New records of Orchidaceae Juss. for the state from Hidalgo, Mexico

Carlos Alberto Hernández-Orta¹, Karla María Aguilar-Dorantes², Jonas Morales-Linares², Vincenzo Bertolini³

¹ Facultad de Ciencias Biológicas, Universidad Autónoma del Estado de Morelos, Avenida Universidad 1001, Col. Chamilpa, Cuernavaca, Morelos, C.P. 62209 México. ² Centro de Investigación en Biodiversidad y Conservación, Universidad Autónoma del Estado de Morelos, Avenida Universidad 1001, Col. Chamilpa, Cuernavaca, Morelos, C.P. 62209, México. ³ El Colegio de la Frontera Sur (ECOSUR), Km 2.5 Carretera Aeropuerto Antiguo, Tapachula, Chiapas, C.P. 30700, México.

Corresponding author: Karla María Aguilar-Dorantes, karla.aguilar@uaem.mx

Abstract
Two new orchid records are reported for Hidalgo, Notylia barkeri Lindl. and Trichocentrum cosymbephorum (C. Morren) R. Jiménez & Carnevali. The genus Notylia is reported for the first time, and the list of orchid flora is updated to include 110 taxa. Unexpectedly, the species were recorded in abandoned orange plantations rather than natural vegetation, likely because of the high anthropogenic pressure exerted on their natural populations. These new records highlight the importance of continuing to survey regions such as Hidalgo with scarce orchid records, including both natural and modified vegetation.

Keywords
Abandoned orange crops, Hidalgo Huasteca, orchid flora, semi-evergreen tropical forest.

Introduction
The family Orchidaceae Juss. has a worldwide distribution and is characterized by its highly diverse morphology and species richness. The family is represented by approximately 27,801 species (The Plant List 2018; Givnish et al. 2016). In Mexico, 168 genera and around 1,250 species have been recorded, of which 444 species are endemic (Soto-Arenas 1996; Hágsater et al. 2005; Soto-Arenas et al. 2007). In the state of Hidalgo, 108 orchid taxa had been recorded, which represent around 8% of the orchid flora at the national level (Ponce-Vargas et al. 2006; Ceja-Romero et al. 2010; Bertolini et al. 2012, 2016; Molina-Mendoza et al. 2012).

Semi-evergreen tropical forest in Mexico is found along the coast of the Gulf of Mexico (Challenger 1988). In particular, the Huasteca region, which extends across the states of Hidalgo, San Luis Potosi, and Veracruz, has the northernmost extent of semi-evergreen tropical forest on the American continent (Luna 1997). In Hidalgo, semi-evergreen tropical forest has been severely fragmented and transformed to crops. Seven species of orchid have been reported in semi-evergreen tropical forest in Hidalgo (Ceja-Romero et al. 2010; Bertolini et al. 2012). In the municipality of San Felipe Orizatlán, in the Huasteca of Hidalgo, there are several important fragments of semi-evergreen tropical forest mixed...
with abandoned orange plantations, yet this municipality has been little explored for orchids. Only four species of orchid have been reported until now: *Bletia coccinea* Lex., *Vanilla planifolia* Jacks. ex Andrews, *Prosthechea radiata* (Lindl.) W.E. Higgins, and *Oncidium sphaecelatum* Lindl. We carried out botanical surveys in the municipality of San Felipe Orizatlan in a semi-evergreen tropical forest and abandoned orange plantations and expand the knowledge of the orchid flora in the state of Hidalgo as a result of these surveys.

**Methods**

In March 2017, three botanical surveys were carried out in 4 km each of semi-evergreen tropical forest fragments and abandoned orange plantations in Ahuatitla, municipality of San Felipe Orizatlan (21°09’ N, 098°39’ W), in the Huasteca of Hidalgo (Fig. 1). Each of these surveys had a duration of approximately 4.5 hours. Two local guides and a botanical expert (Ricardo Alejandro Garza Paredes) aided us in determining our plots. In April the three established plots of 1 ha were studied by two researchers, about two hours each, to detect the presence of flowers in *Notylia barkeri* Lindl. and *Trichocentrum cosymbephorum* (C. Morren) R. Jiménez & Carnevali. As no flowers were detected in *T. cosymbephorum*, a second visit was conducted during of October and a third visit of November.

The literature recording orchids in the state of Hidalgo was reviewed (Villavicencio-Nieto et al. 1998; Ponce-Vargas et al. 2006; Ceja-Romero et al. 2010; Bertolini et al. 2012, 2016; Molina-Mendoza et al. 2012). The collected specimens were identified by specialists and were herborized following the techniques of Lot and Chiang (1986). The species names were verified according to The Plant List (2018). The identity and geographic distribution of the specimens were additionally corroborated with specimens from the National Herbarium of the National Autonomous University of Mexico (MEXU), the Metropolitan Autonomous University (UAMIZ), and the herbarium of the Center for Biological Studies of the Institute of Basic Sciences and Engineering of the Autonomous University of Hidalgo (HGOM), as well as with specimens in online databases such as Tropicos, The Plant List, and the Global Biodiversity Information Facility (GBIF). Finally, the collected specimens were deposited in the herbarium of the Center for Biodiversity and Conservation Research of the Autonomous University of the State of Mexico (HUMO).

**Results**

Two new records of orchids are added to the flora of Hidalgo (Ponce-Vargas et al. 2006; Ceja-Romero et al. 2010; Bertolini et al. 2012, 2016, Molina-Mendoza et al. 2012).
Notylia barkeri Lindl.

**New record.** Mexico: Hidalgo: municipality of San Felipe Orizatlán, Ahuatitla (21°08'33.60" N, 098°40'27.80" W, 364 m elev.), in abandoned orange (Citrus spp.) plantation “Atotomoc”, coll. by A. Hernández-Orta, 11 April 2017, (HUMO) (Fig. 2A, B).

**Identification.** *Notylia barkeri* is a small epiphyte, often with long, pendent roots; pseudobulbs oblong, to 2.5 cm long and 1 cm wide, enveloped at base by several imbricating bracts. Leaves solitary from apex of pseudobulb, ligulate, 8–18 cm long, 1.3–4 cm wide, conduplicate at base. Racemes 1 or 2, arching, 8–30 cm long (usually <15 cm long) from base of pseudobulb, many flowered; flowers green or greenish-white and resupinate; pedicels filiform, 2–6 (10) mm long, subtended by minute bracts; sepals subequal, linear-lanceolate, lip clawed and continuous with base of column, 3–5 mm long, 1–2 mm wide. Pseudobulbs completely covered by sheaths and lateral sepals free or connate (½ of their

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length) with recurved apices; it differs from *N. orbicularis* which presents pseudobulbs covered by sheaths only at the base and entirely connate lateral sepals.

**Comments.** *Notylia barkeri* is widely distributed in Mexico from Jalisco and Tamaulipas to southern Mexico, including Chiapas, Tabasco, and Quintana Roo (Tropicalcos 2017). In our survey, large populations (between five and 10 individuals per tree) were mainly observed in abandoned orange plantations. This species has not previously been recorded in semi-evergreen tropical forest. It is a twig epiphyte (Chase 1987) which grows in areas exposed to sunlight and tends to naturally occur at gaps or edges. The flowering period was from March to April in the study area.

**Trichocentrum cosymbephorum** (C. Morren) R. Jiménez & Carnevali.

**New record.** Mexico: Hidalgo: municipality of San Felipe Ortizatlán, Ahautitla (21°10'03.4" N, 098°39'59.7" W, 242 m elev.), in the abandoned orange (*Citrus* spp.) plantation “Camelia”, coll. by A. Hernández-Orta, 12 November 2017, (Fig. 2C, D).

**Identification.** *Trichocentrum cosymbephorum* is an epiphyte, with leaves that generally exceed 12 cm long, oblong-elliptical to elliptical, acute; thin roots, 2 mm thick. Pseudobulbs very small, compressed and uniform, smooth, dark green. Inflorescences usually longer than leaves, more or less simultaneous, and with resupinate flowers (1–25), rarely successive flowers; lip without spur, with callous teeth of six proximal parts; distal teeth of calluses in two parts; central keel of the callus one or two times smaller than the length of the distal teeth of the callus. Morphologically similar to *T. luridum*, but characterized by its pale brown to pink flowers (not reddish-brown) and leaves, which are up to twice as long.

**Comments.** *Trichocentrum cosymbephorum* is endemic to Mexico, where it has a wide distribution. It is found at middle elevations from the Sierra Madre Oriental of Tamaulipas to Chiapas. It is scarce in the study area, with one to two individuals per tree. This species is an epiphyte, living mostly on abandoned orange trees or in backyard gardens. Some individuals grow in sunny sites along the edges of semi-evergreen tropical forest. Several individuals were rarely seen on the host trees *Inga vera* (Mimosaceae, Willd.) and *Cedrela odorata* (Melaceae, L.). The flowering period was from October to November in the study area.

Espejo-Serna and López-Ferrari (1998) had previously reported the type (Mexico) of *T. cosymbephorum* in the state of Hidalgo under the name of *Oncidium luridum* Lindl. var. *henschmannii* Knowles & Weste. However, the type was apparently lost or destroyed, so Christenson (1996) designated the lectotype, which enables us to confirm the presence of this species in Hidalgo.

**Discussion**

*Notylia barkeri* and *Trichocentrum cosymbephorum* are common species and widely distributed in Mexico, and therefore are not threatened according to SEMARNAT (2010). However, the new records are the first for

<table>
<thead>
<tr>
<th>Species</th>
<th>Herbarium</th>
<th>Catalogue no.</th>
<th>State</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Altitude (m)</th>
<th>Distance (km)</th>
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<td>092°06'20&quot; W</td>
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<td>Nayarit</td>
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the state of Hidalgo. This state has a scarcity of orchid remnants despite the presence of semi-evergreen tropical forest remnants across 4.8% of its territory (Anonymous 1992). Semi-evergreen tropical forest is now only found in patches because it has largely been substituted by agricultural crops (Bertolini et al. 2012), including coffee and orange plantations. Notably, we expected to find orchid records in semi-evergreen tropical forest remnants but were taken to abandoned orange plantations by our guides. Orange plantations could be providing a new niche for these species.

The distances between the new records of *N. barkeri* and *T. cosymbephorum* and previous records are shown in Table 1. Finally, the geographical coordinates and elevation of the orchid records obtained from Herbarium and GBIF are shown in Table 1. In general, *N. barkeri* and *T. cosymbephorum* are distributed in lowlands (average elevation = 241.25 m and 591.36 m, respectively) of the Atlantic slope (Table 1, Fig. 1).

Around 60% of the native vegetation of the state of Hidalgo has been transformed to crop fields, pastures, or human settlements (Martínez-Morales et al. 2007), so it is important to continue to explore this state’s biodiversity in order understand it and promote its conservation. Additional exhaustive botanical surveys in the Huasteca region of Hidalgo and the remaining conserved forest fragments are needed to generate more accurate and up-to-date knowledge of the orchid flora of the state, where few historical orchid records exist. However, as shown by our new records, abandoned crop plantations should also be surveyed. Additional surveys will generate valuable information needed to conserve the few remnants of native tropical forest. Finally, with the addition of *N. barkeri* and *T. cosymbephorum* in Hidalgo, the number of orchid species in the state is updated to 110, which represents around 9% of the orchid species recorded for Mexico (Ponce-Vargas et al. 2006; Ceja-Romero et al. 2010; Bertolini et al. 2012; Molina-Mendoza et al. 2012; Bertolini et al. 2016).

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**Authors’ Contributions**

CAHO and KMAD designed the study and wrote the manuscript. All of the authors contributed to the discussion, review, and approval of the final manuscript.

**References**


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