED W. STAUFFER<sup>1</sup> & JOHANN STAUFFER<sup>2</sup>

**Summary:** French botanists of the late eighteenth and early nineteenth centuries deeply influenced the discovery and description of plant diversity in the Neotropics. Most of them studied medicine or pharmacy, for which systematics and comparative morphology played an extremely important role in the comprehension of useful plants. Some of them took courses by the most renowned European botanists and later themselves became the foremost scientists in charge of naming the plant diversity of most American countries. This article highlights the major contributions of the Goujaud Bonpland brothers to botany and describes the different ways they influenced the natural sciences at a local, regional and planetary scale.

**Key words:** Bonpland, botanical history, Humboldt, Neotropics.

**Resumen:** Los botánicos franceses de finales del siglo XVIII y principios del siglo XIX influenciaron profundamente el descubrimiento y la descripción de la diversidad vegetal que alberga la región Neotropical. La mayoría de estos botánicos realizaron estudios de medicina o farmacia, en el marco de los cuales la sistemática y la morfología comparativa jugaron un rol muy importante en la comprensión de la utilidad de las plantas. De esta manera, algunos de ellos tomaron cursos impartidos por los más reconocidos botánicos europeos y se convirtieron posteriormente en importantes investigadores a cargo de la identificación de la diversidad vegetal de la mayoría de los países americanos. La presente contribución pone en evidencia el aporte de los hermanos Goujaud Bonpland y describe las diferentes maneras en las que influenciaron los estudios de ciencias naturales a nivel local, regional y mundial.

**Palabras clave:** Bonpland, historia de la botánica, Humboldt, Neotrópico.

### Introduction

Shortly after finishing their studies in Medicine by the end of 1797, Michel-Simon Goujaud Bonpland (1770-1850) and Aimé-Jacques-Alexandre Goujaud Bonpland (1773-1858) prepared their return to La Rochelle; following the steps of their father it was clear that the exercise of the Medicine would play a major role in their lives. In the frame of their studies in Paris, the two brothers had followed botanical courses with celebrated French

botanists such as Antoine-Laurent de Jussieu (1748-1836), René Louiche Desfontaines (1750-1833) and André Thouin (1747-1824) among others. Botany soon became an important component in their personal and professional existences, but the ways in which this discipline was understood and further developed were marked by the substantially different personalities of the two brothers.

Michel-Simon immediately returned to La Rochelle where he started a successful career as physician and naturalist. Besides his different

<sup>1</sup> Conservatory and Botanic Gardens of Geneva University of Geneva, Laboratory of Plant Systematics and Biodiversity, CP 60, CH-1292 Chambésy / GE, Switzerland. Email: [fred.stauffer@ville-ge.ch](mailto:fred.stauffer@ville-ge.ch)

<sup>2</sup> Feldstrasse 5, CH-4950 Huttwil, Switzerland.

engagements with the Society of Natural Sciences of La Rochelle, Michel-Simon not only created a private herbarium, preliminarily started during his early years of study in Paris and Montpellier, but also maintained a very active correspondence with other contemporary European botanists. Meanwhile, Aimé stayed in Paris given the proposal of the Natural History Museum to participate as naturalist in the planned second travel around the world of Louis-Antoine Bouganville (1729-1811). Aimé travelled to unknown territories, but indeed with the Prussian Baron Friedrich Heinrich Alexander von Humboldt (1769-1859), who had planned a 4-5 years scientific journey to the Americas (Stauffer et al., 2012). Aimé not only participated as the botanist of Humboldt's expedition, but when the two explorers returned to Europe, he was in charge of some scientific and editorial tasks. The *Plantae Aequinoctiales* (1805-1817) and the *Flora Melastomatacearum* (1806-1823), the latter co-authored by Louis Claude Richard (1754-1821), Auguste F. C. P. de Saint-Hilaire (1779-1853) and Carl Sigismund Kunth (1788-1850), are the most important publications of Aimé Bonpland linked to the study of the specimens issued from the expedition. It is well known that Aimé Bonpland also made botanical collections when he was in charge of the garden of Malmaison and also during his second travel to the New World; however, the present contribution concentrates mostly on the collections issued from the expedition carried out with Alexander von Humboldt, given their large impact in domains such as plant taxonomy, floristics and phytogeography.

This preliminary analysis represents the first comparative approach aiming to characterize the botanical career of the two brothers, through the detailed study of the botanical specimens they collected and original documents. This contribution presents data already published in French by Stauffer et Stauffer (2010); however, we believe that its presentation in the current English version will open their access to a wider community interested in the botanical contribution of the Goujaud Bonpland brothers. Additional information, in particular associated to our findings in the "Médiathèque Michel Crépeau" of the city of

La Rochelle (France), has been included in order to make awareness about an important, yet relatively poorly known set of document associated to Aimé Bonpland.

## Materials and Methods

We studied original specimens deposited at the herbaria P (P and P-Bonpl.) (Figs. 1-3) and B (B and B-W), acronyms following Lanjou et Stafleu (1964). The original field notes of Bonpland and Humboldt, known also as the "Journal Botanique", were examined in the "Bibliothèque Centrale" (MNHN, Paris). As Humboldt's correspondence with Willdenow (Moheit, 1993; letter nr. 41, p. 122) also suggested the presence of expedition collections in the herbarium (LR) of the "Muséum d'Histoire Naturelle", La Rochelle, France (Fig. 4). Accordingly, FWS and JS visited this herbarium in November 2009. All monocotyledon specimens present in the Bonpland herbarium that was assembled by Michel-Simon Goujaud Bonpland (1770–1850), were examined in an effort to locate any specimens that could be attributed to the Humboldt and Bonpland expedition. In addition, letters received by Michel-Simon, which are now kept in the archives of the "Muséum d'Histoire Naturelle", were examined. Finally, the "Médiathèque Michel Crépeau" of La Rochelle was visited by FWS and JS in January 2011 in an effort to locate original documents or correspondence relating to Aimé Bonpland or his brother

## Results

### *History and composition of the Aimé Bonpland and Alexander von Humboldt herbarium*

For many authors the most important botanical collections ever made in tropical America, from the stand point of taxonomy, were probably those made by Aimé Bonpland and Friedrich Alexander von Humboldt from 1799 to 1804. During their journey in the neotropics the two explorers visited Venezuela, Cuba, Colombia, Ecuador, Peru and Mexico; in each country exploring extensive regions



**Fig. 1.** Herbarium of Aimé Bonpland. A: General view of the National Museum of Natural History of Paris. B: One pile of specimens gathered by Aimé Bonpland during his 5 years expedition with Alexander von Humboldt and kept separately in the historical collection P-Bonpl.

**Fig. 1.** Herbario de Aimé Bonpland. A: Vista general del Museo Nacional de Historia Natural de París. B: Una pila de especímenes reunidos por Aimé Bonpland durante su expedición de 5 años con Alexander von Humboldt y conservados por separado en la colección histórica P-Bonpl.





**Fig. 2.** Selected specimens collected by Aimé Bonpland and Alexander von Humboldt deposited in the Historical P-Bonpl. Herbarium. A: *Quercus jonesii* Trel. (Mexico). B: *Piper blandum* Jacq. (Venezuela). C: *Achyrocline bogotense* (Kunth) DC. (Colombia). D: *Agarista bracamorensis* (Kunth) G. Don (Peru). Courtesy of the “Muséum National d’Histoire Naturelle de Paris”.

Fig. 2. Especímenes seleccionados colectados por Aimé Bonpland y Alexander von Humboldt depositados en el herbario histórico P-Bonpl. A: *Quercus jonesii*. (México). B: *Piper blandum* Jacq. (Venezuela). C: *Achyrocline bogotense* (Kunth) DC. (Colombia). D: *Agarista bracamorensis* (Kunth) G. Don (Perú). Cortesía del “Muséum National d’Histoire Naturelle de Paris”.





**Fig. 3.** Selected specimens collected by Aimé Bonpland deposited in the Historical P-Bonpl. Herbarium. A: *Croton bonplandianus* Baill. (Argentina). B: *Sorocea bonplandii* (Baill.) W. C. Burger, Lanj. & Wess. Boer (Argentina). C: *Chamissoa altissima* (Jacq.) Kunth (Paraguay). D: *Butia capitata* (Mart.) Becc. (Paraguay). Courtesy of the “Muséum National d’Histoire Naturelle de Paris”.

**Fig. 3.** Especímenes seleccionados colectados por Aimé Bonpland depositados en el herbario histórico P-Bonpl. Herbario. A: *Croton bonplandianus* Baill. (Argentina). B: *Sorocea bonplandii* (Baill.) W. C. Burger, Lanj. & Wess. Boer (Argentina). C: *Chamissoa altissima* (Jacq.) Kunth (Paraguay). D: *Butia capitata* (Mart.) Becc. (Paraguay). Cortesía del “Muséum National d’Histoire Naturelle de Paris”.



**Fig. 4.** Herbarium of Michel Simon Goujaud Bonpland. A: Natural History Museum of La Rochelle. B: General view of the herbarium stored at the basement of the Museum.

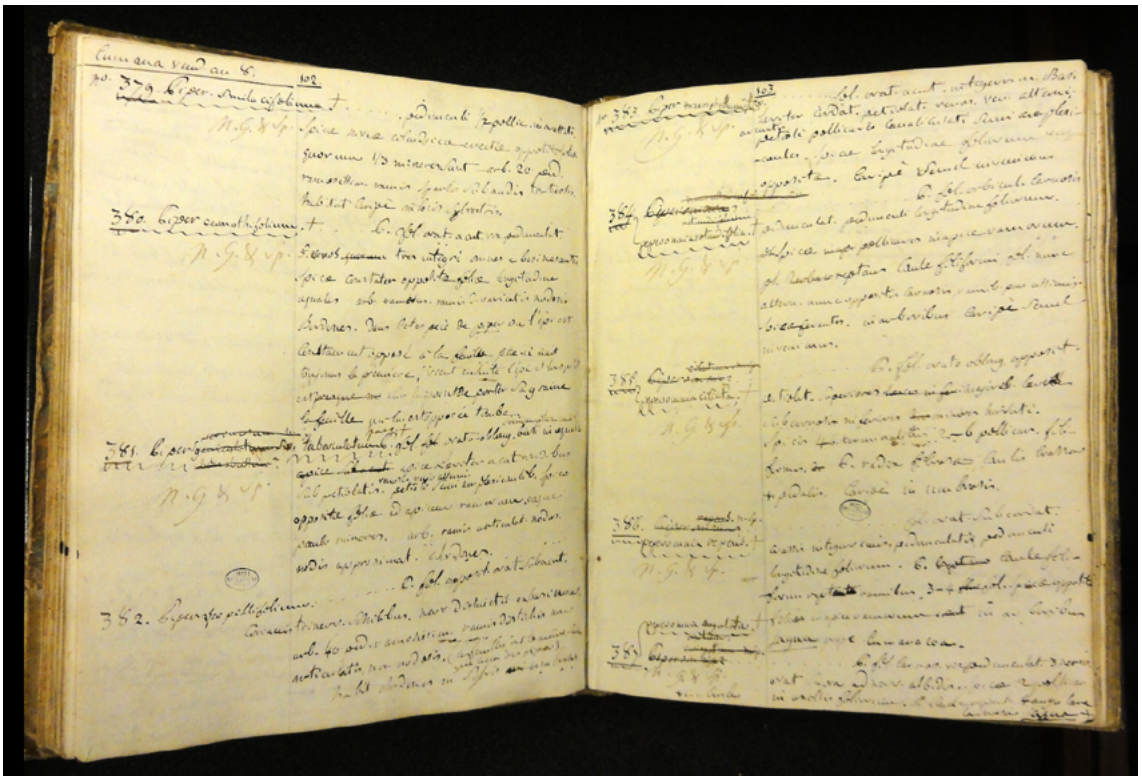
**Fig. 4.** Herbario de Michel Simon Goujaud Bonpland. A: Museo de Historia Natural de La Rochelle. B: Vista general del herbario almacenado en el sótano del Museo.



never before visited by any naturalist and hence gathering an impressive number of plants completely unknown to contemporary botanists. A detailed study of the botanical specimens issued from the expedition and the botanical field notes known as the “Journal Botanique” (Fig. 5) has made clear that Aimé Bonpland played a major role in the botanical work, whereas Alexander von Humboldt concentrated in other disciplines and undertook the coordination of the whole travel. Hence, the botanical specimens issued from the expedition should be attributed to Bonpland and Humboldt, and not the other way round as widely spread in botanical literature.

A vast literature has been devoted to the well-known travels of Humboldt and Bonpland

in the New World (Stearn, 1968; Stauffer et al., 2012) and their impact on a wide range of biological disciplines such as taxonomy, floristics, ecology and biogeography have been highlighted in several hundreds of scientific papers. More specific efforts have been addressed in order to characterize the collections gathered in their journey (Hiepko, 1987, 2006; Lack, 2003), the botanic field notes compiled (Lack, 2004a,b), as well as the plant engraved material (Lack, 2001). The study of taxonomically defined groups such as Amaryllidaceae, Asteraceae and Rubiaceae has provided important hints towards the understanding of the collections and pointed out their importance for taxonomical studies in the Neotropics.



**Fig. 5.** The original field notes (“Journal Botanique”) compiled by Aimé Bonpland during his journey with Alexander von Humboldt to the neotropical regions. Courtesy of the “Bibliothèque Centrale, Muséum National d’Histoire Naturelle de Paris”.

**Fig. 5.** Las notas de campo originales (“Journal Botanique”) recopiladas por Aimé Bonpland durante su viaje con Alexander von Humboldt a las regiones neotropicales. Cortesía de la “Bibliothèque Centrale, Muséum National d’Histoire Naturelle de Paris”.



*Representation of the Aimé Bonpland and Alexander von Humboldt botanical specimens in international herbaria*

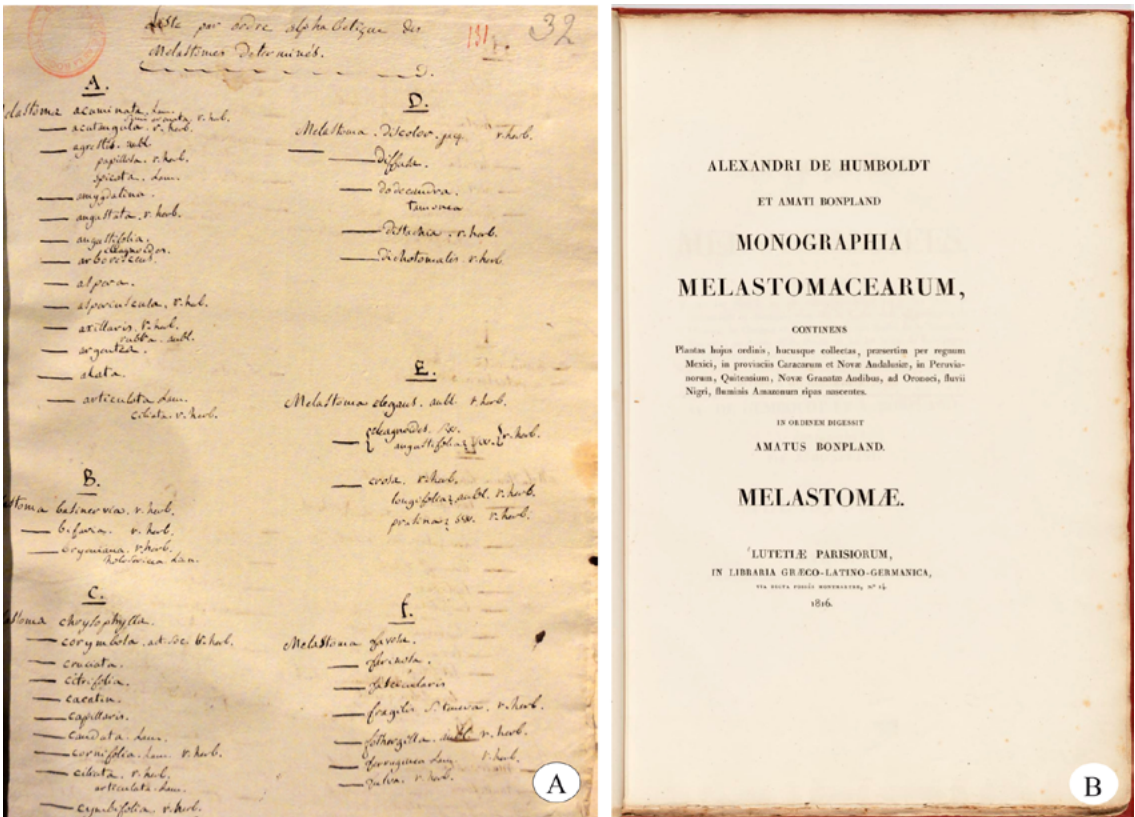
Willdenow and Bonpland himself were originally in charge of the publication of the results issued from the expedition; however, the former died in 1812 without having enough time to study the huge amount of specimens collected, and the latter was completely overwhelmed by his responsibilities at the Malmaison Garden. Humboldt contacted the only 23 years old, but already well known German botanist, Carl Sigismund Kunth (1788-1855) in order to continue with the study of the specimens collected in the Neotropical journey. In fact, Kunth was almost entirely in charge of the titanic publication of the *Nova Genera et Species Plantarum (Nov. Gen. Sp. Pl.)*, a masterpiece work that compiled most of the taxonomical novelties linked to the expedition. According to a thorough study published by P. Hiepko on the fate of the Bonpland and Humboldt collections (Hiepko, 1972, 1987), when Kunth left Paris for Berlin in 1829 having finished the publication of the *Nov. Gen. Sp. Pl.*, four big sets of the collection, containing more than 5000 species could be recognized: 1) main set at P-Bonpl. herbarium, kept separately as historical collection (Figs. 1-3), 2) unknown amount of specimens owned by Bonpland and taken with him to Argentina, 3) a set of ca. 3360 specimens in the Willdenow Herbarium at Berlin and 4) a set of ca. 3000 specimens which was given by Humboldt to Kunth shortly before he left Paris. Duplicates or fragments of the Bonpland and Humboldt specimens have been reported in herbaria such as B (Berlin, Germany), CGE (Cambridge, UK), F (Chicago, USA), FI (Florence, Italy), G (Geneva, Switzerland), HAL (Halle, Germany), KIEL (Kiel, Germany), L (Saint Petersburg, Russia), LINN (London, UK), LR (La Rochelle, France) (Fig. 4), P (Paris, France) and NY (New York, USA) (Lanjouw et Stafleu, 1964); even though the entry for W (Vienna, Austria). We provide here information on what we were able to find in the main sets.

*The historical Bonpland herbarium (P-Bonpl.) at the "Museum National d'Histoire Naturelle de Paris" (France)*

In a letter to the authorities of the Natural History Museum of Paris dated December 18 of 1804 Humboldt formally expressed his desire to deposit in this institution a herbarium containing more than 6000 specimens, packed in 45 boxes. According Hiepko (2006) about 3560 of these specimens are now kept separately in the section of historical collections and considered to represent the main set of collections issued from the Humboldt and Bonpland expedition. The other 3000 specimens of the original group were offered by Humboldt to Kunth in order to be further studied in Berlin. The species present at the P-Bonpl. historical collection (Figs. 1-3) are arranged in exactly the same order as they appear in the volume 1 of the publication *Nov. Gen. Sp. Pl.*, but additional taxa published in the volume 7 were later on intermixed in this collection.

Humboldt and Bonpland spent most of their journey together and hence, collections at the P-Bonpl. Herbarium should be attributed to both of them (i.e. Bonpland and Humboldt) and much less frequently to only one of them. In the case of the Monocotyledons cited in the *Nov. Gen. Sp. Pl.* we could find only one specimen that was clearly not collected by them (Stauffer et al., 2012). The collections deposited at P-Bonpl. were studied by Kunth and in a lower extent by Willdenow; only in very few cases other contemporary botanists had access to them. Louis Claude Marie Richard (1754-1821), regarded as one of the most important French botanists of the XVIII century, was one of them. Richard was a close collaborator of Bonpland for the publication of the *Flora Melastomatacearum* (Fig. 6) and it might be hypothesized that access to some of the Bonpland specimens was probably enabled by the close collaboration maintained between the two botanists.

Most of the original labels present on the specimens were originally written by Bonpland but afterwards replaced by Kunth with new labels usually containing only the species name and very rarely the original number assigned to the collection (Stauffer et



**Fig. 6.** Documents associated to the research of Aimé Bonpland on Neotropical Melastomataceae. A: Working list of Melastomataceae names. B: First page of the *Flora Melastomatacearum* (1806-1823), one of the key botanical works undertaken by Aimé Bonpland. Courtesy of the Mediatheque of the City of La Rochelle and the library of the Conservatory and Botanic Gardens of Geneva.

**Fig. 6.** Documentos asociados a la investigación de Aimé Bonpland sobre las Melastomataceas Neotropicales. A: Lista de trabajo de los nombres de Melastomataceae. B: Primera página de la *Flora Melastomatacearum* (1806-1823), una de las principales obras botánicas emprendidas por Aimé Bonpland. Cortesía de la Mediateca de la Ciudad de La Rochelle y de la biblioteca del Conservatorio y del Jardín Botánico de Ginebra.

al., 2012). Bonpland’s original labels are much less frequent, but when present they contain details on the collector number, locality, date of collection (following the French Republican calendar), and occasionally a common name. The poor inclusion of collector numbers in the replaced labels is at least from our current perspective a bit surprising since this was the only way for Kunth to unequivocally link the specimens with the descriptions in the “Journal Botanique” (Fig. 5). Kunth’s decision to replace the original labels might be related to the fact that the citation of collector numbers was not of current practice in taxonomic

treatments published during the XVIII and the early XIX centuries.

With very few exceptions almost no duplicates are included in the collection, as they were probably already distributed by Willdenow, Kunth or Humboldt himself. The specimens kept in the P-Bonpl. collection should be undoubtedly considered as the nomenclatural types (holotypes, isotypes and syntypes) associated to the species described in the *Nov. Gen. Sp. Pl.* However, taxonomic problems may arise when such specimens are lacking, even though there are only few indications by Kunth that the material

was deposited elsewhere, notably making reference to the Bonpland private herbarium, to which he had no access while preparing the publication. We have found that in the case of the Monocotyledons an important number of species described as new to science in the *Nov. Gen. Sp. Pl.* are not represented in the collection, either because they completely lack an associated specimen or because they are only represented by line drawings. Missing specimens in the P-Bonpl. collection have been already pointed out in other families published in the *Nov. Gen. Sp. Pl.*

The fate of the missing material at P-Bonpl. has always deeply intrigued all botanists interested in this historical collection. As indicated in our investigation, there are strong evidences suggesting that the missing specimens did not disappeared, but may be concentrated in the general collections of Paris (P) and Berlin (B), the latter believed to be heavily destroyed during the WWII bombing. Meanwhile, it cannot be excluded that some of these original collections and not only duplicates reached any of the herbaria cited as depositories of other Bonpland and Humboldt specimens. An additional hypothesis suggests that the missing collections are explained by the fact that neither Bonpland numbered all herbarium specimens nor ever existed a complete set documenting all entries in the collection field notes (Lack, 2004a; Stauffer et Stauffer, 2017).

*The specimens at the general herbarium of Paris (P), "Muséum National d'Histoire Naturelle de Paris" (France)*

In a letter of Humboldt to Bonpland dated December 21 of 1805 (8), Humboldt states *I will send your plants as soon as we have finished to sort them out.* This seems to be a clear sign that not long after they arrival to Europe the two explorers divided the collections, a part of them consisting of an unknown number of specimens, permanently kept by Bonpland and in this contribution referred as his "private" set of collections. In many letters of Humboldt to Bonpland (i.e. January 4, 1806; September 14, 1806; December 30, 1808) (Hossard, 2004) Humboldt firmly pointed out the critical importance to receive without delay Bonpland's

private set, as well as an unknown number of specimens belonging to the Humboldt's set but still kept by Bonpland in Paris. Bonpland's private set was indeed fundamental for the publication of the botanical results issued from the expedition, and the main reason for that was because many of the species present in this set were only represented by a single collection and therefore completely absent from the core Humboldt's set of collections studied at that time by Willdenow.

Much later, when Aimé left Europe in November 1816 with the idea to definitely settle in Argentina, he took with him these collections as well as the "Journal Botanique" (Fig. 5), containing the description of all the collections gathered in the expedition (Hiepkö, 2006; Stauffer et al., 2012). The latter was recovered in the last minute by Kunth before Bonpland left France (Lack, 2004a), whereas the former traveled to Argentina indeed but were finally sent by Bonpland back to Paris in 1832. This set of specimens was incorporated in the general herbarium (P), where material used by Kunth for the publication of the *Nov. Gen. Sp. Pl.* or duplicates of it can be also found. The concerned specimens in the P general herbarium and duplicates present in other herbaria in which Bonpland and Humboldt specimens have been identified can be recognized by the annotation "Herbier donné par M. Bonpland en 1833" on their labels.

The exact amount of specimens and the taxa once contained in the Bonpland private collection, now fully integrated in the P general collection, remains unknown and the location of these specimens represents a huge task. This is true not only due to the large amount of specimens to be spotted, but also because those specimens might have several times changed their original name because of the new determinations they have received throughout all these years. However, targeted efforts on specific families such as Solanaceae (S. Knapp pers. comm.) have retrieved quite a number of these specimens. Moreover, studies carried out in the palm (Arecaceae) family clearly demonstrated that some of the specimens used for the publication of the *Nov. Gen. Sp. Pl.* are indeed to be found in the P general collection (Stauffer et Stauffer, 2017).



*The specimens at the historical Willdenow herbarium (B-W), Botanischer Garten und Botanisches "Museum Berlin-Dahlem" (Germany)*

As already pointed out in other studies on the Bonpland and Humboldt specimens present in the B-W herbarium, their location represents a real challenge and has inherent difficulties. A set of ca. 3360 specimens that could be attributed to the Humboldt and Bonpland expedition were sent to Willdenow (Urban, 1917) and these specimens are now kept separately in the so called Willdenow Herbarium (B-W). Humboldt and Bonpland not only sent to Willdenow herbarium specimens but also seeds. Hence, in a letter of Humboldt to Bonpland dated December 21 of 1805 Humboldt indicates that up to 75 "species" sent to Willdenow were successfully cultivated in Berlin and that Willdenow expected that many more seeds would germinate.

Unlike the general herbarium of Berlin (B), the Willdenow private collection entirely survived the WWII bombing as it was evacuated to a bank vault just after the beginning of the war. Willdenow's set contained not only duplicates of most of the collections in Paris, but also some unique specimens not represented in the principal set. Willdenow's herbarium was purchased in 1818 by the Botanischer Garten und Botanisches "Museum Berlin-Dahlem". Before that, the herbarium was under the custody of Willdenow's close friend D. F. K. von Schlechtendal (1767-1842) (McVaugh, 1955), and later on by Schlechtendal's son, Diederich Franz Leonhard von Schlechtendal (1794-1866). The latter was appointed as curator of the Royal Herbarium in 1819 and took in charge the complete rearrangement of the Willdenow herbarium according to the Linnean system. Bonpland and Humboldt specimens in this herbarium are in general terms very well preserved and present the original label with the Bonpland handwriting. In many cases the labels contain the collector number, locality, date of collection, and occasionally a common name. Willdenow used to copy in the outer label of the folder the origin of the specimens therein contained, including those issued from the Humboldt and Bonpland expedition. However, in some cases there

is no evident match between the locality of collection proposed in the label of the folder or the specimen and the locality proposed by the *Nov. Gen. Sp. Pl.* or the "Journal Botanique".

The specimens issued from the expedition deposited at the B-W collection were extensively studied by Willdenow himself, but after his death in 1812, especially after D. F. L. von Schlechtendal was appointed as director of the herbarium in 1819, accessible to other botanists such as Johan Jakob Roemer (1763-1819) and Josef August Schultes (1773-1831), who apparently only had access to the botanical notes left by Willdenow, and Johann Heinrich Friedrich Link (1767-1851), among others. Link was appointed as director of the Berlin garden in 1815 and studied in detail Willdenow's herbarium, describing in 1820 at least 7 new species of Monocotyledons based on specimens collected by Bonpland and Humboldt.

#### *History and composition of the Michel-Simon Goujoud Bonpland herbarium at LR*

Not long after finishing his studies of Medicine in Paris and having returned to La Rochelle, Michel-Simon joined his medical responsibilities to a very active participation in the political life of the city. He was deeply engaged with the Society of Agriculture, in the frame of which he organized several courses on plant identification and was involved in the foundation of the Society of Natural Sciences of La Rochelle, which in turn enabled the foundation of the Natural History Museum of the city that holds the LR herbarium (Fig. 4). It is in the frame of this Museum that the so-called Bonpland Herbarium had its early origins. The only known set of plants collected by Michel-Simon has been always believed to be deposited there, where it is currently kept separated from the rest of the collections. The specimens associated with this herbarium have been preliminarily characterized (Rallet, 1970) and mainly attributed to Michel-Simon, although some collections of his brother Aimé had been also reported. With the aim to identify in this herbarium collections that could be attributed to the expedition of Humboldt and Bonpland in the Neotropics we were able to study all the specimens corresponding to

the Monocotyledons and about 90% of the Dicotyledons. What has been kept separated as the Bonpland collection in the LR herbarium consists of 36 piles, with an estimate of 60-70 specimens per pile, leading to an estimation of 2000 and 2500 specimens (Figs. 4A, 7). Most of them are not mounted, which allows manipulation of specimens only with extreme care. These 36 piles are arranged according to the Linnaean system and consist of 7 piles of specimens of Monocotyledon families, 28 piles containing Dicotyledon families and one pile containing a mixture of algae, lichens, fungi and mosses (Fig. 7). In general terms

the Monocotyledon collection is much better preserved than the Dicotyledon collection, the latter specially damaged in families such as Asteraceae and Brassicaceae. Meanwhile, the specimens of Poaceae are very well preserved and especially diverse from a taxonomical point of view.

Localities on the labels are very scarce but when available they largely correspond to French localities such as Barèges, Bois de Boulogne, Bois de Champagne, Bondy, Charente inf., Des Cevènnnes, Fontainebleau, Forêt de St. Germain, H. F. (Hortus Fontainebleau), H. M. (Hortus Montpell.),



Fig. 7. Selected documents of the Bonpland Herbarium kept by Michel-Simon Goujaud - Bonpland and deposited in the LR herbarium. Courtesy of the Muséum d'Histoire Naturelle de La Rochelle.

Fig. 7. Documentos seleccionados del Herbario Bonpland guardados por Michel-Simon Goujaud - Bonpland y depositados en el herbario LR. Cortesía del Muséum d'Histoire Naturelle de La Rochelle.

H. P. (Hortus Paris.), H. R. (Hortus Rochef.), H. Rup. (Hortus Rochel.), Ile d'Aix, Iles de Charentons, Marseille (ex horto Audibert), Montferrat, Montmorency, Nantes, Pyrénées, Plaine de Grenelle, St. Germain-en-Laye, St. Léger, Sainte-Radegonde and Valence. Some localities referred to Spain are Aranjuez, Barcellona, Madrid, Tenerife and Hispania (no exact locality indicated); and localities attributed to other countries: St. Thomas, Portugal, Suisse (Vaud, comm. De Candolle) and Tunisie. Michel-Simon actively corresponded with several contemporary botanists as it can be observed in the names on several of the labels present in the specimens. The word "dedit" is associated to the following names: Bellanger, Bonafosse, Cavanilles, de Candolle, Desfontaines, Delisle, Lorenti, Née, Porret, Richard, Thibault, Thouin, Violet, Verdier and Zimmermann. There are very few dates on the labels. In fact, only the dates 1792, associated to the locality of Cévennes and the date of 1843, associated to the locality of Barèges could be identified.

It should be pointed out that some doubts have been raised about the clear separation of the "Herbier Bonpland" with the so called "Herbier Dessalines d'Orbigny", even though previous studies on this collection did not express any doubt about this fact. The collection of Dessalines d'Orbigny deposited at LR has been attributed to Charles-Marie Dessalines d'Orbigny (1770-1856) father of the famous explorer Alcide Charles Victor Marie Dessalines d'Orbigny (1802-1857) and consists of 13 piles stored just beside the Bonpland's collection. We found no evidence in the specimens to accurately separate the two herbaria. In many aspects (i.e. format of the specimens, type and information on the labels) the two collections largely resemble and much more detailed studies would be needed to establish clear attributions on their respective origin.

We were neither able to clearly establish a difference between the specimens collected by Michel-Simon and the ones that could have been collected by his brother Aimé. Moreover, the comparison of the handwriting of the two brothers does not let to establish a clear attribution of the specimens. Many of

the collections from Spain do match several localities visited by Aimé Bonpland shortly before he left Europe (i.e. Aranjuez, Madrid) and at least one that was visited by him half way to the New World (i.e. Tenerife). In fact, as indicated in a letter of Michel-Simon to André Thouin dated January 15 of 1799 (folder 68/11 deposited in the archives of the Library of the Natural History Museum of La Rochelle) Michel-Simon had received some plants collected in Spain by his brother, and this would suggest that an important number of plants from Spain were indeed collected by Aimé shortly before he left Europe. We were able to identify at least two specimens that unequivocally could be attributed to the Humboldt and Bonpland expedition. The first specimen corresponds to a lichenized fungus bearing the name *Gymnoderma* (Cladoniaceae), which indicates that it was sent from Caracas by Aimé Bonpland. The second specimen corresponds to a *Mutisia* (Asteraceae), containing the note "hab. in Monte Quindio", a locality visited by the two explorers during their Colombian journey.

J.-C. Jolinon and M. Pignal from the Natural History Museum of Paris carried out a preliminary analysis on the main botanical collections deposited at LR (Jolinon et Pignal, 1998) and further research was undertaken by Stauffer et Stauffer (2010). In the frame of these assessments it was possible to describe a group of 19 notebooks containing plant specimens, known as the "Petit Cahiers", that may have been in the hands of Michel-Simon. We have studied in detail these notebooks and were not able to identify any evidence (i.e. handwriting) accurately demonstrating that he was the owner of the herbarium or that he directly or indirectly contributed to its composition. The information related to each plant is very scarce, only restricted to the Latin names and its classification according the Linnaean system. With respect to the Bonpland herbarium previously described, the herbarium presented in the notebooks looks much more modern. The first fascicle compiles a group of plants collected abroad, represented by localities such as Am. Equinoctiale, Am. Septentrionale (Virginie), Canada, Cap, Chine, La Plata, Espagne,



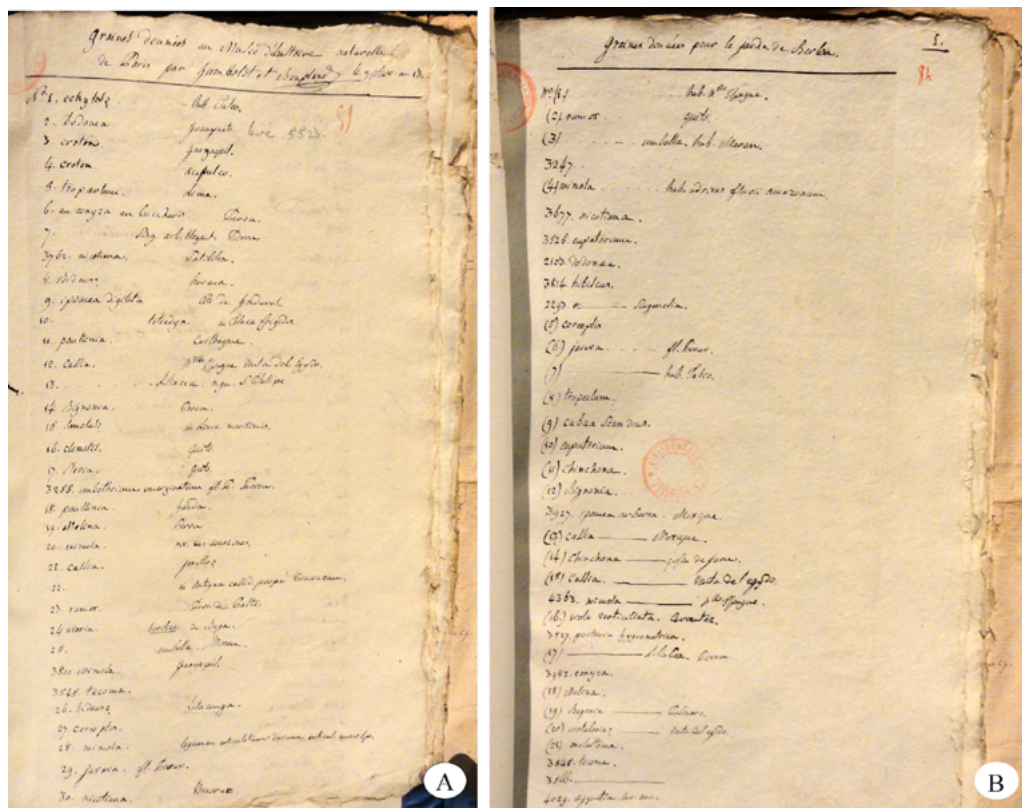
Mexique, Nouvelle Hollande, Portugal and La Caroline.

The archives deposited in the library of the Museum provided a clear overview on the botanical interest developed by Michel-Simon, whereas few documents are connected to Aimé Bonpland and the collections made in the New World. The correspondence between them represented in the archives is rather scarce and it might be very well possible that more critical information on the botanical exchange between the two brothers could be available in the collection of original letters of Aimé Bonpland deposited at the Mediatheque of the City of La Rochelle. Most botanical documents related to Michel-Simon are concentrated in folder 68/11, which contains a document entitled

“Herbier de Michel-Bonpland, 1828” and many other lists providing data on localities or regions that were apparently visited during botanical field work (i.e. Fontainebleau).

*Remarkable and poorly known documents of Aimé Bonpland stored in the Mediatheque of the City of La Rochelle*

During our visit to the Mediatheque of the City of La Rochelle on January 2011 we were able to study what we believe is a group of remarkable and poorly known documents associated to Aimé Bonpland (Figs. 8-9). These documents, contained in the folder 676 (“Portefeuille contenant des manuscrits autographes du naturaliste voyageur Bonpland”), have certainly different degrees of importance



**Fig. 8.** Selected documents related to Aimé Bonpland. A: List of seeds shipped by Alexander von Humboldt and Aimé Bonpland to the Natural History Museum of Paris in 1813. B: List of seeds shipped to the Berlin Botanical Garden. Courtesy of the Mediatheque of the City of La Rochelle.

**Fig. 8.** Documentos seleccionados relacionados con Aimé Bonpland. A: Lista de semillas enviadas por Alexander von Humboldt y Aimé Bonpland al Museo de Historia Natural de París en 1813. B: Lista de semillas enviadas al Jardín Botánico de Berlín. Cortesía de la Mediateca de la Ciudad de La Rochelle.

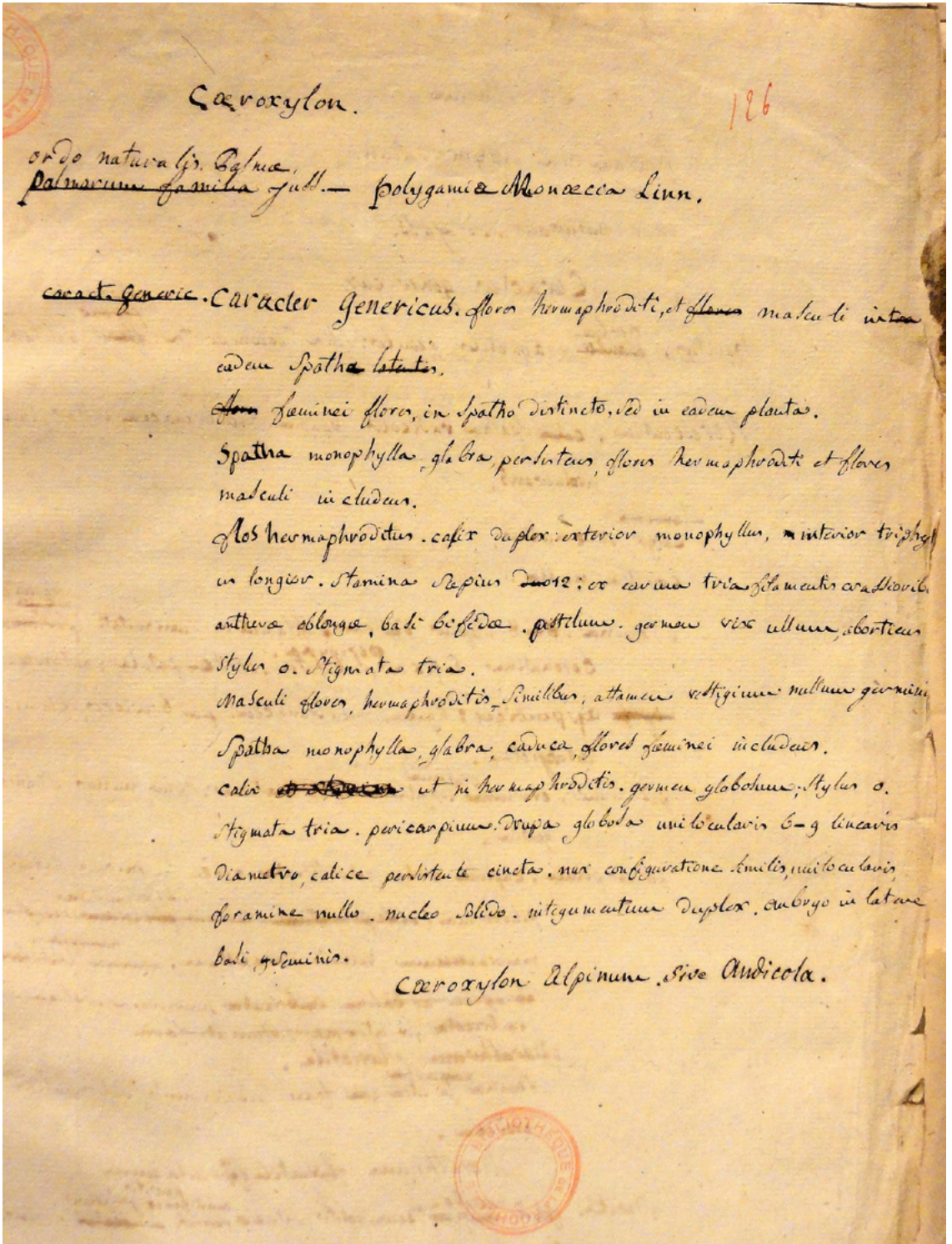


Fig. 9. Hand written notes prepared by Aimé Bonpland for the description of the Andean palm genus *Cerroxylon*. Courtesy of the Mediatheque of the City of La Rochelle.

Fig. 9. Notas manuscritas preparadas por Aimé Bonpland para la descripción del género de palmera andina *Cerroxylon*. Cortesía de la Mediateca de la Ciudad de La Rochelle.



and should be studied in further detail to better understand Aimé's Bonpland contribution to Neotropical botany. In the appendix 1 are listed some of the most remarkable documents found in the Mediatheque, to which we added brief comments on their potential interest for taxonomy, floristics and botanical history associated to the publication of results issued from the Humboldt and Bonpland's expedition to the Americas.

### Discussion and Conclusions

It is clear that the two brothers Goujaud Bonpland shared a great passion for botany, probably started long before their more formal studies in Paris and Montpellier. This solid botanical knowledge was exploited by them in remarkably different ways. Aimé, keen to explore remote areas of the world, successfully collected and characterized an almost complete unknown flora in the Neotropics. The expedition with Alexander von Humboldt is widely recognized as one of the most successful scientific journeys of the early XIX century and the botanical results linked to the plant collections gathered are nowadays regarded as milestones in the domains of taxonomy and floristics. Meanwhile, his less botanically known elder brother, Simon-Goujaud, interpreted botany mostly as an applied science, strongly linked to more agronomical purposes. His rich herbarium and the large amount of data on his botanical activities represented in the archives clearly show his deep interest on this discipline. He focused his studies on the regional flora, promotion of local botanical courses and development of more applied aspects such as agronomy and the study of plant uses.

After having studied in detail the rich herbarium and the archives of Michel-Simon one can be almost sure that Aimé Bonpland was at least in his early years deeply influenced by his brother's botanical interest. The inspiration of renamed botanists such as de Jussieu, Desfontaines and Thouin and his own field experience in the Neotropics made of Aimé one of the most important botanists of the history. As we have been able to confirm, the

two brothers have become icons of an era and their impact on botany, either from a more applied and regional to a more fundamental and world scale, can be successfully traced through their botanical collections.

The two brothers developed complementary skills in several domains of Natural Sciences and their influence in a regional and worldwide context is completely astonishing. Many questions remain open with respect to the relationship of the two brothers and this aspect should be further explored to better understand the major forces that encouraged Aimé in his restless search of botanical knowledge on New World plants.

### Acknowledgements

First of all I would like to thank the kind invitation of the editors of Bonplandia to participate in this special issue honoring Aimé Bonpland's contribution to American botany. The latter results from the "III Congreso Internacional e Interdisciplinario Humboldt-Bonpland", organized by the "Sociedad Científica del Paraguay", in Asunción (July 29-31, 2019). In the frame of our research we would like to express our gratitude to Marc Pignal, Jean-Noël Labat, Cécile Aupic and Gerard Aimonin, (Herbier, Muséum National d'Histoire Naturelle de Paris) for their permanent support to our studies of the P-Bonpl. collection and Pascale Heurtel (Bibliothèque Centrale, Muséum National d'Histoire Naturelle de Paris) for the kind access to the "Journal Botanique" of Aimé Bonpland. Robert Vogt and Walter Lack (Botanischer Garten und Botanisches Museum Berlin-Dahlem) are greatly thanked for their support to our study of the B-W collection. Catherine Menant, Guillaume Baron and Chantal de Gaye (Muséum d'Histoire Naturelle de La Rochelle) kindly provided valuable information of the Bonpland Herbarium and the original manuscripts of Michel-Simon Goujaud Bonpland. Natalia Tkach and Martin Roeser (University of Halle-Wittenberg) provided critical information on the Bonpland and Humboldt specimens deposited in the Schlechtendal's Herbarium at HAL. The



libraries of the Conservatory and Botanic Garden of Geneva (Patrick Perret, Patrick Bungener), the Royal Botanic Gardens of Kew, Natural History Museum of La Rochelle, and the universities of Basel, Bern and Zurich are greatly acknowledged for permanent access to their historical bibliographic collections.

## Bibliography

- HIEPKO, P. (1972). Herbarium Willdenow. Alphabetical index. Inter Documentary Company AG, Zug.
- HIEPKO, P. (1987). The collections of the Botanical Museum Berlin-Dahlem (B) and their history. *Englera* 7: 219-252.
- HIEPKO, P. (2006). Humboldt, his botanical mentor Willdenow, and the fate of the collections of Humboldt & Bonpland. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 126: 509-516. <https://doi.org/10.1127/0006-8152/2006/0126-0509>
- HOSSARD, N. (2004). Alexander von Humboldt & Aimé Bonpland. Correspondance 1805-1858. Editions L'Harmattan, Documents Amériques Latines, Paris.
- JOLINON, J.-C. & PIGNAL, M. (1998). Les Herbiers de La Rochelle. Compte-rendu d'expertise. Muséum National d'Histoire Naturelle, Laboratoire de Phanérogamie M. N. H. N.
- LACK, H. W. (2001). The plant self-impressions prepared by Humboldt and Bonpland in tropical America. *Curtis's Botanical Magazine* 18: 218-229. <https://doi.org/10.1111/1467-8748.00319>
- LACK, H. W. (2003). Alexander von Humboldt und die botanischen Sammlungen in Berlin. *Algorismus* 41: 107-132.
- LACK, H. W. (2004a). The botanical field notes prepared by Humboldt and Bonpland in tropical America. *Taxon* 53: 501-110. <https://doi.org/10.2307/4135629>
- LACK, H. W. (2004b). Botanische Feldarbeit: Humboldt und Bonpland in tropischen Amerika (1799-1804). *Annalen des Naturhistorischen Museums in Wien* 105: 493-514.
- LANJOUW, J. & STAFLEU, F. A. (1964). Index Herbariorum, Part. 1: The Herbaria of the World, ed. 5. *Regnum Vegetabile* 46.
- MCVAUGH, R. (1955). The American collections of Humboldt and Bonpland as described in the "Systema Vegetabilium" of Roemer and Schultes. *Taxon* 4: 78-86. <https://doi.org/10.2307/1217774>
- MOHEIT, U. (ed.) (1993). Briefe aus Amerika 1799–1804. Alexander von Humboldt. Beiträge zur Alexander-von-Humboldt-Forschung 16. Akademie-Verlag, Berlin.
- RALLET, L. (1970). La collection d'herbiers conservés au Muséum de La Rochelle. *Annales de la Societé des Sciences Naturelles de la Charente-Maritime* XX: 45-52.
- STAUFFER, F. W. & STAUFFER, J. (2010). Les frères Goujoud-Bonpland: deux destins, une passion commune, la botanique. En MARTINIÈRE, G. & T. LALANDE (eds.), Aimé Bonpland un naturaliste rochelais aux Amériques (1773-1858), pp. 68-88. Rivage des Xantons, Paris.
- STAUFFER, F. W. & STAUFFER, J. (2017). The palm (Arecaceae) collections gathered by Bonpland and Humboldt in their American journey: origin and fate of the specimens and typifications. *Candollea* 72: 5-22. <https://doi.org/10.15553/c2017v721a1>
- STAUFFER, F. W., STAUFFER, J. & DORR, L. J. (2012). Bonpland and Humboldt specimens, field notes, and herbaria; new insights from a study of the monocotyledons collected in Venezuela. *Candollea* 67: 75-130. <https://doi.org/10.15553/c2012v671a10>
- STEARNS, W. T. (ed.). 1968. Humboldt, Bonpland, Kunth and Tropical American Botany. A miscellany on the Nova Genera et Species Plantarum. Verlag von J. Cramer, Lehre.
- URBAN, I. 1917. Geschichte des Königlichen Botanischen Museums zu Berlin-Dahlem (1815-1913) nebst Aufzählung seiner Sammlungen. Beihefte zum Botanischen Centralblatt. Original Arbeiten. Kassel sect. 1, 34: 1-457.

**Appendix 1.** Remarkable documents associated to Aimé Bonpland stored in the Mediatheque of the City of La Rochelle. (Folder 676 – *Portefeuille contenant des manuscrits autographes du naturaliste voyageur Bonpland*).

- Fol. 43. Notes on the palm family (Arecaceae). This document on three pages consists of a short treatment on the phytogeography, sexual expression, ecology and economic importance of the palm family. More detailed comments are proposed for *Chamerops humilis* L. and *Phoenix dactylifera* L. A list of 25 different genera recognized at that time is proposed, curiously also including some taxa of Zamiaceae (*Zamia*) and Cyclanthaceae (*Carludovica*). Critical references are presented on the left side of the first page.
- Fol. 58 (and others). Shipments of seed to European Botanical Gardens. Several documents include lists of seed and living plants sent in exchange to the Botanical Gardens of Paris (Museum of Natural History, Medicine School) (Fig. 8A), the Botanical Garden of Montpellier (sent to A.P. de Candolle), and the Botanical Garden of Berlin (Fig. 8B)
- Fol. 126. Notes on the genus *Ceroxylon* (Arecaceae). This document represents the original notes used by Aimé Bonpland to describe the wax palm genus *Ceroxylon*, endemic of the Andean region (Fig. 9). The genus was first proposed by Augustin Pyramus de Candolle in the *Bulletin des Sciences (Societe Philomatique)* in 1804, based on these working notes. This document is extremely important for neotropical palm botany as it presents the first attempts to define one of the most emblematic palm genera, currently composed of 12 species distributed throughout the Andes, in Venezuela, Colombia, Ecuador, Peru and Bolivia.
- Fol. 131. Alphabetical list of *Melastoma* (Melastomataceae) determined by Aimé Bonpland Brief account on three pages in which 149 species of *Melastoma* are named. Another document (one page) proposes an identification key mostly based on the calyx morphology. This list and the identification key certainly played a major role in the early studies of Aimé Bonpland on this genus, which later resulted in the publication of the *Flora Melastomatacearum* (1806-1823).
- Fol. 248. Letter of Aimé Bonpland to the Baron Benjamin Delessert. This letter, dated May 17 of 1840 and sent from Montevideo, reveals some aspects on the difficult life of Aimé Bonpland at that time. Not able to travel, he had difficulties to obtain an updated “certificat de vie”, which was necessary at that time by the Baron Delessert to obtain the transfer of revenues to Bonpland.