

## SPREAD OF THE AFRICAN SPOTTED ORCHID *OECEOCLADES MACULATA* IN THE NEW WORLD

SARAH K. WETTERER<sup>1,3</sup> & JAMES K. WETTERER<sup>2</sup>

<sup>1</sup>Pine Jog Environmental Education Center, Florida Atlantic University,  
West Palm Beach, FL 33415, U.S.A.

<sup>2</sup>Department of Biology, Harriet L. Wilkes Honors College Florida Atlantic University,  
Jupiter, FL 33458, U.S.A.

<sup>3</sup>Author for correspondence: [skwetterer@berkeley.edu](mailto:skwetterer@berkeley.edu)

**ABSTRACT.** *Oeceoclades maculata* (= *Eulophia maculata*) has a broad native range across tropical Africa and Madagascar. Here, we document the spread of *O. maculata* in the New World, using published records, herbarium specimens, photographs posted online, and our own collections. The earliest known New World record of *O. maculata* is from Brazil dating to before 1790. Until 1962, *O. maculata* was known in the New World only from South America. Since then, this species has spread north through Central America into Mexico and across the West Indies to Florida and the Bahamas. It was first found in Florida in 1974, and until 1994 all Florida records of *O. maculata* were restricted to Miami-Dade County (except one record of greenhouse escapees in Gainesville). Here, we document *O. maculata* records from the following geographic areas in the New World: 11 South American countries (all except Chile and Uruguay), all 7 Central American countries, Mexico, 22 West Indian island-groups, and Florida. We also document records from 31 counties in peninsular Florida. *Oeceoclades maculata* has now been recorded in the New World from northeastern Rio Grande do Sul, Brazil (~28.5°S) and Estancia Santa Teresa, Corrientes, Argentina (28.0°S) in the south, to Gainesville (29.7°N) and Palm Coast, Florida (29.6°N) in the north. A report of *O. maculata* populations in Gainesville dying out after a hard frost suggests that this species may have reached its northern outdoor limit in peninsular Florida. Although its impact on native species in the New World appears to be minor, there are efforts to eradicate *O. maculata* in some natural areas.

**KEYWORDS / PALABRAS CLAVE:** especie invasora, invasive species, *Eulophia maculata*, *Oeceoclades*, Orchidaceae.

**Introduction.** *Oeceoclades maculata* (Lindl.) Lindl. (= *Eulophia maculata* (Lindl.) Rchb.f.) (Orchidaceae) has a broad native range across tropical Africa and Madagascar (Stern 1988). In addition, this species has become widely naturalized in the New World. *Oeceoclades maculata* is commonly known as the monk orchid or the African spotted orchid. The specific epithet, *maculatum*, means “spotted” in Latin, relating to the distinctive mottling on its leaves (Fig. 1).

The full plant body of *O. maculata* has one or more pseudobulbs, each with a single leaf or leaf remnant at the top (Fig. 1). Each pseudobulb develops surrounded by a fibrous sheath that can wear off over time. The central ridge of the leaf, which allows *O. maculata* to be easily distinguished from *Dracaena trifasciata* (Prain) Mabb. (= *Sansevieria trifasciata*), is clearly visible. The flower stalks grow from the base of the

pseudobulb and the flowers mature sequentially. The dehiscent seed capsule is pendant and heavily ridged. The stamens, style, and stigma are all combined into the central column and with an anther cap that covers the pollinarium. When disturbed the cap comes free, thus allowing for self-pollination (González-Díaz & Ackerman 1988).

*Oeceoclades maculata* has many qualities that allow it to readily colonize new areas. In addition to having small, wind dispersed seeds, it is autogamous (self-pollinating), capable of vegetative reproduction, and has a wide ecological amplitude. This means that it can successfully colonize many habitats and can found a viable new population from a single individual. Under proper conditions, *O. maculata* can grow from seed to flowering in a single year (Adamowski 1999).

ORCID of the Authors: SKW , JKW 

Received 18 July 2022; accepted for publication 31 October 2022. First published online: 11 November 2022.

Licensed under a Creative Commons Attribution-NonCommercial-No Derivs 3.0 Costa Rica License.



FIGURE 1. *Oeceoclades maculata* illustrated by Sarah K. Wetterer. (a). Bud with a distinct spur. (b). Back of the mature flower. (c). Front view of a mature flower.

TABLE 1. Earliest known record of *O. maculata* from South America, including citation for published records and catalog numbers for museum records. MBG = Missouri Botanical Garden. MNHN= Muséum National d'Histoire Naturelle. USNM = US National Museum of Natural History.

Country	Date	References
Brazil	≤1790	Vellozo (1831, 1881) as <i>Epidendrum connivens</i>
Paraguay	1856	USNM: 37986
Argentina	1890	Stern (1988)
Bolivia	1900	Hauman (1917) as <i>Eulophidium maculatum pterocarpum</i>
French Guiana	1936	MNHN: 00376298
Peru	1942	Stern (1988)
Venezuela	1948	Stern (1988)
Guyana	1948	Stern (1988)
Colombia	≤1976	Garay & Taylor (1976)
Ecuador	1980	Dodson & Dodson (1980)
Suriname	2003	MBG: MO-1949879

John Lindley (1799–1865), an English botanist, described *Angraecum maculatum* (= *Oeceoclades maculata*) based on a cultivated greenhouse specimen sent to him by George Loddiges & Sons, the owners of the Hackney Botanic Nursery, located in Hackney, north of London, England. Lindley (1821) wrote “Messrs. Loddiges inform us that they are uncertain from what quarter they received it, but they think from South America.” (Many references incorrectly state that Lindley described *O. maculata* based on a specimen known to be from Brazil.) Later the same year, Link and Otto (1821) described the same species, also from a cultivated specimen, as *Geodorum pictum* Link & Otto (= *O. maculata*).

The earliest known record of *O. maculata*, however, is at least 30 years older, made by José Mariano de Conceição Vellozo (1742–1811), a Brazilian botanist who illustrated and described *Epidendrum connivens* Vellozo (= *O. maculata*), based on a specimen from “S. Crucis” (Santa Cruz, Brazil). In 1790, Vellozo brought his manuscript describing 1,640 Brazilian plant species to Lisbon for publication, but these descriptions were not published until long after his death (*E. connivens* illustration in 1831, description text in 1881). All subsequent records of *O. maculata* in the New World come from South America, until one was recorded from Trinidad

TABLE 2. Earliest known record of *O. maculata* from the West Indies and Florida, including citation for published records, catalog numbers for museum records, and web address for photos posted on-line. NYBG = New York Botanical Garden. USNM = US National Museum of Natural History.

Country	Date	References
Trinidad	1962	Stern (1988)
Puerto Rico	~1965	González-Díaz & Ackerman (1988)
Florida	1974	Hammer (2001)
Bahamas	1974	Stern (1988)
Dominican Republic	1975	Dod (1986)
Jamaica	1981	MBG: 2314970
Cuba	1984	Hernández <i>et al.</i> (1988)
Haiti	1985	Dod (1986)
US Virgin Islands	1990	USNM: 00428298
Cayman Islands	1992	Proctor (1996)
Navassa Island	1998	NYBG: 227195
Turk & Caicos	~1998	Jones (2006)
Saba	≤2005	Chipka & Izquierdo (2005)
Martinique	≤2007	Broome <i>et al.</i> (2007)
Guadeloupe	≤2007	Broome <i>et al.</i> (2007)
St Lucia	≤2007	Broome <i>et al.</i> (2007)
Montserrat	≤2008	Hamilton <i>et al.</i> (2008)
Antigua & Barbuda	≤2008	Lindsay <i>et al.</i> (2008)
Curaçao	≤2012	Proosdij (2012)
St Eustatius	≤2015	Axelrod (2015)
British Virgin Islands	≤2015	Island Resources Foundation (2015)
Grenada	2019	<a href="https://www.inaturalist.org/observations/39670726">iNaturalist.org/observations/39670726</a>
St Kitts & Nevis	2020	<a href="https://www.inaturalist.org/observations/63091860">iNaturalist.org/observations/63091860</a>
Dominica	2022	<a href="https://www.inaturalist.org/observations/105596541">iNaturalist.org/observations/105596541</a>

in 1962 (Tables 1–3), which is the first known record outside of the South American continent.

In 1974, Robert Grimm, a professor of botany at the University of Miami, discovered the first North American population of *O. maculata* while he was leading a group of students on a fieldtrip to Matheson Hammock Park, Miami-Dade County, Florida (Hammer 2001). Hammer (2001: 77) wrote: “It has been reported that *O. maculata* originally escaped into Miami-Dade County’s Matheson Hammock from Fairchild Tropical Garden,

TABLE 3. Earliest known record of *O. maculata* from Central America and Mexico. MBG = Missouri Botanical Garden.

Country	Date	Reference
Panama	1981	MBG: MO-2266725
Guatemala	1988	MBG: MO-2311928
Mexico	1990	Dodson (1992)
Nicaragua	≤1992	Dodson (1992)
Honduras	≤1992	Dodson (1992)
Belize	≤2000	Balick <i>et al.</i> (2000)
Costa Rica	2000	MBG: MO-2985717
El Salvador	2007	MBG: MO-2173991

but a check by the author in 1974 revealed that this species has never been accessioned at the Garden and none of the staff ever recall propagating it there. By whatever means it arrived in Florida, it is certainly here to stay.

Hammer (2001: 76) reported: “This rapidly dispersing orchid has since invaded natural habitats and disturbed sites throughout South Florida and much of Central Florida and is expected to continue its advance northward. It has already moved as far north as Brevard and Sarasota counties. University of Florida professor, William L. Stern, collected plants in Miami-Dade County to study, and those that he cultivated at Gainesville (Alachua County) escaped cultivation and managed to survive several winters before succumbing to a prolonged hard freeze.”

The present study was motivated by our discovery of a large population of *O. maculata* in a reserve near our home in South Florida. We were particularly interested in documenting the spread of this orchid north, into more subtropical parts of the state. Here, we document the continued spread of *O. maculata* in the New World, using published records, herbarium specimens, photographs posted online, and our own collections. *Oeceoclades maculata* is relatively easy to identify both in the field and in photographs. It has a superficial resemblance to the snake plant, *Dracaena trifasciata*, another plant native to Africa that is spreading in the New World. While both *O. maculata* and *D. trifasciata* bear leaves mottled with different shades of green, *O. maculata* can be distinguished by its prominent midvein, pseudobulb, and smooth, rounded leaf edge (Fig. 1). In contrast, *D. trifasciata* lacks a midvein and pseudobulb and has ridged leaves with curved margins that come to a sharp point.

**Materials and methods.** We compiled *O. maculata* site records from many online sources, including Atlas of Florida plants (Wunderlin *et al.* 2021), EDDmapS (EDDmapS 2022), iDigBio (iDigBio.org, 2022), The Floristic Inventory of South Florida (FISF; Gann *et al.* 2022), and Tropicos (tropicos.org, 2022). We also obtained site records of *O. maculata* based on photographs posted online at several sites, including iNaturalist (iNaturalist.org), Flickr (Flickr.com), and Project Noah (projectnoah.org). These photographs proved to be a very useful source of site records. *Oeceoclades maculata* is an attractive plant that is frequently photographed and is simple to distinguish in photographs from other species from the New World. SKW confirmed the identification of each photographed specimen posted online. We did not include records based on photos that were too blurry or showed only the capsules, which lack characters distinct enough to allow positive identification. A few photos posted online as *O. maculata* were misidentified as *D. trifasciata* and vice versa. We did not map records of *O. maculata* in cultivation or photographed in flowerpots or gardens.

We obtained geographic coordinates for collection sites from published references, specimen labels, maps, or geography websites (e.g., Google Earth (earth.google.com), Tago (www.tago.com), and Falling Rain (www.fallingrain.com)). If a site record listed a geographic region rather than a “point locale,” and we had no other record for this region, we used the coordinates of the largest town within the region or, in the case of small islands and natural areas, the center of the region. Some early records of *O. maculata* lacked important site data, often listing only the country or province, or giving an ambiguous locale name, but we mapped the record to the most likely locale. For example, Vellozo (1881) painted and described *Epidendrum connivens* (= *O. maculata*) from Santa Cruz, Brazil sometime before 1790. Although there are now many towns named Santa Cruz in Brazil, we mapped this record to Santa Cruz, Minas Gerais because Vellozo was from a town in Minas Gerais only 7 km east. In May 1841, Scottish naturalist George Gardner collected *O. maculata* specimens in the state of Maranhão, Brazil. Although no additional site data was recorded, Gardner (1846) wrote that during his three weeks in Maranhão in May 1841, he was only able to visit the area around the port of São Luis and nearby Alcantara due to rain.

Hauman (1917) described *Eulophidium maculatum pterocarpum* from a specimen reportedly collected in 1900 at the mouth of Rio Pilayá, a tributary to the Rio Pilcomayo. Although Hauman (1917) listed this site in Formosa Province, Argentina, we mapped this record to the actual location of the mouth of the Rio Pilayá, which is in Bolivia, ~300 km NW of the nearest point in Formosa Province, Argentina.

We divided records of *O. maculata* into four time periods and mapped them using different colors: Red = 1790–1900, Orange = 1901–1960, Green = 1961–1990, Blue = 1991–2021. If the earliest record we found for a country lacked specific site information and we had no other records of the same period, we mapped the data point to the largest city: French Guiana (Cayenne), Guyana (Georgetown), and Venezuela (Caracas).

Records usually included collection dates, but in several cases, publications did not include the collection dates for specimens. For many of these records, we were able to determine the date based on information on the collector's travel dates or limit the date by the collector's date of death.

**Results.** We compiled several thousand records of *O. maculata* from the following geographic areas in the New World: 11 South American countries (all except Chile and Uruguay), all 7 Central American countries, Mexico, 23 West Indian island-groups, and Florida (Tables 1–4). We documented *O. maculata* records from 32 counties in peninsular Florida (Table 4).

We personally recorded *O. maculata* at 62 sites in Florida, including the earliest records in two counties: DeSoto (Arcadia; 18-Nov-2020; 27.2226, -81.8574) and Glades (Brighton Reservation; 18-Nov-2020; 27.0776, -81.0703). Our observations confirm those of other researchers that *O. maculata* most often grows in shaded areas with thick leaf litter. We most commonly found *O. maculata* growing in deeply shaded areas under slash pine trees (*Pinus elliottii* Engelm.) and oaks (*Quercus* spp.) at sites where fire has been suppressed and there is a thick layer of leaf litter on top of the sandy substratum. These were very often heavily disturbed sites by the side of roads and next to parking lots though *O. maculata* has also penetrated some local reserves. *Oeceoclades maculata* was one of the few plants growing on leaf-litter mats under Australian pine (*Casuarina equisetifolia* L.). Although Stern

(1988) reported that *O. maculata* roots do not penetrate the soil beneath the leaf litter, we found many specimens' roots extending deep into the soil. Additionally, while many of our collections were found growing in leaf litter, we also found specimens growing in sandy soil and muddy areas, indicating an even wider range of suitable habitats.

Many *O. maculata* records came from photographs posted online, most notably on iNaturalist, demonstrating the value of these outlets for community science. Photos are particularly useful sources of site records in areas where specimen collection is severely restricted (e.g., in Everglades National Park).

**Discussion.** Originally from Africa, *Oeceoclades maculata* has attained a broad distribution in the New World, ranging from the Atlantic rainforest of north-eastern Rio Grande do Sul, Brazil (~28.5°S; Colla 2014), and Estancia Santa Teresa, Corrientes, Argentina (28.0°S; 1976; AL Cabrera; FMNH) in the south, to St. Augustine, Florida (29.9°N; 2022; Table 4) in the north (Fig. 2). Due to its original discovery in Brazil, Hammer (2001) suggested that *O. maculata* may be native to both Africa and South America. However, most researchers, including Stern (1988) and Cohen and Ackerman (2009), list it as originating in Africa. Considering the expansion of *O. maculata*'s range as documented in this paper, it seems unlikely that it is native to South America. *Oeceoclades maculata*'s spread to Florida is likely merely an extension of its invasion of suitable habitats throughout the New World.

All early records of *O. maculata* in the New World (1790–1900) are from South America, south of 2.5°S: in Brazil, Paraguay, Bolivia, and northern Argentina (red in Fig. 2A). By 1960, *O. maculata* had spread into northern South America as well (orange in Fig. 2A). Beginning in 1962, populations of *O. maculata* were found in other parts of the New World beyond South America (Tables 2–4). By 1990, *O. maculata* established scattered populations in Central America and Mexico, on several West Indian islands, and into Florida (green in Fig. 2). Since 1990, *O. maculata* has spread broadly through much of Central America, southern Mexico, the West Indies, and peninsular Florida (blue in Fig. 2). Hammer (2001: 77) states that *O. maculata*'s appearance in Florida “may be the result of a natural migration northward from tropical America as a result of global warming”.

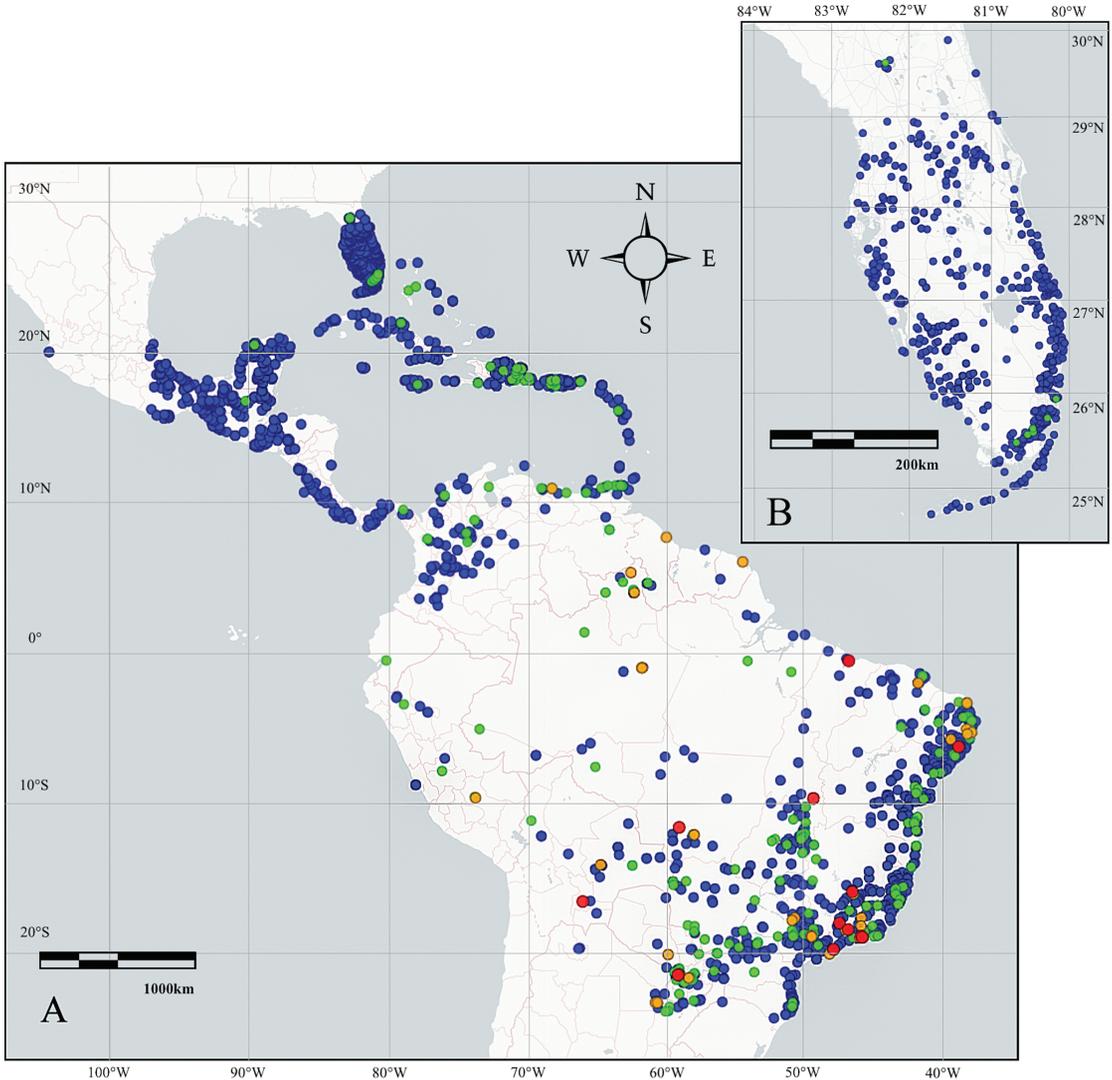


FIGURE 2. **A.** Records of *Oeceoclades maculata* in the New World. **B.** Records of *Oeceoclades maculata* in Florida. Red = 1790–1900, Orange = 1901–1960, Green = 1961–1990, Blue = 1991–2021. Older records overlay and may obscure newer records. Maps were generated using Carto (2021).

Although *O. maculata* produces tiny, wind-dispersed seeds, it almost certainly first arrived in South America from tropical Africa by ship, probably unintentionally accompanying cargo or in dumped ballast. The ability of *O. maculata* to self-fertilize and its potential for vegetative propagation allows this species to establish new populations from a single individual. Though *O. maculata* possesses nectar guides and a nectar spur, there are almost no reports of outcrossing over its naturalized range, except for observations made by

Aguiar *et al.* (2012) who observed two species of butterfly (*Heliconius ethilla narcaea* and *H. erato phyllis*) acting as pollinators in a population in Brazil. Nevertheless, Ueno *et al.* (2015) confirmed that most populations across their study site had low genetic diversity, with high genetic structure between populations, apparently as the result of predominantly self-pollination and vegetative propagation within populations established by a small number of individuals. Despite the absence of a reliable pollinator throughout the New World, these

RIGHT, TABLE 4. Earliest known record of *O. maculata* from counties of Florida. FDA = Florida Department of Agriculture, FMNH = Florida Museum of Natural History, FTBG = Fairchild Tropical Botanic Garden. INHS = Illinois Natural History Survey. SEL = Marie Selby Botanical Gardens. UF = University of Florida. USF = University of South Florida.

plants display high fruit set due to rain-assisted pollination (González-Díaz & Ackerman 1988). The stamens and the stigma are fused into a column which is covered by a cap; when disturbed, the cap falls off and the pollinarium moves and contacts the stigmatic surface allowing for spontaneous self-pollination. In absence of rain as a disturbance, fruit set is dramatically reduced. Under optimal conditions, *O. maculata* can grow from seed to flowering in a single year (Adamowski 1999).

After its arrival in the New World, *O. maculata* appears to have spread gradually both by wind and human transport. It took >170 years before the New World *O. maculata* populations were recorded beyond South America, and >20 years for the first Florida populations to expand beyond Miami-Dade County, indicating that *O. maculata* naturally disperses only relatively short distances per generation. Thus, it appears that wind may carry *O. maculata* seeds perhaps 10–20 km, not hundreds or thousands of kilometers. Long-distance colonization events, such as the arrival of the first populations of *O. maculata* in Guatemala, Mexico, Florida, and many West Indian islands, were most likely human-assisted.

Recently, Kolanowska (2014) modeled the ecological niche of *O. maculata* using climatic data from 15 Old World and 59 New World site records to estimate the worldwide distribution of the suitable habitats for the spread of this species. Kolanowska's (2014) analysis, however, used only a single Florida site, from Miami-Dade County, for calibrating the model, which subsequently indicated that Florida should have habitat with suitable climate for this species only at its southernmost tip. Nevertheless, *O. maculata* populations have spread and are thriving across much of peninsular Florida. The question remains as to how far north they will spread. In the Köppen-Geiger climate classification system, the southeastern US has a humid subtropical (Cfa) climate similar to that of southeastern Brazil, eastern Paraguay, and northeastern Argentina, areas where *O. maculata* records are common (see Peel *et al.* 2007).

County	Date	Reference
Miami-Dade	1974	Hammer (2001)
Alachua	1984	Stern (1988)
Monroe	1994	INHS: 226051
Broward	1995	EDDMapS: 85235
Indian River	1996	FDA: 8694
Sarasota	1997	MBG: 100792435
Collier	1998	USF: 247955
St Lucie	1998	FTBG: 82267
Martin	1999	USF: 233101
Brevard	≤2001	Hammer (2001)
Polk	2005	UF: 228070
Volusia	2006	USF: 244321
Hendry	2006	USF: 243298
Lee	2006	USF: 242277
Hillsborough	2008	FMNH: 230614
Hernando	2010	Robinson <i>et al.</i> (2011)
Palm Beach	2011	FMNH: 271153
Highlands	2014	flickr.com/photos/38514062@N03/12446472715
Lake	2014	Anderson (2014)
Charlotte	2014	EDDmapS: 4791400
Orange	2015	flickr.com/photos/38514062@N03/23567896332
Osceola	2018	iNaturalist.org/observations/14487753
Seminole	2018	iNaturalist.org/observations/16214385
Pinellas	2019	iNaturalist.org/observations/35022580
Okeechobee	2019	EDDmapS: 8267809
Pasco	2020	FMNH: 272868
Manatee	2020	iNaturalist.org/observations/38837839
Sumter	2020	iNaturalist.org/observations/60762054
Flagler	2020	iNaturalist.org/observations/61341483
DeSoto	2020	see Results
Glades	2020	see Results
St Johns	2022	iNaturalist.org/observations/132643180

Stern (1988: 968) wrote: “An example of the invasive capabilities, ability to colonize new ground and capacity to withstand extremes of temperature is the fact that plants of *Oeceoclades maculata* have persisted over the past four years in Gainesville, Florida. I observed several clusters of *Oeceoclades maculata* plants growing in leaf litter in dense shade under oaks and pines near my house. No doubt, these escaped from greenhouse cultivation as seeds and became established spontaneously.”

Hammer (2001) reported the *O. maculata* populations in Gainesville dying out after a hard freeze (several hours below  $-2^{\circ}\text{C}$ ), suggesting that populations may not be able to persist this far north. The University of Florida Herbarium, however, has *O. maculata* specimens from Gainesville collected in 2001 and 2002 in neighboring sites, with the 2002 record (leg. J. Barichivich) annotated with: “Locally abundant; persisting for three years as escapes from potted mother plant on front porch (mother plant transplanted from Miami lawn). Flowering and fruiting.” In January 2020, Shannon Bieniek (pers. comm.) searched the Gainesville areas where *O. maculata* populations had been reported but did not find any. In April and May 2021, we also searched these areas, but did not find any *O. maculata*. We did, however, locate several individuals in Paynes Prairie Preserve, just south of Gainesville. In 2022, photos of *O. maculata* were posted on iNaturalist from three additional sites in the Gainesville area, and one site in St. Augustine in St. Johns County, the highest latitude population ( $29.9^{\circ}\text{N}$ ) known for this species,  $\sim 1.4^{\circ}$  higher than the southernmost known records in South America ( $\sim 28.5^{\circ}\text{S}$ ). This difference may relate to the tempering influence of the Gulf Stream on the climate of northeast Florida.

While *O. maculata* may reach its northern outdoor limit in peninsular Florida, limited by hard freezes, it seems likely that this species will continue to spread northward through eastern Mexico and eventually invade southeastern Texas, a region with a similar humid subtropical (Cfa) climate to that of central Florida.

Although we found *O. maculata* primarily in heavily disturbed sites, many records come from relatively natural habitats. In Puerto Rico, Cohen and Ackerman (2009) found established populations of *O. maculata* in every class of forest they examined, from extensively

disturbed areas to intact old growth forest. In fact, the second least disturbed forests, with 50–80% of tree cover remaining, hosted the largest *O. maculata* populations. Cohen and Ackerman (2009) found a significant negative correlation between the prevalence of *O. maculata* and the abundance of two native orchid species, although this could be due to differences in habitat preferences rather than any direct impact between the species. Similarly in Veracruz, Mexico, Hågsater *et al.* (2005) found a negative correlation between the density of *O. maculata* and native orchid density. Cohen and Ackerman (2009) suggest that this could be due to negative interactions between the species' mycorrhizae.

There are efforts to eradicate *O. maculata* in some natural areas, e.g., in Mexico, where it is classified as one of 23 high priority invasive plants (Aguilar *et al.* 2007). In 1991, as *O. maculata* was spreading in Miami-Dade County, the Florida Exotic Pest Plant Council (FEPPC) placed *O. maculata* on its list of invasive exotic plants that are impacting or have the potential of impacting native plant communities through displacement of native species, changing community structures or ecological functions, or hybridizing with native species (FEPPC 1991). In 2003, however, the FEPPC (2003) removed *O. maculata* from this list. Although *O. maculata* is thriving in peninsular Florida, its impact on native plant species in the New World appears to be minor, especially when compared with the many other invasive plants that plague Florida. Currently, there is just one orchid species on the FEPPC (2019) list: the Chinese crown orchid (*Eulophia graminea* Lindl.), a species that is quickly spreading in Florida, Texas, and the West Indies (Pemberton 2013, Ackerman & González-Díaz 2021).

*Oeceoclades maculata* and many other non-native plant species are still sold online and at nurseries. Orchids in particular have a cachet and people struggle to view them as potentially damaging. Despite having many invasive attributes, people continue to cultivate *O. maculata* throughout Florida. A pot of blooming *O. maculata* is displayed in front of a neighbor's house in Stuart, Florida. She received them as a gift from a coworker. Valdez (2020) posted a video on YouTube of a potted *O. maculata* flowering in San Antonio, Texas, giving instructions on how to care for this species. Among those commenting on the video was a person in Malaysia who had received *O. maculata* from

a friend. It seems to be only a matter of time before *O. maculata* spreads to everywhere worldwide where it can survive outdoors, either dispersing on its own or with human help, perhaps through escaping from cultivation, as documented in Gainesville, Florida.

Whether it will have any major impacts in the areas where it invades remains to be seen.

ACKNOWLEDGMENTS. The authors thank F. Rocha Vento, A. Cirranello, I. Valdez, and M. Wetterer for comments on this manuscript.

## LITERATURE CITED

- Ackerman, J. D. & González-Díaz, N. (2021). Explosive range expansion of *Eulophia graminea* (Orchidaceae) in Puerto Rico and the West Indies. *Lankesteriana*, 21(3), 307–312. doi: <http://dx.doi.org/10.15517/lanke.v21i3.48871>
- Aguiar, J. M. R. B. V., Pansarin, L. M., Ackerman, J. D. & Pansarin, E. R. (2012). Biotic versus abiotic pollination in the *Oeceoclades maculata* (Lindl.) Lindl. (Orchidaceae). *Plant Species Biology*, 27, 86–95. doi: <https://doi.org/10.1111/j.1442-1984.2011.00330.x>
- Adamowski, W. (1999). Orchids as Invasive Plants. *International Conference on the Ecology of Invasive Alien Plants*, 5, 1.
- Axelrod, F. S. (2015). *A systematic vademecum to the vascular plants of Sint Eustatius*. [https://www.dutchcaribbeanspecies.org/linnaeus\\_ng/app/views/literature2/reference.php?id=4353](https://www.dutchcaribbeanspecies.org/linnaeus_ng/app/views/literature2/reference.php?id=4353)
- Balick, M. J., Nee, M. & Atha, D. E. (2000). Checklist of the vascular plants of Belize. *Memoirs of the New York Botanical Garden*, 85, 1–246.
- Bone, R. E., Sanz, E. & Buerki, S. (2014). The transfer of *Eulophia beravensis* Rchb.f. to *Oeceoclades* Lindl., a genus with its centre of diversity in Madagascar (Eulophiinae, Orchidaceae). *Candollea*, 69(2), 201–205. doi: <https://doi.org/10.15553/c2014v692a13>
- Broome, R., Sabir, K., & Carrington, S. (2007). Plants of the Eastern Caribbean. Barbados: University of the West Indies. <http://ecflora.cavehill.uwi.edu/index.html> [accessed 15 January 2021].
- Chipka, S. A. & Izquierdo, J. A. (2005). A new catalogue of Orchidaceae for Saba, N.A. *Selbyana*, 26, 14–22. doi: <https://journals.flvc.org/selbyana/article/view/121351/120123>
- Cohen, I.M. & Ackerman, J. D. (2009). *Oeceoclades maculata*, an alien tropical orchid in a Caribbean rainforest. *Annals of Botany*, 104, 557–563. doi: <https://doi.org/10.1093/aob/mcn191>
- Colla, F. B. (2014). Distribuição e conservação de orquídeas terrestres em florestas subtropicais brasileiras. *Dissertação de Mestrado*. Universidade Federal do Rio Grande do Sul, Porto Alegre.
- Dod, D. D. (1986). *Oeceoclades maculata*, 1975 a 1985, en una marcha inexorable cruza La Isla Española. *Moscsoa*, 4, 203–205.
- Dodson, C. & Dodson, P. M. (1980). *Icones Plantarum Tropicalium: Orchids of Ecuador*, serie II, fascicle 5–6. Missouri Botanical Garden, St. Louis.
- Dodson, C. H. (1992). *Checklist of the orchids of the Western Hemisphere*, draft. Missouri Botanical Garden Library, St. Louis.
- EDDmapS. (2022). Monk orchid *Oeceoclades maculata* (Lindl.) Lindl. Early Detection and Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. <https://www.eddmaps.org/distribution/viewmap.cfm?sub=6090> [accessed 12 May 2021]
- Gann, G. D., Stocking, C. G., & collaborators. (2022). *Oeceoclades maculata* (Lindl.) Lindl. Floristic Inventory of South Florida Database Online. The Institute for Regional Conservation. Delray Beach Florida. <https://regionalconservation.org/ircs/database/plants/PlantPage.asp?TXCODE=Oecemacu> [accessed 3 October 2022]
- Garay, L. A. & Taylor, P. (1976). The genus *Oeceoclades* Lindl. *Botanical Museum Leaflets, Harvard University*, 24, 249–274.
- Gardner, G. (1846). *Travels in the interior of Brazil, principally through the northern provinces, and the gold and diamond districts, during the years 1836–1841*. Reeve, London: Reeve.
- González-Díaz, N. & Ackerman, J. D. (1988). Pollination, fruit set, and seed production in the orchid, *Oeceoclades maculata*. *Lindleyana*, 3, 150–155.
- Government of Antigua and Barbuda. (2008). *Biodiversity inventory and status assessment report for the proposed Wallings Forest Protected Area (Antigua) and the Codrington Lagoon National Park (Barbuda)*. Island Resources Foundation Washington D.C., USA.
- Hágsater, E., Soto Arenas, M. A., Salazar Chavez, G. A., Machorro, R. J., Lopes Rosas, M. A. & Dressler, R. L. (2005). *Las orquídeas de México*. Productos Farmaceutico, S.A. de C.V., Mexico.
- Hamilton, M. A., Clubbe, C., Robbins, S. K. & Bárrios, S. (2008). Plants and habitats of the Centre Hills and Montserrat. In R. P. Young [ed.] *A Biodiversity Assessment of the Centre Hills, Montserrat, Durrell Conservation Monograph*, 1, 40–55.

- Hammer, R. L. (2001). A status report on the native and naturalized Orchidaceae of Collier, Miami-Dade, and Monroe counties, Florida. *North American Native Orchid Journal*, 7, 76–77.
- Hauman, L. (1917). Quelques Orchidées de l'Argentine. *Anales del Museo Nacional de Historia Natural de Buenos Aires*, 29, 353–390.
- iDigBio. (2021). iDigBio Home Page. <https://www.idigbio.org/> [accessed 12 October 2021]
- Island Resources Foundation. (2015). An Environmental Profile of the Island of Tortola, British Virgin Islands. Addendum I: Preliminary List of Plant Species. Website: [http://www.irf.org/an-update-on-the-status-of-bvi-environmental-profiles/environmentalprofiletortola\\_addendum\\_1\\_preliminaryplantlist\\_2015/](http://www.irf.org/an-update-on-the-status-of-bvi-environmental-profiles/environmentalprofiletortola_addendum_1_preliminaryplantlist_2015/) [accessed 5 May 2021]
- Island Resources Foundation. (2015). *An environmental profile of the island of Tortola, British Virgin Islands. Island Resources Foundation. Addendum I: Preliminary list of plant species.* Tortola, BVI and Washington, DC. [http://www.irf.org/wp-content/uploads/2015/10/EnvironmentalProfileTortola\\_ADDENDUM\\_1\\_PreliminaryPlantList\\_2015.pdf](http://www.irf.org/wp-content/uploads/2015/10/EnvironmentalProfileTortola_ADDENDUM_1_PreliminaryPlantList_2015.pdf) [accessed 26 October 2021]
- iNaturalist. (2021). Monk orchid (*Oeceoclades maculata*). [https://www.inaturalist.org/observations?place\\_id=any&subview=table&taxon\\_id=140483](https://www.inaturalist.org/observations?place_id=any&subview=table&taxon_id=140483) [accessed 3 October 2022]
- Kolanowska, M. (2014). The naturalization status of African Spotted Orchid (*Oeceoclades maculata*) in Neotropics. *Plant Biosystems*, 148, 1049–1055.
- Lindley, J. (1821). *Collectanea Botanica; or Figures and Botanical Illustrations of Rare and Curious Exotic Plants, Chiefly Cultivated in the Gardens of Great Britain.* Richard and Arthur Taylor, London.
- Lindsay, K., Mussington, J., & Bacle, J.-P. (2008). *Biodiversity inventory and status assessment report for the proposed Wallings Forest Protected Area (Antigua) and the Codrington Lagoon National Park (Barbuda).* Government of Antigua and Barbuda. [http://www.irf.org/wp-content/uploads/2015/10/Wallings-CodringtonBiodiversitySurvey\\_Antigua\\_2008.pdf](http://www.irf.org/wp-content/uploads/2015/10/Wallings-CodringtonBiodiversitySurvey_Antigua_2008.pdf)
- Link, J. H. F., & Otto, C. F. (1821). *Icones Plantarum Selectarum Horti Regii Botanici Berolinensis cum descriptionibus et colendi ratione*, fascicle 3. Berolini, Berlin.
- Naturalis Biodiversity Center. (2021). Monk Orchid *Oeceoclades maculata*. Dutch Caribbean Species Register. [www.dutch-caribbeanspecies.org](http://www.dutch-caribbeanspecies.org) [accessed 3 January 2021].
- Peel, M. C., Finlayson, B. L. & McMahon, T. A. (2007). Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences*, 11, 1633–1644. doi: <https://doi.org/10.5194/hess-11-1633-2007>
- Pemberton, R. W. (2013). Rapid geographic spread of the alien orchid *Eulophia graminea* in Florida. *Selbyana*, 31(1), 47–51. doi: <https://journals.flvc.org/selbyana/article/view/122971>
- PNUD (Programa de las Naciones Unidas para el Desarrollo, México). (2017). Plan de Monitoreo y Control de la orquídea africana (*Oeceoclades maculata*) en la Reserva de la Biosfera Los Tuxtlas. Proyecto 089333 “Aumentar las Capacidades Nacionales para el Manejo de las Especies Exóticas Invasoras (EEI) a través de la Implementación de la Estrategia Nacional de EEI”. 17 pp. + 1 Anexo. Vega-Rodríguez, B. I., Terán-González, G. J., Luna-Aguilar, L. A. y G. E. Martínez-Romero. Fomento Ecológico y Social A. C. Veracruz, México.
- Proctor, G. R. (1996). Additions and corrections to ‘Flora of the Cayman Islands’. *Kew Bulletin*, 51 (3), 483–507.
- Proosdij, A. S. J. van. (2012). *Arnoldo's Zakflora. Wat in het wild groeit en bloeit op Aruba, Bonaire, en Curaçao.* 4th revised edition. Walburg Pers, Zutphen, Netherlands.
- Robinson, D. J., Gandy, E., VanHoek, C. & Pemberton, R. W. (2011). Naturalization of the Nun's Hood orchid (*Phatus tankervilleae*: Orchidaceae) in Central Florida. *Journal of the Botanical Research Institute of Texas*, 5(1), 337–339.
- Stern, W.L. (1988). The long-distance dispersal of *Oeceoclades maculata*. *American Orchid Society Bulletin*, 57, 960–971.
- Tropicos.org. (2021). *Oeceoclades maculata* (Lindl.) Lindl. Missouri Botanical Garden. <https://tropicos.org/name/23512591> [accessed 15 January 2021]
- Ueno, S., Rodrigues, J. F., Alves-Pereira, A., Pansarin, E. R. & Veasey, E. A. (2015). Genetic variability within and among populations of an invasive, exotic orchid. *AoB PLANTS*, 7, plv077, <https://doi.org/10.1093/aobpla/plv077>
- Valdez, L. (2020). *Oeceoclades maculata* [video] <https://www.youtube.com/watch?v=ep6tUFJrmo> [accessed 6 May 2021].
- Vellozo, J. M. C. (1831). (imprint 1827). *Florae Fluminensis icones*. 9: Tab. 44. Senefelder, curante J. Knecht, Paris, France.
- Vellozo, J. M. C. (1881). *Flora Fluminensis*. Flumine Janeiro, Machado, Brazil.
- Wunderlin, R. P., Hansen, B. F., Franck, A. R. & Essig, F. B. (2021). *Oeceoclades maculata*. *Atlas of Florida plants*. [S. M. Landry and K. N. Campbell (application development), USF Water Institute.] Institute for Systematic Botany, University of South Florida, Tampa. <http://florida.plantatlas.usf.edu/Plant.aspx?id=1327> [accessed 8 June 2021].