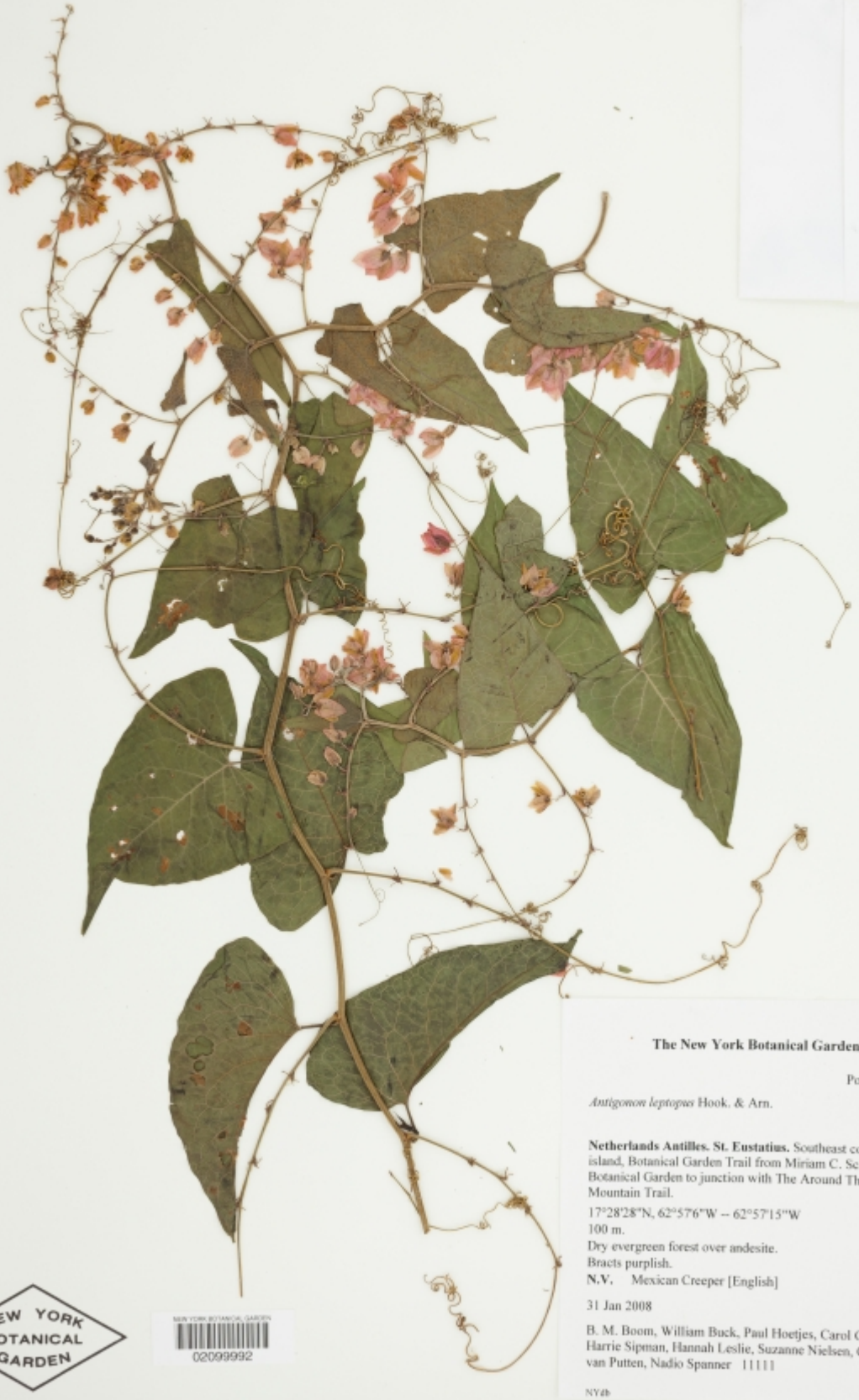
From Collection to the Digitization of Caribbean Plant Specimens [1]

Submitted by Kristian Saied-Santiago [2] on 15 January 2017 - 4:22pm

[2]



The New York Botanical Garden

Polygonaceae

Antigonon leptopus Hook. & Arn.

Netherlands Antilles. St. Eustatius. Southeast corner of island, Botanical Garden Trail from Miriam C. Schmidt Botanical Garden to junction with The Around The Mountain Trail.

17°28'28"N, 62°57'6"W -- 62°57'15"W
100 m.
Dry evergreen forest over andesite.
Bracts purplish.
N.V. Mexican Creeper [English]

31 Jan 2008

B. M. Boom, William Buck, Paul Hoetjes, Carol Gracie, Harrie Sipman, Hannah Leslie, Suzanne Nielsen, Carleton van Putten, Nadio Spanner 11111

NY4b

Corallita (Antigonon leptopus). Top: Photograph of Corallita at St. Eustatius. Bottom: Image from collection in the NYBG. Images provided by C. V. Starr Virtual Herbarium for educational purposes only.

Imagine you are walking around your ideal natural paradise in the Caribbean. To me, that would be hiking a trail at 'El Yunque' [3] deep into the tropical forest, gazing at one of its majestic waterfalls. While busy contemplating your surroundings, a flower you have never encounter before, mesmerizes you. You quickly get closer and use your senses to learn more about this beauty. After an initial observation, a few questions usually follow in our minds including: What is the name of this plant/species? Is it native to this region or is it originally from a different place? And, could this be an endangered species?

In this day and age, with a good Internet connection and some patience, you will likely be able to obtain answers to these questions. However, have you ever wondered how field scientists acquired details on plant diversity in Puerto Rico and the Caribbean, and where is this information kept for the use and benefit of the public?

As a Puerto Rican graduate student who for five years has have to endure the grueling winters of New York City, I have found in the New York Botanical Garden (NYBG) [4] a place where I can be amidst the warmth of tropical nature, a true oasis from the grittiness of New York. Recently, I learned about NYBG's remarkable herbarium, its connection to Puerto Rico, and how their efforts to make a large database of plant records and images available to scientists can help regions with critical issues such as invasive and endangered species. In this blog post I would like to share my experiences visiting the botanical garden and what I learned from Dr. Barbara Thiers [5] and Dr. Brian Boom [6], scientists at this institution.

During the late 19th century, the NYBG was led by Nathaniel Britton, a driven individual who had the interest and power to carry the daring task of collecting information on the flora of the Caribbean. The NYBG was seeking to expand its collection at that time, and expeditions to different regions of United States (US) were taking place[1]. Following the Spanish-American War, the US acquired a group of islands in the Caribbean, and among these Puerto Rico. Britton saw these events as the perfect time to begin team expeditions to the Puerto Rican archipelago.

After discussions with Arthur Yager, Puerto Rico's governor at the time, and the New York Academy of Sciences, Britton was allowed to move forward with his operation. In 1913, he proceeded to assemble a group of renowned scientists from diverse backgrounds that engaged in at least sixteen documented expeditions to Puerto Rico[1]. "The Scientific Survey of Puerto Rico and the Virgin Islands" is an eighteen-volume collection that stems from the expeditions carried by Britton and colleagues [7], in which more than 10,000 plants species were documented in a span of almost thirty years[2]. It was the first project of this magnitude conducted in any Caribbean soil. Currently, the NYBG's William & Lynda Steere Herbarium [8] is home to the extensive compilation of specimens that were collected in the lands of Puerto Rico and the Virgin Islands.

The NYBG's Herbarium is one of the richest places in North America when it comes to plant collections. Apart from collections of Puerto Rico and Virgin Islands' mentioned above, the herbarium contains close to ~7.8 million plant specimens [9] and continues to grow[3]. These samples have come from distinct regions of the Western Hemisphere, with major contributions

from the Caribbean islands. While having these plants in their possession is valuable, making the collections accessible to scientists and the general public is a major step to advance efforts on the conservation of specimens from invasive species. Work from Burke and DiTommaso on the invasive species Corallita (*Antigonon leptopus* [10], also known as Mexican creeper or San Miguelito vine), is an excellent example of the benefits of having available data on plant species from herbariums. Scientists from Cornell University have used information on Corallita at different gardens, including the NYBG, to determine new distribution data and clarify the identity of similar species [11][4]. Corallita has been introduced to many islands in the Caribbean, including Puerto Rico, because of its aesthetics and vibrant growth at tropical climates. Personally, I am fond of how this plant can enhance the beauty of a house garden when it is properly maintained. Unfortunately, it has been difficult to limit its propagation if left unmonitored. It is estimated that twenty percent of St. Eustatius (a small island west of Antigua) is covered in Corallita[4]. By studying herbarium samples of this species, researchers have been able to alert regions containing the plant of its destructive potential to local vegetation.

The need for disseminating information on plant species, led to the creation of new databases at the NYBG. However, these initial endeavors were mostly brute force and were not sufficient to digitize the millions of samples present at the herbarium[3]. Recently, the involvement of Dr. Barbara Thiers and Dr. Brian Boom, researchers at the NYBG, has ushered a new age, as they have been able to bring new research grants protocols and initiatives to tackle the problem of digitization.

Dr. Thiers discusses some of the advances in her 2012 publication "Increasing the efficiency of digitization workflows for herbarium specimens." [9] Some of the new tactics implemented include "field book digitization, partial data entry and imaging, and optical character recognition [a mechanism for grouping records during data entry] of specimen images."[3] Think of the impact of these improvements in the database as moving from an old phone book to an online website like Facebook when attempting to contact a person. These modern platforms have greatly facilitated how information is disseminated with just the click of a button, and their goal was to create a similar platform for plant biology. The approaches have considerably sped the scanning process, which is apparent by the number of files the 'Virtual Herbarium' [12] holds. As of January 2016, they have added near 2.5 million online records [13]![5]

For decades, herbariums have served as the equivalent of museums for plant collections and a local source for learning about the properties of the flora displayed there. The NYBG has been a unique source for plants from different regions, particularly specimens from Puerto Rico and the Caribbean. The evolution of these collections to digitized records has thus become the logical step of sharing this knowledge with the people interested in preserving our environment.

References:

[1] Boom, B. Nathaniel Lord Britton and the Making of The Scientific Survey of Puerto Rico. (As presented in the American Historical Association on Jan. 2015.)

[2] Sastre-D.J, and Santiago-Valentín, E. Botanical explorations of Puerto Rico by N. L. Britton and E. G. Britton: their significance in plant conservation, horticulture and education. (1996)

[3] Tulig, M. et al., Increasing the efficiency of digitization workflows in herbarium specimens. (2012)

[4] Burke, M., and DiTommasio, A. Corallita (*Antigonon leptopus*): Intentional Introduction of a Plant with Documented Invasive Capability. (2011)

[5] Thiers, B. et al., Digitization of the New York Botanical Garden Herbarium. Brittonia (2016) 68: 324.

Tags:

- Puerto Rico [14]
- New York Botanical Garden [15]
- Plant Biology [16]
- Herbarium [17]
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Links
[1] https://www.cienciapr.org/en/blogs/members/collection-digitization-caribbean-plant-specimens [2] https://www.cienciapr.org/en/user/kristian313 [3] https://www.fs.usda.gov/elyunque/ [4] http://www.nybg.org/home/ [5] http://www.nybg.org/science/scientist_profile.php?id_scientist=22 [6] http://www.nybg.org/science/scientist_profile.php?id_scientist=81 [7] http://link.springer.com/article/10.1007/BF02805294 [8] http://sweetgum.nybg.org/science/ [9] http://zookeys.pensoft.net/articles.php?id=2919 [10] http://sweetgum.nybg.org/science/vh/specimen_list.php?SummaryData=antigonon+leptopus&LimitPerPage=40 [11] http://www.bioone.org/doi/abs/10.1614/IPSM-D-10-00088.1 [12] http://sweetgum.nybg.org/science/vh/ [13] http://link.springer.com/article/10.1007/s12228-016-9423-7 [14] https://www.cienciapr.org/en/tags/puerto-rico [15] https://www.cienciapr.org/en/tags/new-york-botanical-garden [16] https://www.cienciapr.org/en/tags/plant-biology [17] https://www.cienciapr.org/en/tags/herbarium [18] https://www.cienciapr.org/en/tags/corallita [19] https://www.cienciapr.org/en/tags/invasive-species