

Rediscovery and Range Extension of *Encyclia grahami* (Hook.) Bosmenier, Esperon and Sauleda (Orchidaceae).

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Abstract

The discovery of abundant populations of *Encyclia grahami* (Hook.) Bosmenier, Esperon & Sauleda on Isla de la Juventud, Cuba is reported. This discovery confirms its status as a distinct Cuban polymorphic species. The discovery of an additional population at Cabo Corrientes, Cuba confirm that *Encyclia navarroi* Vale & Rojas is a synonym of *E. grahami* (Hook.) Bosmenier, Esperon & Sauleda.

Sir William Jackson Hooker described *Epidendrum grahami* Hook. in Curtis's Botanical Magazine (1841, pl. 3885) based on live material. The holotype of the species has remained extant at Kew since its description was published. The original publication includes a well detailed description and illustration signed by the renowned botanical illustrator Walter Hood Fitch. Besides the extant holotype, the detailed description and illustration by the renowned author and illustrator and the well-known magazine where it was published, this species remained as an obscure name relegated to a synonym of other species.

The extensive documentation of vicariant populations at two isolated locations in Pinar del Rio, Cuba made possible publishing the rediscovery and validation of *E. grahami* (Bosmenier et al. 2014). In addition, the authors transferred the epithet to the genus *Encyclia* Hook and discussed the taxonomic history of *E. grahami*, listing the different authors that considered *E. grahami* a synonym. Lindley (1841) stated that *E. grahami* could be a synonym of *E. altissima* (Bateman ex Lindley) Schltr. or a taxon related to *Encyclia pyriformis* (Lindl.) Schltr. (1853). Schlechter (1915) included *E. grahami* as a synonym of *Encyclia phoenicea* (Lindl.) Neum. However, Rolfe (1901) stated that *Epidendrum grahami* "seems to represent a distinct species". While Lindley and Rolfe explained the reasons for their determinations, Schlechter never gave an explanation. All authors after Schlechter have followed his determination without explanation.

The live specimen used for the holotype described by Hooker, corresponds to one of the dominant morphs observed in the populations of *Encyclia grahami* (Hook.) Bosmenier, Esperon & Sauleda in 2014. The white lip color form morphs are present at all the populations of *E. grahami* reported up to now. Comparison of the pictures of the white lip morphs to the illustration of Hooker does not leave any doubt of the correct identification of this species. In addition, comparing other color forms of the species to the holotype does not leave any doubt of the proper identification of this species either, the shape of the lateral lobes and the callus are consistent with the holotype, the description and the illustration of this species.

Since the publication of *Encyclia grahami* (Hook.) Bosmenier, Esperon & Sauleda in 2014, no publication listing the Cuban encyclias have included this species, completely ignoring the publication of Bosmenier et al. (2014) without explanation. Up to now *Encyclia grahami* was only known from the original collection (Holotype) used by Hooker to describe the species, the plant collected by Osment in the Peters collection, the specimen at AMES also collected by Osment and the two populations discovered in Western Cuba (Bosmenier et al. 2014).

Recently, several large populations have been discovered by the junior author on the Isle of Pines (Isla de la Juventud) which also correspond to *E. grahami*. In addition, the junior author discovered another population of *E. grahami* at Guanahacabibes, Pinar del Rio. The previous report from the mainland of just two locations, left the doubt whether this taxon represented a natural hybrid or a hybrid swarm of current species (Mùjica Benitez and Gonzalez, 2015). The occurrence of two additional vicariant populations at distantly different locations that constitute different fitogeographic subsectors, Subsector Pinar del Rio and Subsector Isla de Pinos (Samek 1973), the patterns similarity between populations at both islands and the abundance of populations at Isla de la Juventud further corroborates that *E. grahami* is a polymorphic species of *Encyclia*.

Floral polymorphism has been described in many orchid species (Jersáková et al. 2015). Hybridization and introgression, via adaptation, is more likely to contribute to speciation in rapidly speciating taxa such as in the genus *Encyclia*. (Sauleda and Esperon 2016) and this could explain the origin of polymorphic species as *E. grahami*. However, the explanation for the sustainability of intraspecific floral polymorphism have been attributed to pollination mechanisms and many ecological studies have attempted to explain how these pollination mechanisms contribute to maintain intraspecific floral polymorphism in orchids (Dormont et al. 2009). One of the more current trends hypothesizes that variation in floral traits is expected to be high in food deceptive orchids, because pollinators will learn to avoid common unrewarding floral phenotypes. Approximately one-third of all orchid species achieve pollination through food deception (Dormont et al. 2009); flowers of deceptive species have a larger degree of variation in both floral morphology and fragrances than do rewarding species (Ackerman et al. 2011).

Isla de la Juventud Populations

Based on the amount of populations found and the size of the populations, *E. grahami* appears to be the most abundant species of *Encyclia* on Isla de La Juventud. This can be explained due to the fact that there is less habitat destruction than on the mainland. Comparison of the better conserved and more abundant populations of *E. grahami* on Isla de la Juventud to the populations on the mainland, demonstrates a pattern of similarity among the diverse morphs of this species. Although morphs on the Isla de la Juventud are similar to the Pinar del Rio morphs previously documented, new morphs were also documented at the Isla de la Juventud populations. In addition, some of the populations on Isla de la Juventud also demonstrate possible introgression of *E. grahami* with other species such as *Encyclia grisebachiana* (Cogn.) Acuña where both species grow sympatrically or in close proximity.

Cabo Corrientes, Isla de la Juventud Population

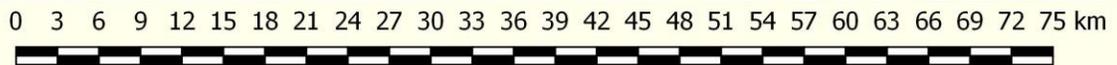
The population found at Cabo Corrientes is as polymorphic as the other populations previously reported. The discovery of this population confirms that *E. navarroi* is a synonym

of *E. grahami*. The population found by the junior author is in the vicinity of the locality where the holotype of *E. navarroi* was collected (Vale and Rojas, 2011), "...21°48'N, 84°29'W...". In the type description of *E. navarroi* it is stated that the type specimen was collected sterile and flowered in cultivation at a later date. Apparently, the authors of *E. navarroi* did not observe the population and therefore never understood the polymorphism of the population. No comparison of the type with other plants in the population is included in the description. In another recent publication where the epithet *E. navarroi* is discussed (Mújica and González (2015)) the authors affirm: "We failed to find other individuals of this taxon when following the geo-coordinates given by the authors in the protologue." and then they add "...it is our opinion that in the area, a process of natural hybridization is taking place among *E. plicata*-*E. bocourtii* and *E. phoenicea*-*E. plicata*" ... "This has given rise to a great number of morphs in the area that we have photographed and documented...". These authors did not recognize the key characters physically observed in individuals of *E. grahami* that Hooker referred to, when he stated, "we cannot find any described species with which it corresponds,". Specifically, the shape of the side lobes of the labellum and the shape of the lamellae are distinct to any of the current species that have been listed as possible parents of this species. But when these authors mentioned the "...great number of morphs in the area..." this affirmation constitutes further verification that what was described as *E. navarroi* is a morph of the polymorphic *E. grahami*. Based on the explanation provided these authors saw and documented the diversity of morphs of *E. grahami*, but they did not understand that the morphs they were documenting corresponded to another Caribbean polymorphic species as phenotypically diverse as the already well-known case of *Tolumnia lucayana* (Nash) Braem.

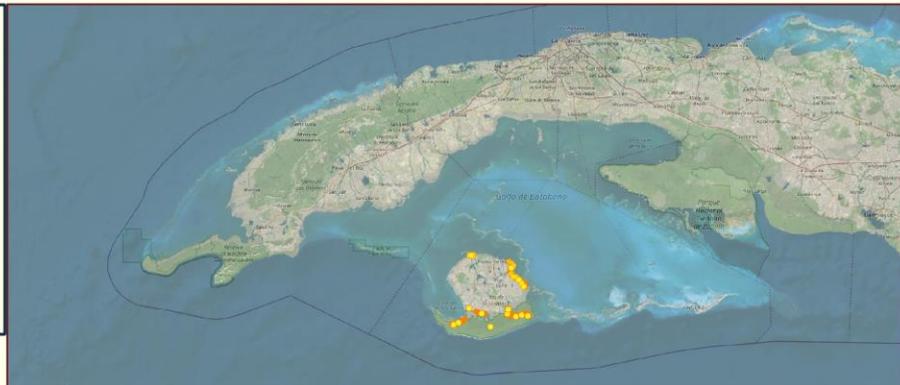


Comparison of a morph of *Encyclia grahami* (Hook.) Bosmenier, Esperon and Saulea from Isla de la Juventud demonstrating similarity to the detail of a flower on the holotype of *Epidendrum grahami* Hook.

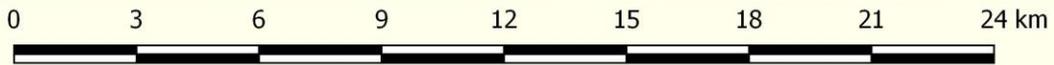
POPULATIONS OF *ENCYCLIA GRAHAMI* ISLA DE LA JUVENTUD, CUBA



- Legend**
- Encyclia grahami*
- Observations
 - Populations Boundaries
- Base Map**
- Rivers
- OpenStreet
Esri Imagery



POPULATION OF *ENCYCLIA GRAHAMI* FOUND AT CABO CORRIENTES, CUBA



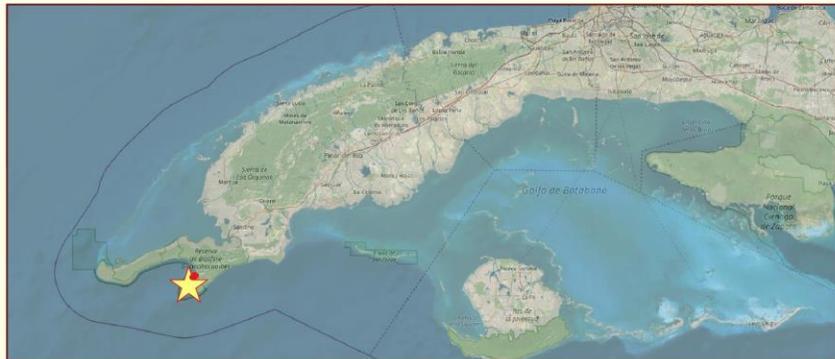
Legend

Cabo Corrientes

- ★ Type Locality *E. navarroi*
- *E.grahami* Population Boundary

Base Map

OpenStreet
Esri Imagery





Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs from the Isla de la Juventud demonstrating the similarity of the callus, column and labellum to Hooker's type illustration of labellum and column.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Illustration of different morphs flowering in the same population (in situ) from Pinar del Rio, Cuba demonstrating the polymorphism.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Illustration of different morphs from Isla de la Juventud demonstrating similarity in its polymorphism to the morphs from Pinar del Rio.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Las Nuevas population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Siguanea population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Costa Este population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Costa Noreste population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at San Pedro population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Punta del Este population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Cocodrilo population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Jorobado population, Isla de la Juventud.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda. Morphs photographed at Cocodrilera population, Isla de la Juventud.



Additional pictures of *Encyclia grahami* (Hook.) Bosmenier, Esperon and Sauleda. Morphs documented near populations of *Encyclia grisebachiana* (Cogn.) Acuña from the Isla de la Juventud, demonstrating possible introgression with *E. grisebachiana*.



Encyclia grahami (Hook.) Bosmenier, Esperon and Sauleda new color forms from Isla de la Juventud that appear to be distinct of any previously documented morph at Pinar del Rio.

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