

Artificial Self-pollination (Autofecundation) as a Taxonomic Tool – *Encyclia tampensis* (Lindl.) Small.

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ABSTRACT

This paper describes a Bahamian population of *Encyclia* Hook. (Orchidaceae) previously identified as *Encyclia tampensis* (Lindl.) Small, as a new natural hybrid. In addition, gives the possible parentage of the hybrid swarm described as *Encyclia tampensis* (Lindl.) Small in Florida.

This is the first paper of a series that reports the results of over 50 years of selfing (autofecundation) of species by Ruben In Orchids of Miami, Florida. The selfings were made originally to make available to orchid hobbyists what was at the time rare species. The selfings were also made with the intention of taking collecting pressure off natural populations especially in Florida. In most cases usually only one plant was available of each species, therefore outcrossing was not possible.

In the 1950's William Osment of Osment Orchids in Hollywood, Florida introduced to the United States a number of species that were only known from the literature (Sauleda & Esperon, 2016; Sauleda, 2016). These included: *Encyclia phoenicea* (Lindl.) Neumann, *Encyclia plicata* (Lindl.) Schltr., *Cattleyopsis ortgiesiana* (Rchb. f.) Cogn. and *Cattleyopsis cubensis* (Lindl.) Sauleda & Adams. Selfings were made several times of each species. Accurate photographic records were kept which now can be used to analyze the evolutionary history of each species.

Stebbins (1957) proposed that selfing might be an 'evolutionary dead end' due to reduced genetic variation and have an increased risk of extinction because of a reduced potential for adaptation. However, the causes of elevated extinction rates in selfers remain unclear. While there is growing evidence for accumulation of deleterious mutations in some selfing taxa, these effects are subtle and may be unlikely to contribute to elevated extinction rates (Wright, *et al.*, 2013). It is premature to assess whether genetic variation is sufficiently reduced to eliminate adaptive potential and drive populations to extinction (Ashi, *et al.*, 2001).

Selfing can be advantageous in the short term as demonstrated by several orchids in Florida. *Epidendrum rigidum* Jacq., *Epidendrum strobiliferum* Rchb. f., *Epidendrum nocturnum* Jacq., *Anacheilium cochleatum* var. *triandrum* (Ames) Sauleda, Wunderlin & Hansen and *Epicladum boothianum* var. *erythronioides* (Small) Acuña are all autogamous (self-pollinating). Without this ability these species would be extinct in Florida due to the lack of a pollinator.

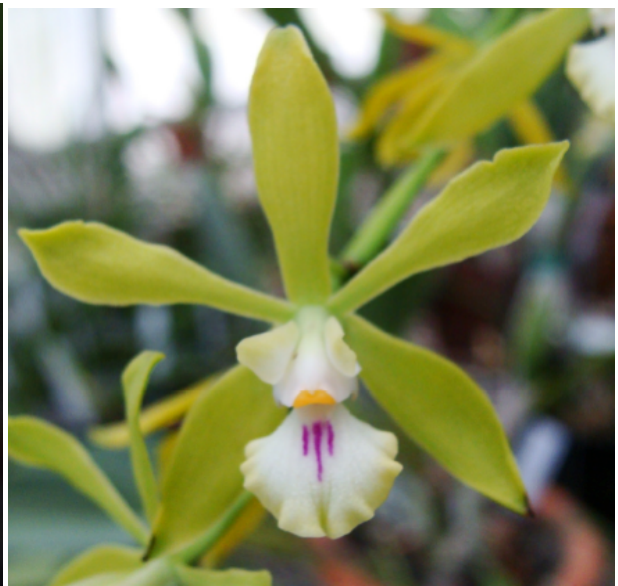
Selfing individuals that normally outcross results in a high level of homozygosity due to the expression of recessive alleles in the first generation. Many of the suppressed alleles in a species may be from introgression. Selfing results in the expression of these suppressed alleles giving a glimpse of the evolutionary history of a species.

One of the first species to be selfed and raised to maturity by Ruben In Orchids was *Encyclia tampensis* (Lindl.) Small. *Encyclia tampensis* ranges in Florida from Monroe County to Putnam County on the east coast, from Miami-Dade County to Levy County in the west coast and to Lake County in central Florida (Wunderlin et al., 2016). The plants in the area of Seven Palm Lake, Miami-Dade County, Florida demonstrate the greatest amount of floral and vegetative diversity. As one travels north the floral and vegetative diversity diminishes. Along the Peace River in central Florida the plants are very similar demonstrating almost no diversity.

Encyclia tampensis in Florida appears to be a hybrid swarm composed of more than two species. In the Bahama Islands there are several populations on Andros Island and Great Abaco identified as *E. tampensis* (Saulea & Adams, 1982; 1983), which are similar to the Florida populations but without the diversity demonstrated in Florida. Selfings of plants from the Bahama Islands demonstrate diversity more typical of a natural hybrid with introgression. We can speculate that the Bahamian population is a result of a hybrid of *E. fehlingii* and *E. androsiana* with possible introgression. *Encyclia fehlingii* and *E. androsiana* have both been selfed and the resulting progeny of each species is homogeneous indicating that both still occur in their pure genetic state. On Andros Island both species are sympatric along with the hybrid. Although, *E. androsiana* is rare, having been found only on Andros Island. *Encyclia tampensis* in the Bahamian sense occurs on Great Abaco but *E. androsiana* has not been found. Most of the progeny from the selfing of *E. tampensis* from the Bahama Islands resembles *E. fehlingii* more than *E. androsiana*. Although there are several other species of *Encyclia* in the Bahama Islands, the characteristics of these other species are not demonstrated in the hybrid swarm. Several natural hybrids have been found with *E. fehlingii* and with other species but, a comparison of these natural hybrids with the Bahamian *E. tampensis*, indicates that the only species present in the natural hybrid are *E. androsiana* and *E. fehlingii*.



Encyclia androsiana.



Encyclia fehlingii.



Variation in *Encyclia androsiana*.



Encyclia androsiana.



Encyclia fehlingii.



Labellum of *Encyclia fehlingii*.

For the above reasons the natural hybrid previously identified as *E. tampensis* in the Bahama Islands is here described as a new natural hybrid.

Encyclia xadamsii Sauleda, *nothosp. nov.*

Encyclia fehlingii (Sauleda) Sauleda & Adams X *Encyclia androsiana* Sauleda

Type: Bahama Islands, Andros Island, coppice near Driggs Hill, 10 July, 1976,
Sauleda R. P., 1050 (Holotype, USF).

ETYMOLOGY

This natural hybrid is named in honor of the late Ralph M. Adams, Assistant Professor of Biology at Florida Atlantic University active in the taxonomy of the Orchidaceae of the Bahama Islands and a pioneer in fragrance analysis in the Orchidaceae.

DIAGNOSIS

Encyclia xadamsii grows sympatrically with the parent species in the Bahama Islands: *Encyclia fehlingii* (Sauleda) Sauleda & Adams and *Encyclia androsiana* Sauleda. It differs from *E. androsiana* in having the side lobes acute; clasping the column and the lip is free from the column. In *E. androsiana* the side lobes of the labellum are obtuse, flat and not tightly clasping the column and the labellum is basally adnate to the column. *Encyclia xadamsii* differs from *E. fehlingii* mainly in the termination of the callosity under the column. In *E. fehlingii* the callosity usually ends in three equal lobes, while in *E. xadamsii* it varies between two equal to three unequal lobes.

Plant epiphytic, rhizomatous, to 70 cm tall; roots many, slender, velamentous; primary stem or rhizome short, stout, creeping or ascending, enclosed by imbricating scarious sheaths; secondary stems modified into pseudobulbs, erect or ascending, clustered, elliptic to ovate, attenuate, to 5 cm long, 3 cm wide, basally enclosed by scarious sheaths, to 2-leaved at apex; leaves coriaceous to rigid, linear-lanceolate, acute, to 28 cm long, 2 cm wide; inflorescence terminal, to 65 cm tall, peduncles slender, erect, distantly several-sheathed, paniculate above, to 30 flowers; floral bracts ovate-triangular, acute, to 3 mm long, 4 mm wide; ovary pedicellate, slender, to 3.5 cm long; sepals green, yellow or ochraceous with reddish-brown suffusion, oblanceolate, acute, to 1.8 cm long, 4 mm wide; petals green, yellow or ochraceous with reddish-brown suffusion toward apex, spatulate, subobtusate to acute, to 1.5 cm long, 3 mm wide; labellum free, deeply 3-lobed, to 2.0 cm wide, 1.6 cm long, white with radiating purple lines on lateral lobes, midlobe with a central purple spot, lateral lobes oblong-ligulate, obtuse, erect, embracing column, midlobe round, emarginate to apiculate, callosity under column is two lateral erect keels joined by a third keel at junction of lobes and with two additional ridges on each side; column white, elongate to 1.0 cm long, 4 mm wide, with membranaceous, incurved rounded auricles, anther yellow; capsule pendent to 4.0 cm long, 1.5 cm thick.



Holotype of *Encyclia xadamsii* (USF).

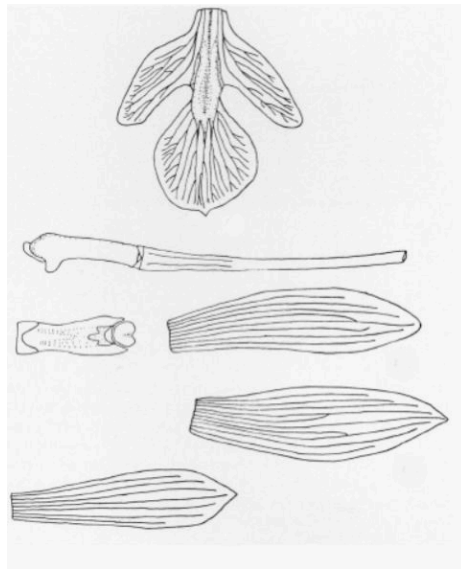


Illustration of flower parts of *Encyclia xadamsii*, from Saulea & Adams (1983).

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Encyclia xadamsii from Andros Island, Bahama Islands.



Encyclia xadamsii from Andros Island, Bahama Islands.



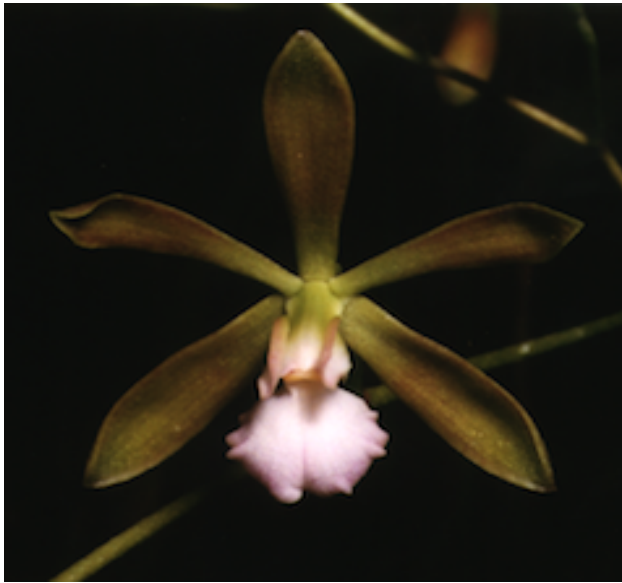
***Encyclia xadamsii* from Andros Island, Bahama Islands.**



***Encyclia xadamsii* from Andros Island, Bahama Islands.**



Encyclia tampensis photographed at Seven Palm Lake, Miami-Dade County, Florida.



Encyclia tampensis photographed at Seven Palm Lake, Miami-Dade County, Florida.



***Encyclia tampensis* photographed at Seven Palm Lake, Miami-Dade County, Florida.**

The selfings of the Florida plants from southern Florida demonstrate diversity typical of a hybrid swarm involving at least three species. The selfings of plants from further north demonstrate less diversity.

It is difficult to determine if the hybrid swarm of *E. tampensis* originated in the Bahama Islands and migrated to Florida where other species added to the hybrid swarm or if each population developed independently.

Plants in south Florida demonstrate characters of *E. androsiana* and *E. fehlingii*. In addition characters of several Cuban species also appear to be present, *Encyclia plicata* (Lindl.) Britt. & Millsp., *Encyclia pyriformis* (Lindl.) Schltr., *Encyclia rufa* (Lindl.) Britt. & Millsp. and *Encyclia phoenicea* (Lindl.) Neumann. The recurving of the edges of the disc of the labellum and the shape of the lateral lobes found in some individuals is characteristic of *E. plicata*. The large round disc of the labellum found in some individuals is characteristic of *E. pyriformis* and the color of the labellum is characteristic of *E. phoenicea*. In addition occasionally a plant that smells like chocolate a characteristic of *E. phoenicea* and *E. pyriformis* is found. Also the recurved edges of the disc of the labellum and yellow sepals and petals is characteristic of *E. rufa*. *Encyclia rufa* was collected in Florida by J. K. Small in a hammock north of Eau Galle, Brevard County, Florida and the specimen is extant in NY (*Small, Mosier and Matthaus, 12938, 24 May 1926*). However, this is the only plant that has been reported for Florida.



Encyclia pyriformis.



Encyclia plicata Bahama Islands.



Encyclia plicata Cuba.



Two of the many forms of *Encyclia phoenicea* from Cuba that may be involved in the hybrid swarm.



***Encyclia rufa* Bahama Islands.**



Results from selfing *Encyclia tampensis* from south Florida.



Results from selfing *Encyclia tampensis* from south Florida.



Results from selfing *Encyclia tampensis* from south Florida.



Results from selfing *Encyclia tampensis* from south Florida.

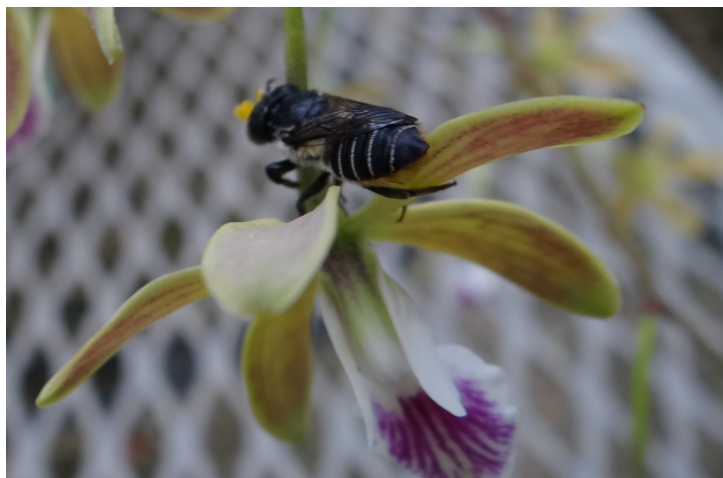


Labella of plants resulting from selfing *Encyclia tampensis* from south Florida.

Pollination studies on *E. tampensis* in south Florida have shown that there are several insects that visit the flowers. Two wasps and four bees of varying size are common visitors. However, only one bee is of the correct size and fits perfectly between the auricles, *Megachile mendica* Cresson. All the other visitors are either too small or too large to pollinate the flowers and may have been pollinators of the parent species.



Pollinator of *Encyclia tampensis* - *Megachile mendica* Cresson landing on flower.



Pollinator of *Encyclia tampensis* - *Megachile mendica* Cresson with pollinia attached.



Pollinator of *Encyclia tampensis* - *Megachile mendica* Cresson with pollinia attached.



***Encyclia tampensis* flower changing color two days after pollination to indicate to pollinator that it has been pollinated.**

ACKNOWLEDGEMENTS

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