Diversity and distribution of the orchids of the Tacaná-Boquerón region, Chiapas, Mexico

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Abstract

The Tacaná-Boquerón region (TBR) in Chiapas is considered an area of high biodiversity in Mexico, with a rich but poorly studied orchid flora, which is an important component of the vegetation and threatened by an accelerated rate of deforestation. By means of fieldwork, and the revision of scientific collections and literature, an orchid checklist for the TBR and adjacent areas was made; using geographic information systems the distribution of this orchid flora was analyzed in the study area. From 1,235 records we report 105 genera and 325 species, two of them determined to infraspecific level and two are natural hybrids; nine species were additions to the Mexican flora; 39 species are considered at risk in Mexico; the national distribution of a further 20 species are restricted to the TBR. This orchid flora represents 24 % and 44 % of the national and state orchid species richness, respectively, is the second richest in Mexico, and only surpassed by the region El Momón-Las Margaritas-Montebello (Chiapas). The greatest orchid richness is concentrated between elevations of 500 to 2,499 m, in areas now given over to permanent agriculture (including coffee and cocoa plantations); in primary forest the richness is lower. The Tacaná Volcano Biosphere Reserve is the only protected area in the TBR and the proposal to extend it to the Boquerón peak would promote the protection of the orchid flora growing above 1,000 m in the region. Traditional coffee plantations could be alternative to conserve orchids that grow below 1,600 m.

Key words: floristic, Mesoamerican-México Biological Corridor, Orchidaceae, Priority Terrestrial Regions, Soconusco.

Diversidad y distribución de las orquídeas de la región Tacaná-Boquerón, Chiapas, México

Resumen

La Región Tacaná-Boquerón (RTB) en Chiapas se considera un área de alta biodiversidad en México, posee una orquideoflora rica pero poco estudiada aunque es un componente importante de su vegetación, la cual está amenazada por un acelerado proceso de deforestación. Mediante trabajo de campo y revisiones de colecciones científicas y literatura se elaboró un listado de las orquídeas de la RTB y áreas adyacentes. Usando sistemas de información geográfica se analizó la distribución de esta orquideoflora en la zona de estudio. A partir de 1,235 registros se reportan 105 géneros y 325 especies, dos de ellas determinadas a nivel infraespecífico y dos híbridos naturales; nueve especies resultaron ser adiciones a la flora mexicana; 39 orquídeas son especies consideradas en riesgo en México, otras 20 restringen su distribución nacional a la RTB. Esta orquideoflora representa 24 % y 44 % de la riqueza orquideológica nacional y estatal, respectivamente, es la segunda más rica en México, solo superada por El Momón-Las Margaritas-Montebello (Chiapas). La mayor riqueza de orquídeas se concentra entre 500 y 2,499 m de elevación, en zonas actualmente destinadas a la agricultura permanente (incluyendo plantaciones de café y cacao); en los bosques primarios la riqueza es menor. La Reserva de la Biosfera del Volcán Tacaná es la única área protegida en la RTB, la propuesta de extenderla hasta el cerro Boquerón favorecería la protección de la orquideoflora que crece arriba de 1,000 m en la región; los cafetales tradicionales podrían ser alternativas para conservar orquídeas que crecen por debajo de 1,600 m.

Palabras clave: Corredor Biológico Mesoamericano-México, florística, Orchidaceae, Regiones Terrestres Prioritarias, Soconusco.

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During the last eight decades, botanists such as Eizi Matuda (1950a, 1950b), Faustino Miranda (1953) and Dennis E. Breedlove (1981, 1986) have contributed to the floristic knowledge of the Sierra Madre of Chiapas (SMCh). More recently, research has intensified, with explorations carried out by botanists from the National Autonomous University of Mexico (UNAM), the Metropolitan Autonomous University (UAM), ECOSUR (El Colegio de la Frontera Sur) and the Chiapas University of Science and Arts (UNICACH). These studies have increased the knowledge of the floristic diversity of the SMCh, but have focused almost exclusively on protected areas, such as El Triunfo (Long & Heath 1991, Williams-Linera 1991, López-Molina 2000, Pérez-Farrera 2004, Pérez-Farrera & Miceli-Méndez 2004, Pérez-Farrera *et al*. 2012, Martinez-Meléndez *et al*. 2008, 2009), La Frailesca (Bachem-Calmund & Rojas-Cruz 1994), and La Sepultura (Castillo 1996, Reyes-García 2008), and have generated little or no knowledge about the floristic composition of unprotected areas in the region.

One of the areas of the SMCh that has received little attention, is the mountain system formed by the Tacaná Volcano connecting to the Boquerón peak, referred to as the Tacaná-Boquerón Region (TBR). This system forms part of the Mesoamerican-Mexico Biological Corridor (MMBC) which extends from the area of the great volcanos of Guatemala, passing through the SMCh and connecting to the Biosphere Reserves of the Tacaná Volcano, El Triunfo, La Sepultura, and La Encrucijada and, by passing through the Ocote Forest unites the protected areas of the north-northeast of Chiapas, before entering Guatemala once again in the Petén region. Thereby, the MMBC permits the integration, continuity and maintenance of the biological and ecological processes of a biota consisting of elements with tropical and boreal affinities, whilst interacting with those that have evolved in the Mesoamerican region (Mittermeier *et al*. 1999). The TBR extends almost 50 km from the Pacific coast to the peak of the Tacaná volcano (4,100 m), with a gradient of soil types, climates, plant communities and agroecosystems. This region hosts a high biodiversity, which makes it a site of high priority for conservation in Mexico (Arriaga *et al*. 2000). Unfortunately the TBR is affected by increasing deforestation, mainly at lower and intermediate elevations, due to both shifting and intensive agriculture and cattle ranching, an increasing human population, the construction and maintenance of roads using inadequate technology and, more recently, factors relating to climate change (Arriaga *et al*. 2000, Soto-Arenas *et al*. 2007a, Challenger *et al*. 2010). To that we should add that the habitats are already highly fragmented, with little continuity between remnant fragments and the loss of transition zones, further increasing the risks faced by the resident flora and fauna.

One of the most conspicuous groups in the flora of Chiapas is the Orchidaceae family, with an estimated species richness of more than 700 species. However, as mentioned previously, floristic studies in Chiapas have mainly focused upon protected areas, and for orchids include the Lacandon Forest (Martínez-Salas *et al*. 1994), Montebello (Cabrera-Chacón 2000, Soto-Arenas 2001), the Sumidero Canyon (Miceli-Méndez *et al*. 2009, Espinosa-Jiménez *et al*. 2011), El Triunfo (Pérez-Farrera & Miceli-Méndez 2004, Martínez-Meléndez *et al*. 2009, 2011, Martínez-Camilo *et al*. 2012), and the Ocote Forest (Miceli-Méndez 2002, Moreno-Molina 2010). On the other hand, information regarding the orchid flora of Chiapas is widely dispersed, in media that often have reduced circulation and limited accessibility, or is only available through the scientific collections where the specimens are kept. In the last few years an in depth study of the orchid flora of the TBR has been carried out (Cruz-Lustre 2009, Jiménez-Bautista 2009, Damon 2010, Damon *et al*. 2015), but the results had not been presented in a scientific publication. For that reason, the aims of this study were: i) to list the orchid diversity of the TBR and adjacent areas, ii) to analyze the patterns of distribution of the orchids in the TBR, according to the vegetation, climate, elevation and soil types, and iii) to identify and analyze the distribution of vulnerable orchid species in the TBR. Orchids are considered a priority group within the context of the conservation of tropical forests, so the information generated by this study will be useful for evaluating the importance of the TBR using the diversity and distribution of orchids as a model, and then to prioritize specific species and areas for special attention.

Materials and methods

Study area. Situated within the coordinates 14°36'57'' and 15°28'12" latitude N and 92°03'28'' and 92°40'58'' longitude W, the TBR covers an area of 3,462.63 km^2 distributed between the municipalities of Cacahoatán, Huehuetán, Huixtla, Mazapa de Madero, Mazatán, Motozintla, Porvenir, Tapachula, Tuzantán, and Unión Juárez (Figure 1). The area considered includes the Priority Terrestrial Regions (PTR) of Selva Espinosa Alto Grijalva-Motozintla, El Motozal, and Tacaná-Boquerón, or PTR 134, 135, and 136, respectively (Arriaga *et al*. 2000). According to

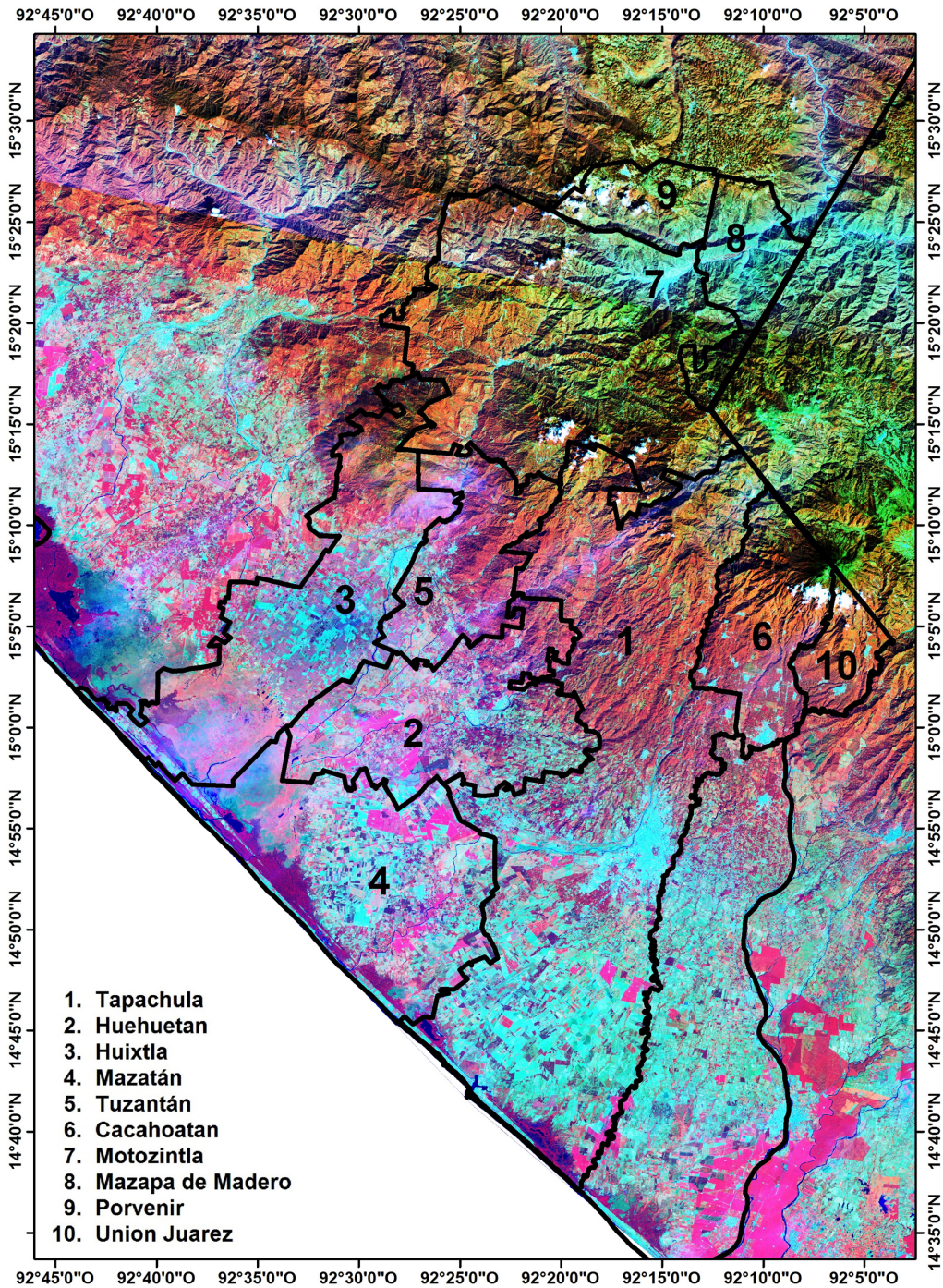

Figure 1. A map of Chiapas showing the study area, and municipal divisions (numbers 1-10), and superimposing a Landsat satellite image downloaded from http://eros.usgs.gov/about-us/data-citation.

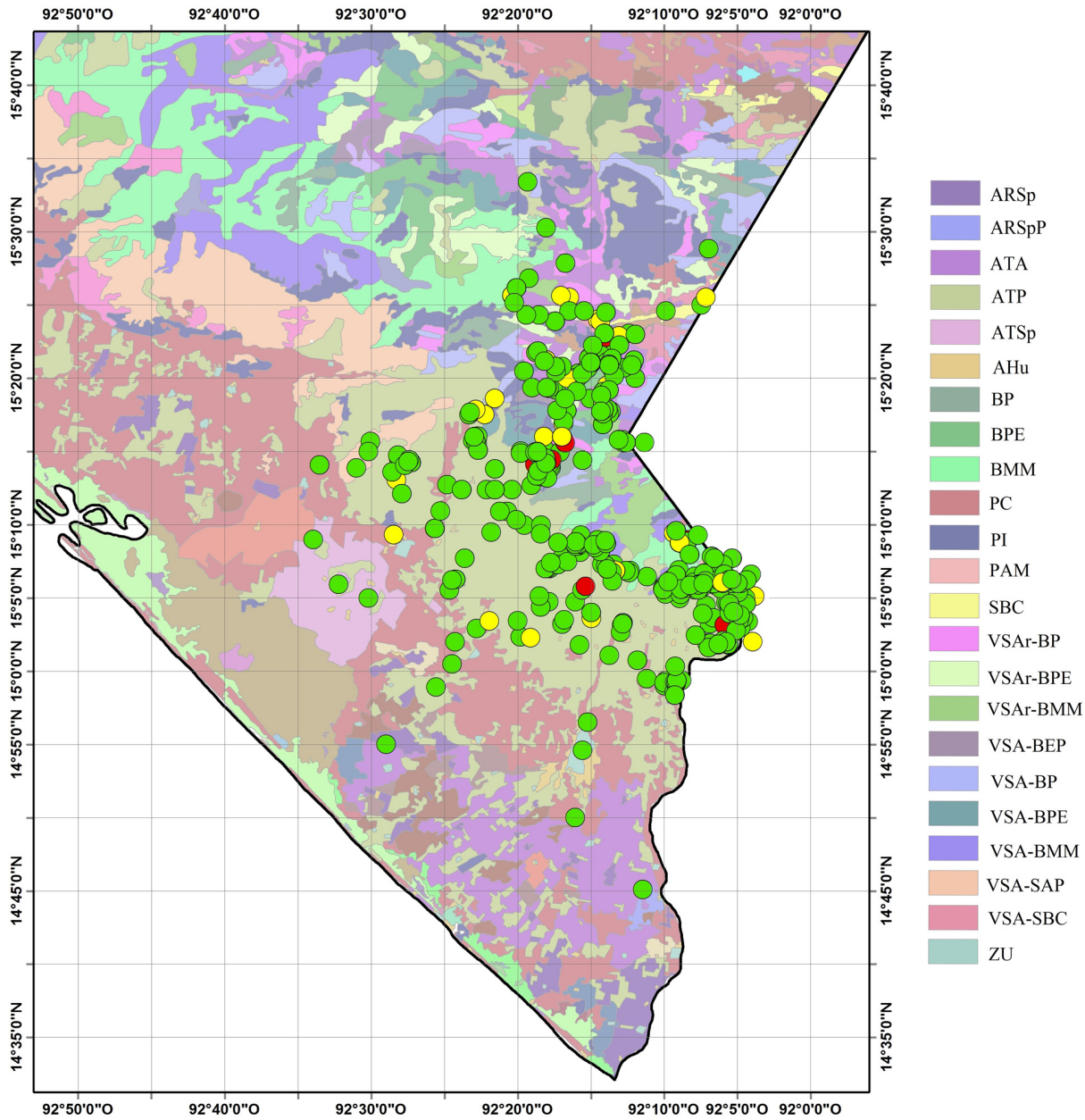

Figure 2. Distribution of the orchid records in the study area on a map of land use and vegetation types (INIFAP 2010). Green dots are epiphytic orchids, red dots are lithophytic orchids, and yellow dots are terrestrial orchids. Codes for use land and vegetation types are as follows: permanent seasonal agriculture (ATP), annual seasonal agriculture (ATA), secondary arboreal vegetation derived from mountain cloud forest (VSA-BMM), induced pasture (PI), mountain cloud forest (BMM), human settlements (AHu), pine-oak forest (BPE), secondary arboreal vegetation derived from pine-oak forest (VSA-BPE), secondary shrub vegetation derived from pine-oak forest (VSAr-BPE), semi-permanent irrigation agriculture (ARSp), alpine meadows (PAM), secondary shrub vegetation derived from pine forest (VSAr-BP), secondary arboreal vegetation derived from pine forest (VSA-BP), cultivated pasture (PC), secondary shrub vegetation derived from mountain cloud forest (VSAr-BMM), urban zone (ZU), secondary arboreal vegetation derived from low deciduous forest (VSA-SBC), semi-permanent seasonal agriculture (ATSp), low deciduous forest (SBC), secondary arboreal derived from tropical rain forest (VSA-SAP), pine forest (BP), secondary arboreal vegetation derived from oak-pine forest (VSA-BEP), semi-permanent and permanent irrigation agriculture (ARSpP).

García (2001) the climate at lower elevations is warm-humid, with an average annual temperature of 22–26 °C, annual rainfall of 2,500–4,880 mm and the percentage of rain in the dry season less than 5 %, or between 5 and 10.2 %. At higher elevations the climate is semi-warm, temperate-humid, with an average temperature of 18–22 °C, average annual rainfall of 3,730–4,090 mm and the percentage of rain in the dry season less than 5 %. In the driest areas the climate is

warm sub-humid with an average annual temperature of 22.2 °C, precipitation of 829 mm, with the percentage of rain in the dry season less than 5 %. The greater part of the rainfall occurs in summer and autumn and increases during periods of cyclone activity; furthermore, cloud cover is frequent throughout the year at higher elevations. According to the National Forest Inventory (INIFAP 2010), vegetation types in the study area are: oak forest, pine-oak forest, tropical mountain cloud forest, oyamel forest, pine forest, alpine grassland, high evergreen tropical forest, and extensive areas of secondary vegetation derived from the ecosystems above mentioned, as well as areas dedicated to agriculture.

Sources of information. We searched the literature for relevant floristic studies, and the data bases of various herbarium collections (AMO, ARIZ, CHAPA, ECOSUR, ENCB, FCME, HEM, MEXU, OAX, TEX, and UAMIZ) to localize orchid specimens collected in the study area.

Fieldwork. Visits to various sites within the study area were carried out between November 2007 and June 2008 and samples of orchid plants with reproductive structures were collected, processed in the Herbarium of ECOSUR, Tapachula and divided up to be deposited in the Herbaria OAX and ECOSUR. Species for which no reproductive individuals were found were cultivated in the orchidarium of the Regional Botanical Garden "El Soconusco" to be identified when flowering occurred, whereupon samples of flowers were preserved in liquid (Bedford & James 1995) or herbarium specimens were prepared. Between 2009 and 2015 further explorations were carried out in the area to obtain additional registers.

Orchid inventory. The inventory is presented in phylogenetic order, with observations. Each taxon includes the correct name, authors of the name, habitat, risk category (when applicable, following SEMARNAT 2010), and supporting evidence of their presence in the study area. The assignation of specific and intraspecific names follows Soto-Arenas *et al*. (2007b), Salazar (2011) and Solano-Gómez *et al*. (2011b), and for generic and suprageneric categories Chase *et al*. (2015). Vulnerable species within the orchid flora of the TBR were identified by the fulfilling one or both of two criteria: i) included in a risk category according to the Mexican legislation (SEMARNAT 2010) and ii) with a distribution in Mexico restricted to the study area. Orchid species richness in the study area was compared with other regions in Mexico (Table 1) by means of richness index (I), which is calculated in the following manner: $I = R/A \times 1000$, where R is the orchid species richness and A is the total area of the region in km^2 (Romero 1996).

Geographic Information System. Using the software ArcGIS 10.2 (ESRI 2012) and a map of Chiapas, georeferenced records were mapped to explain the distribution of the orchid species according to the parameters of land use and vegetation type (INIFAP 2010), climate (García 2001), altitudinal intervals, edaphology (INIFAP 2001), contour lines (CONABIO 2001) and

Table 1. Values for comparison of the orchid richness among several orchid floras from South-Southeast of Mexico; R = orchid species richness, A = surface in km^2, I = richness index.

Region	R	A	I	Source
El Momón-Las Margaritas-Montebello, Chiapas	333	1,500.00	222.00	Soto-Arenas (2001)
Region Tacaná-Boquerón, Chiapas	325	3,462.63	93.86	This study
Sierra Mixe, Oaxaca	151	1,945.64	77.61	Solano-Gómez *et al*. (2013)
Juquila-Coatlán, Oaxaca	153	2,066.00	74.04	Solano-Gómez *et al*. (2007), Campos-Villanueva & Villaseñor (1995)
Los Tuxtlas-Catemaco, Veracruz	200	3,486.54	57.36	Carmona (1996), Ibarra-Manríquez & Sinaca-Colín (1997)
Cañada-Cuicatlán, Oaxaca	126	2,272.25	55.45	Salazar-Chávez *et al*. (2006)
Sierras Triqui-Mixteca, Oaxaca	207	3,935.00	52.60	Pichardo-Ramírez (2011)
Chimalapa-Uxpanapa, Veracruz-Oaxaca	298	5,910.00	50.42	Hágsater *et al*. (1998)
Region Huatulco, Oaxaca	124	5,220.69	23.75	Solano-Gómez, unpublished data
La Lacandona, Chiapas-Guatemala	271	20,000.00	13.55	Martínez-Salas *et al*. (1994)

Priority Terrestrial Regions for conservation (Arriaga *et al*. 2000). To analyze the patterns in the distribution of orchid species richness, the percentage of species found within per category for each parameter was calculated.

Results

Orchid Diversity. From a total of 1,235 registers for the TBR and surrounding areas we report 105 genera and 325 species, including two identified at intraspecific level, and two natural hybrids, belonging to three subfamilies, nine tribes and 22 subtribes; the commented list is presented in the Appendix 1. The subtribes with the greatest richness of genera were Oncidiinae (18), Laeliinae (17), Pleurothallidinae (11) and Spiranthinae (13), whereas the subtribes

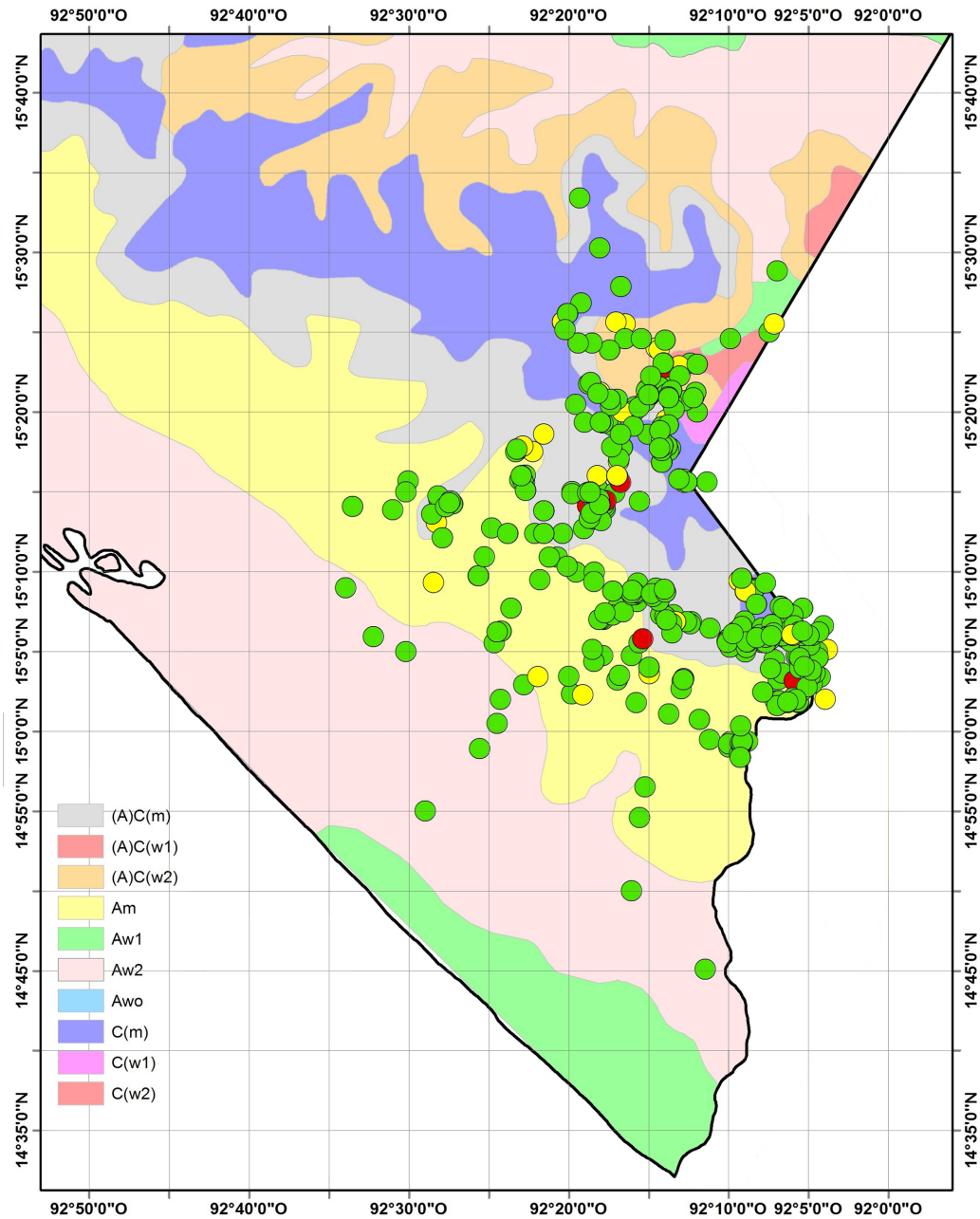

Figure 3. Distribution of the orchid records in the study area on a map of climate types (García 2001). Green dots are epiphytic orchids; red dots are lithophytic orchids, and yellow dots are terrestrial orchids.

with the greatest species richness were Laeliinae (82), Pleurothallidinae (60), Oncidiinae (51), Maxillariinae (20) and Spiranthinae (20). The genera with the most species were *Epidendrum* L. (39), *Maxillaria* Ruiz & Pav. (17), *Stelis* Sw. (17), *Oncidium* Sw. (14), *Prosthechea* Knowles & Westc. (12) and *Lepanthes* Sw. (11). Analyzing life forms, 256 (79.5 %) of the orchid species registered were epiphytes, 63 (18.63 %) were terrestrial and six (1.87 %) were rupicolous.

Nine of the species reported in this study were new additions to the Mexican flora, with three of those, *Stelis annedamoniae* Solano, *S. hagsateri* Solano and *S. soconuscana* Solano, described as species new to science (Solano-Gómez 2011). Three taxa corresponded to species possibly undescribed in *Catasetum* Rich. ex Kunth, *Cyclopogon* C.Presl. and *Habenaria* Willd. The other species, *Acianthera herrerae* (Luer) Solano & Soto Arenas, *Maxillaria brunnea* Linden

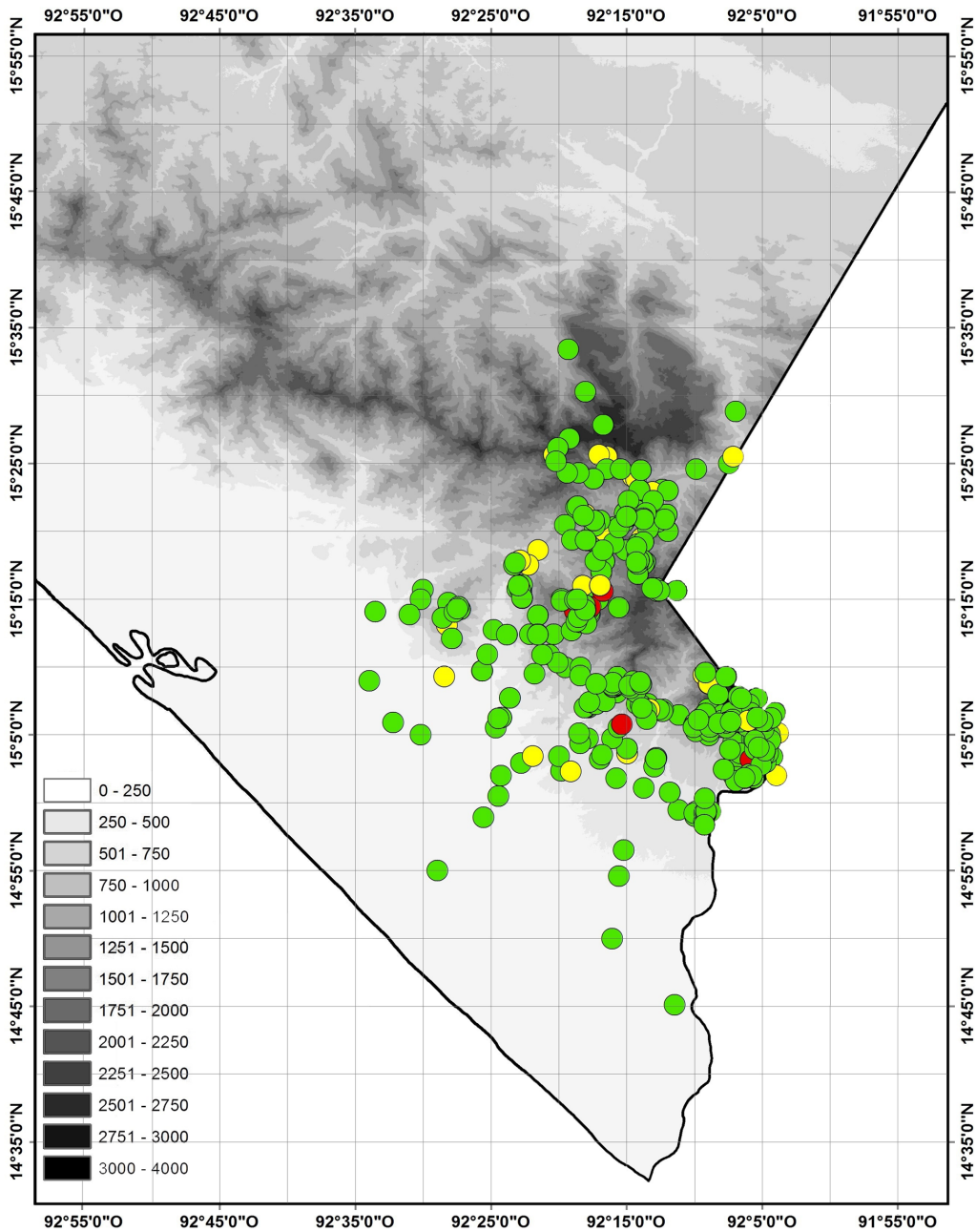

Figure 4. Distribution of the orchid records in the study area on a map with 250 m elevation intervals (CONABIO, 2001). Green dots are epiphytic orchids, red dots are lithophytic orchids, and yellow dots are terrestrial orchids.

& Rchb.f., *Oncidium poikilostalix* (Kraenzl.) M.W.Chase & N.H.Williams (previously known as *Sigmatostalix poikilostalix* Kraenzl.) and *Telipogon helleri* (L.O.Williams) N.H.Williams & Dressler, were previously known in other Central American countries, but are registered here for the first time in Mexico (Solano-Gómez *et al*. 2011a). Furthermore, *Plectrophora alata* (Rolfe) Garay was rediscovered in the study area having been considered extinct due to no reports of this species after 1935 (Soto-Arenas *et al*. 2007a, Solano-Gómez *et al*. 2011a). Two orchids reported here correspond to natural hybrids: *Trichocentrum xquintanarooensis* (Cetzal & Balam) J.M.Hsaw and another not described whose putative parents belong to the *Epidendrum arbuscula* complex.

Comparing the orchid flora of the TBR with that of other regions in southeast Mexico (Table 1), for both R (325) and I (93.86) values, the TBR had the second highest value, behind the

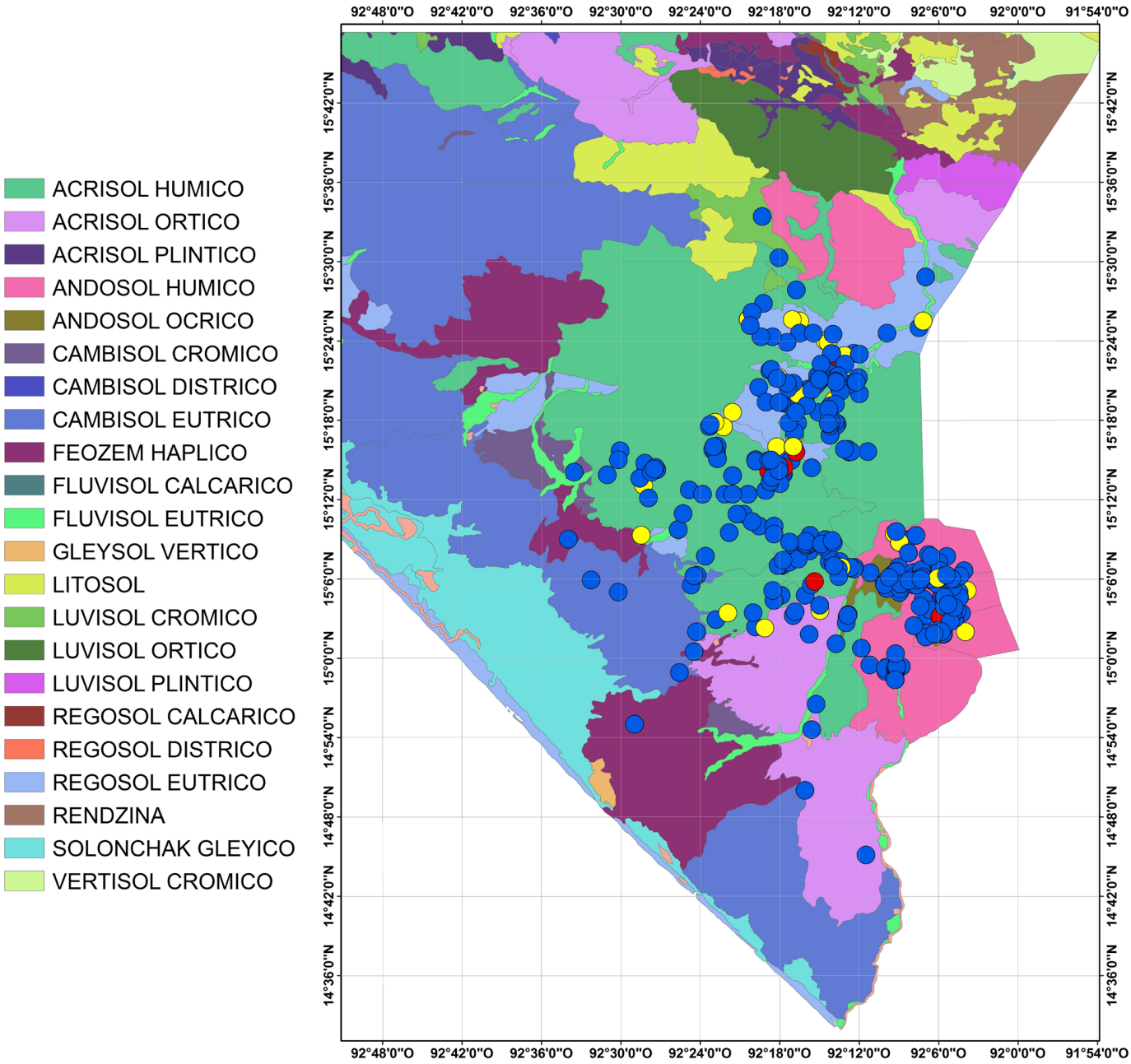

Figure 5. Distribution of the orchid records in the study area on a map of edaphology (INIFAP, 2001). Blue dots are epiphytic orchids, red dots are lithophytic orchids, and yellow dots are terrestrial orchids.

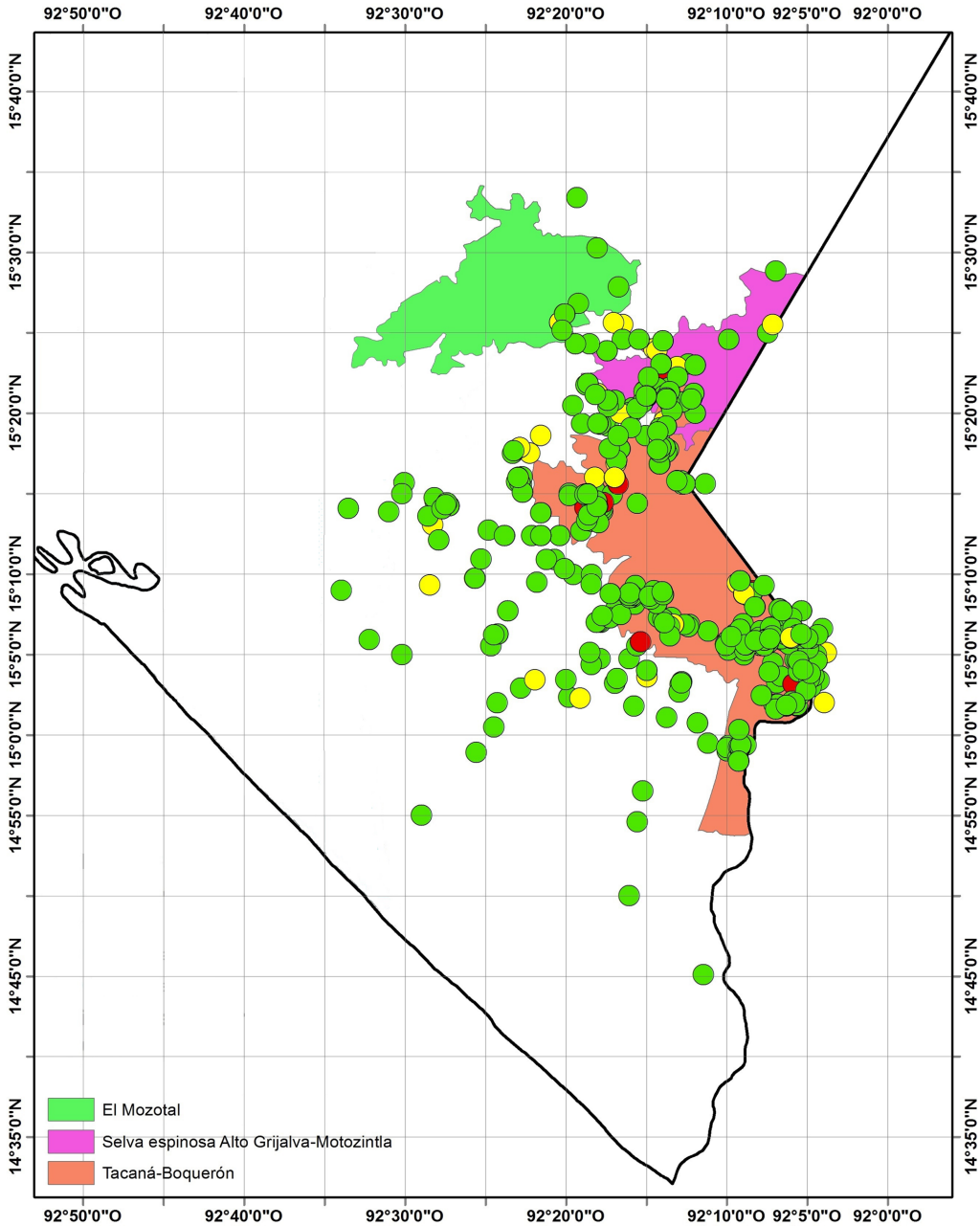

Figure 6. Distribution of the orchid records in the study area on a map of Priority Terrestrial Regions for Conservation in México (CONABIO, 2004). Green dots are epiphytic orchids, red dots are lithophytic orchids, and yellow dots are terrestrial orchids.

region of El Momón-Las Margaritas-Montebello (R = 333, I = 222), which, however, also covers a smaller area. Other regions, covering wider areas and with high orchid species richness, such Chimalapas-Uxpanapa (in the states of Oaxaca and Veracruz) and the Lacandon Forest (in the state of Chiapas and extending into Guatemala), had lower values for I. On the other hand, regions covering a similar area but with lower orchid species richness, such as Sierra Mixe, Juquila-Coatlán and Cañada-Cuicatlán (in the state of Oaxaca) also present lower I values.

Patterns of distribution of orchid diversity. Land use and vegetation.- The orchids in the TBR were registered in almost all the land use and vegetation types present in the region (Figure 2). Four of the land use categories that involved disturbance due to anthropogenic productive ac-

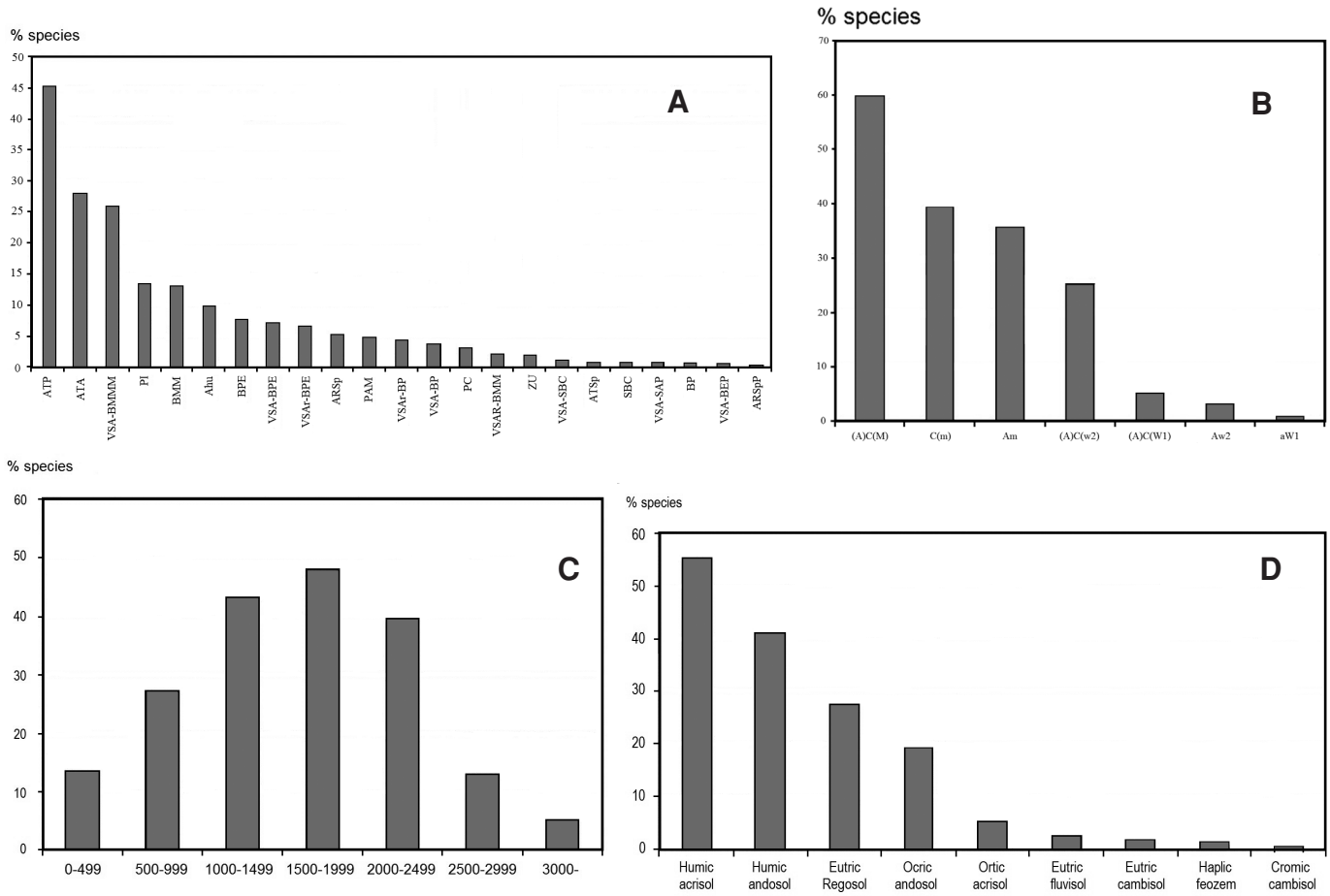

Figure 7. A) Percentage of orchid species richness in the study area by land use and vegetation types. **B)** Percentage of orchid species richness in the study area by climate types. **C)** Percentage of orchid species richness in the study area by elevation intervals. **D)** Percentage of orchid species richness in the study area by soil types.

tivities had the highest percentages of orchid species richness (Figure 7a): permanent seasonal agriculture (45.31 %), annual seasonal or shifting agriculture (28.12 %), secondary vegetation derived from mountain cloud forest (25.93 %) and induced pasture (13.43 %). Considering primary vegetation, mountain cloud forest had the highest percentage orchid species richness (13.12 %), followed by pine-oak forest (7.81 %), alpine meadow (4.68 %), low deciduous forest (0.93 %), and pine forest (0.62 %).

Climate.- The orchids in the TBR were registered in all the climate types present in the region (Figure 3). Areas with a semi-warm humid (A)C(m) climate had the highest percentage orchid species richness (60 %), followed by the temperate humid C(m) (40 %), warm humid Am (36 %) and semi-warm subhumid (A)C(w2) (25 %) climates. The least preferred climates were the semi-warm subhumid (A)C(w1), and both categories of warm subhumid Aw1 and Aw2 climates (Figure 7b).

Elevation.- Orchids were registered at most of the elevations present in the TBR, from just above sea level to high up on the Tacaná volcano (Figure 4). However, almost half (48.13 %) of the orchid species were registered at elevations between 1,500 and 1,999 m, followed by 43.28 % registered at elevations of 1,000 to 1,499 m, 39.55 % for 2,000 to 2,499 m, and 27.24 % for 500 to 999 m. Below 500 m and above 2,500 m similar, lower values for percentage orchid species richness were recorded (13.43 % and 13.06 %, respectively), and very few species were found above 3,000 m (5.22 %) (Figure 7c).

Soils.- Considering the soil types found in the TBR, nine propitiated environments that are favorable for orchids (Figure 5). More than half of the orchid species richness (55.31 %)

was found in humic acrisol type soil; followed by humic andosols (41.25 %), eutric regosols (27.5 %) and ocric andosols (19.37 %). To the contrary, areas of the TBR with ortic acrisols, eutric fluvisols, eutric cambisols, haplic feozems and chromic cambisols all had less than 6 % orchid species richness (Figure 7d).

Priority Terrestrial Regions.- Almost two thirds (64.37 %) of the total orchid species richness registered within the study area were found within the polygon that corresponds to the Tacaná-Boquerón Region (TBR). The region Selva Espinosa Alto Grijalva-Motozintla had 20.31 %, whereas El Motozal had only 3.43 %. Areas outside of these three priority regions had 17.81 % of the total species richness (Figure 6).

Orchid vulnerability, threats and conservation. The TBR is host to 55 species of orchids considered here as vulnerable, of which 39 are included in a risk category in the Mexican legislation and 21 species have a distribution in the country restricted to the study area (see Appendix 1). *Epidendrum alticola* Ames & Correll, *Oncidium wentworthianum* Bateman ex Lindl., and *Rhynchostele uroskinneri* (Lindl.) Soto Arenas & Salazar are at risk species which are also restricted to the study area. Amongst these at risk orchids, four are considered to be in danger of extinction: *Lycaste skinneri* (Bateman ex Lindl.) Lindl., *Rhynchostele majalis* (Rchb.f.) Soto Arenas & Salazar, *R. uroskinneri* and *Rossioglossum grande* (Lindl.) Garay & G.C.Kenn. A further 15 species are considered as threatened and 20 are subject to special protection.

The orchid species that are restricted to the study area are *Acianthera herrerae*, *Catasetum* sp., *Epidendrum alticola*, *Domingoa gemma* (Rchb.f.) van den Berg & Soto Arenas, *Funkiella stolonifera* (Ames & Correll) Garay, *Lepanthes lenticularis* Luer & Béhar, *L. motozintlensis* Salazar & Soto Arenas, *L. tecpanica* Luer & Béhar, *L. tenuiloba* R.E.Schult. & G.W.Dillon, *Maxillaria brunnea*, *M. soconuscana* Breedlove & D.Mally, *Oncidium poikilostalix*, *O. wentworthianum*, *Plectrophora alata*, *Rhynchostele uroskinneri*, *Stelis annedamoniae*, *S. hagsateri*, *S. soconuscana*, *S. tacanensis* Solano & Soto Arenas, *S. vespertina* Solano & Soto Arenas and *Telipogon helleri*.

The factors which pose threats to the conservation of orchids in the TBR can be divided into three categories: 1) of anthropogenic origin, such as the transformation of the habitat for shifting and seasonal agriculture, the introduction of cattle, the increase of human settlements, the illegal extraction and commercialization of timber and orchids (and other species of flora and fauna); 2) phenomena related to climate change, such as extended dry periods, periods of extreme frosts or greater frequency of heavy rains (although these factors could be an indirect consequence of human activities, here we prefer to consider them as climatic phenomena); 3) intrinsic factors related to the life cycle of some species, such as preference for a specific phorophyte, pollinator or mycorrhizal fungus, highly specialized reproductive systems, low pollination rates and/or very low recruitment rates.

The only natural protected area in the TBR is the Tacaná Volcano Biosphere Reserve, covering an area of 63.78 km^2, most of which has an elevation above 1,500 m. Due to the fact that orchid species richness is greatest between 500 and 2,499 m, this reserve does not guarantee the protection of orchids found below 1,500 m, and which is also where the highest deforestation rates are encountered.

Discussion

Orchid species richness. The orchid flora of the TBR and adjacent areas represents 67.7 % and 24 % of the generic and specific diversity, respectively, of the orchids known in Mexico, and almost 66 % and 44 % of the genera and species, respectively, estimated for the state of Chiapas (Soto-Arenas *et al*. 2007b, CONABIO 2012). As is commonly found in other biological groups, there is a bias in the taxonomic distribution of this species richness in relatively few genera, and in the case of orchids, in only six of 105 genera (*Epidendrum, Maxillaria*, *Stelis*, *Oncidium*, *Prosthechea*, and *Lepanthes*) in which 34 % of the total species are concentrated, meanwhile five of 22 subtribes contain almost two thirds of the genera and almost three quarters of the species. According to Govaerts (2014) these five subtribes are amongst the most species rich within the Orchidaceae: Laeliinae (2,094), Maxillariinae (819), Oncidiinae

(1,604), Pleurothallidinae (4,571) and Spiranthinae (518); the first four are lineages exclusive to the Neotropics.

At national level, the values of R and I for the orchid flora of the TBR are the second highest in Mexico, only exceeded by the region El Momón-Las Margaritas-Montebello, also in Chiapas, where Soto-Arenas (2001) registered a similar number of orchid species (333) in a smaller area (1,500 km^2). The orchid flora of the TBR is greater than that of other regions in the southeast of Mexico, which, although covering larger areas, have lower orchid species richness and lower I values, such as the Lacandon Forest with 20,000 km^2 and 271 species (Martínez-Salas *et al*. 1994), Chimalapa-Uxpanapa with 5,910 km^2 and 298 species (Hágsater *et al*. 1998), the Triqui-Mixteca hills with 3,935 km^2 and 207 species (Pichardo-Ramírez 2011), and Los Tuxtlas-Catemaco with 3,486.54 km^2 and 200 species (Carmona 1996, Ibarra-Manríquez & Sinaca-Colín 1997).

According to the recent classification of the Orchidaceae (Chase *et al*. 2015), at national level, the Orchidaceae is divided up into four subfamilies, eleven tribes, 22 subtribes, and 155 genera. It is notable that the diversity of orchids in the TBR is represented by three subfamilies (75 %), nine tribes (81.8 %), 22 subtribes (100 %), and 105 genera (67.7 %). In this way, the study zone is not only important for hosting almost 25 % of all Mexican orchids, but also for the high diversity of phylogenetic lineages represented.

Patterns of distribution of the diversity of orchids. Without doubt, the elevation gradient present in the TBR has been fundamental for the development of the variety of vegetation types, climates and soils in the region, and the second most diverse orchid flora in Mexico. Orchids are to be found in practically all the vegetation, climate, soil, and land use types registered in the region. However, species richness is concentrated in the humid areas at elevations of 500 to 2,499 m, where 93 % of the orchid species have been registered; within this altitudinal interval the climate ranges from humid warm to humid temperate, with humic acrisols, humic andosols or eutric regosols soils, which are environmental factors that are also associated with the highest orchid species richness in the region.

It is interesting to note that the greatest species richness of orchids in the TBR occurs in areas disturbed by permanent or shifting agriculture and cattle ranching. To the contrary, areas that still maintain intact primary forest have much lower species richness. This reflects the extensive deforestation that the region has suffered, where the original forests have been reduced to isolated fragments, with reduced functional integrity, immersed in a landscape that, although diverse, is dominated by anthropogenic productive activities, which has resulted in the assignation of a low priority status for conservation in this area (Arriaga *et al*. 2000, Challenger *et al*. 2010).

The ecosystem that registered the greatest orchid species richness in the TBR corresponded to areas now designated for permanent agriculture, wherein coffee and cocoa are the most important crops. Originally arabic coffee (*Coffea arabica* L.) was planted, and in the so called traditional plantations using trees from the original forests as shade, in which the greater part of the original diversity of flora and fauna continued to coexist with the coffee crop and at the same time the human element satisfied its economic needs. For that reason, historically, traditional coffee plantations have been labeled as conservationist agroecosystems compatible with biological conservation in the tropics (García-Franco & Toledo-Aceves 2008, Espejo-Serna *et al*. 2005). However, in the last few years, the scene has changed dramatically and in the coffee growing zone of Soconusco it is now very unusual to find orchids in the plantations. There are now very few traditional coffee plantations, and large areas have been replanted to robusta coffee (*Coffea canephora* Pierre ex A. Froehner) which is not a good host, or phorophyte, for epiphytes. There are few coffee plantations with a diversity of shade tree species and most now have monospecific shade trees, which are usually heavily pruned, introduced species of *Inga* Mill. (Fabaceae). As well as causing severe erosion in the zone, the implementation of technological packages, combining the use of herbicides, insecticides, fungicides, the elimination of moss, lichens and epiphytes from the trunks and branches of the coffee bushes, and the heavy pruning of the coffee bushes and shade trees, has reduced to virtually nil the biodiversity that could have continued to coexist with the economically viable activity of coffee growing.

Nonetheless, it should be recognized that, being one of the most important coffee growing

regions in Mexico for more than a century, coffee has been an important factor in the history of the region's orchids, and various species had adapted to grow almost exclusively upon the coffee bushes themselves, particularly miniature species. According to the literature, the first collections in the region carried out by Eizi Matuda and Otto Nagel, in the decade of 1930, were carried out in the large coffee "fincas" that had spread through the region. Many of the orchids collected by those botanists have been observed or collected recently in traditional coffee plantations, confirming that, during more than a century, coffee plantations set up in these areas of maximum orchid species richness have served as a refuge for these plants, despite the extensive disturbance. Many of the orchids reported in this study as novelties for the national or regional flora, were discovered in the few remaining traditional coffee or cocoa plantations, such as *Oncidium poikilostalix*, *Plectrophora alata* and *Telipogon helleri*. Furthermore, in these same environments populations of orchid species considered as threatened have also been registered, including *Erycina crista-galli* (Rchb.f.) N.H.Williams & M.W.Chase, *Guarianthe skinneri* (Bateman) Dressler & W.E.Higgins, *Oncidium guatemalenoides* M.W.Chase & N.H.Williams (formerly named as *Sigmatostalix guatemalensis* Schltr.), *O. wentworthianum*, *Pleurothallis nelsonii* Ames, *P. saccatilabia* (C.Schweinf.), *Restrepia trichoglossa* F.Lehm. ex Sander, and *Specklinia lateritia* (Rchb.f.) Pridgeon & M.W.Chase (Avendaño-Vásquez 2010).

Vulnerable orchids, threats and conservation. Considering the Orchidaceae as an example, this study shows high species richness and heterogeneity of environments in the TBR, characteristics that indicate high conservation value. The region, however suffers from a high degree of fragmentation and low functional integrity of the ecosystems, which, to the contrary suggests a low value for conservation (Arriaga *et al*. 2000, Challenger *et al* 2010). Although mention has been made in the literature that the TBR has few or no endemic or threatened species (Challenger *et al*. 2010), the results presented here suggest the contrary: the region is host to 55 orchids considered as vulnerable, of which 39 are threatened species and represent 21.5 % of the Orchidaceae included in the NOM-059-SEMARNAT-2010 (SEMARNAT, 2010). Taking into account the criteria indicated by Margules & Sarkar (2007) and Sarkar *et al*. (2006), the TBR certainly represents a priority for conservation for the number of orchid taxa considered vulnerable, and three species in particular stand out (*Epidendrum alticola*, *Oncidium wentworthianum* and *Rhynchostele uroskinneri*) due to being threatened and also because the only populations in Mexico are found in the TBR. *Rhynchostele uroskinneri* and three other species (*Lycaste skinneri*, *Rhynchostele majalis* and *Rossioglossum grande*) are species considered as in danger of extinction in Mexico, and comprise four of the total of 15 species in that highest risk category in Mexico.

The risk factors that orchids face in the TBR are fundamentally of anthropogenic origin, related to the loss and transformation of habitat for shifting and permanent agriculture, cattle ranching, timber extraction, transformation of the traditional coffee plantations and an increase in human settlements (Soto-Arenas *et al*. 2007a, Challenger *et al*. 2010, Avendaño-Vásquez 2010). Other factors affect species of high ornamental value, whose populations are subject to illegal extraction and sold in local or national markets. Additionally, in the last few years the possible effects of climate change have been observed in the study area, such as extended dry periods, and increased frequency of heavy rainfall, which can interact with anthropogenic factors (such as subsistence agriculture and poor land management) and combine to cause major effects upon the resident biodiversity in vulnerable environments, which may have high orchid species richness (Soto-Arenas *et al*. 2007a).

The Tacaná Volcano Biosphere Reserve is the only protected area within the TBR, where the greater part of area (63.78 km^2) is situated above 1,500 m, wherein the forests are in a better state of conservation, the human population is much smaller and with fewer invasive and destructive activities. However, a significant part of the TBR consists of lower elevations where fragmentation of the ecosystems is greater, there is far greater intensity of agriculture and cattle ranching, human populations are far larger and there is no provision for the conservation of these lower altitude ecosystems. This study demonstrates that 93 % of the orchid species richness in the study area is to be found at elevations of 500 to 2,499 m with 71 % registered at elevations above 1,500 m, and not only on the Tacaná Volcano. It is clear that the designation of

the Tacaná Volcano Biosphere Reserve is insufficient to guarantee the protection of the majority of the region's orchids and the forests and other ecosystems where they grow; the designated area is also insufficient to buffer the severe effects of certain natural phenomena such as hurricanes and fires in the region.

There is a proposal to extend the Tacaná Volcano Biosphere Reserve to connect with the Boquerón peak (CONANP 2011), increasing the area protected to 482.19 km^2, which is slightly less than the area determined as the PTR Biological Corridor Tacaná-Boquerón (574 km^2). If the proposal is accepted, not only will the protected area be increased but also the variety and extension of the environments and species that inhabit them, and the biological connectivity of the ecosystems will be increased, with better prospects for the maintenance of ecological and evolutionary processes and the environmental services that natural ecosystems provide.

The extension of the Tacaná Volcano Biosphere Reserve to connect with the Boquerón peak implies sufficient area to contribute to the conservation of almost two thirds of the orchids of the TBR, and corresponds to the Tacaná-Boquerón Biological Corridor, recognized as a Priority Terrestrial Region in Mexico. For the remaining third of the orchid species, especially those that grow at elevations below 1,000 m, that are not included in the proposed extended protected area and where the forests have been extensively modified by agricultural activity, conservation efforts should include the renovation of traditional and organic coffee plantations, a strategy that if well planned and coordinated could contribute towards the creation of agroecosystems that are compatible with long term conservation and human needs in the lower elevations in the region.

Conclusions

The orchid flora of the Tacaná Boquerón Region is the second richest in Mexico, representing 24 % and 44 % of the species richness for the Orchidaceae, for Mexico and the state of Chiapas, respectively. This orchid flora is phylogenetically rich, including three quarters of the subfamilies, nine of the eleven tribes, all of 22 subtribes, and 105 of the 155 genera of Mexican orchids.

Orchids are present in all of the types of vegetation, climates, soils and anthropogenic environments registered in the TBR, but the major part of this total species richness is to be found at elevations of between 500 and 2,499 m, in environments given over to permanent or shifting agriculture, and it is interesting to note that primary forests have a relatively lower orchid species richness. Considering areas of permanent agriculture, traditional coffee plantations have in the past registered the greatest number of orchids, however, in the last few years these plantations have been totally transformed and are now almost devoid of orchids and other epiphytes.

The TBR is host to 55 vulnerable species of orchids, of which 39 are protected by the Mexican legislation (four are considered to be in danger of extinction), and 20 are species whose distribution en the country is restricted to this region.

The Tacaná Volcano Biosphere Reserve is the only protected area within the TBR, but clearly offers insufficient protection for the region's orchid flora, as it does not include the areas at lower elevations that are host to the greatest orchid species richness. The proposal to extend the reserve to include the Boquerón peak would increase the protected area, include more low elevation areas and protect almost two thirds of the orchids found in the TBR. In the remaining unprotected areas at lower elevations, the renovation of organic and traditional coffee plantations with *Coffea arabica*, and a diversity of native tree species which would remain without pruning, could be an extremely important alternative for the conservation of the greater part of the orchid species richness of the TBR.

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Appendix 1. Annotated checklist and phylogenetically ordered for orchids from Tacaná-Boquerón region and adjacent areas, Chiapas, México. The asterisk indicates that the taxon is protected by the NOM-059-SEMARNAT-2010; the risk category is indicated by the letters A= threatened, Pr= subject to special protection, and P= endangered. "hort." indicates specimen cultivated in the El Soconusco Regional Botanical Garden, El Colegio de la Frontera Sur. In parentheses is the number of taxa that each group present in the category immediately below.

SUBFAMILY Vanilloideae
Tribe Vanillideae (1)
Vanilla Plum. ex Mill. (1)
1 *Vanilla inodora* Schiede. Epiphyte. Matuda 360, 17912, 18446 (MEXU).

SUBFAMILY Orchidoideae
Tribe Cranichideae (4)
Subtribe Cranichidinae Lindl. ex Meisn. (3)
Cranichis Sw. (3)
2 *Cranichis muscosa* Sw. Terrestrial. Ventura & López 3009 (AMO, ENCB).
3 *Cranichis sylvatica* A.Rich & Galeotti. Terrestrial. Matuda 18336 (MEXU).
4 *Cranichis wageneri* Rchb.f. Terrestrial. Matuda 1807, 2397, 28552 (MEXU), Breedlove 42506 (DS).
Ponthieva R.Br. (3)
5 *Ponthieva mexicana* (A.Rich. & Galeotti) Salazar. Terrestrial. Damon s.n. (hort. and photo).
6 *Ponthieva racemosa* (Walt.) C.Mohr. Terrestrial. Matuda 28534 (MEXU), Soto *et al.* 1709 (AMO).
7 *Ponthieva tuerckheimii* Schltr. Epiphyte. Matuda 2398, 28535 (MEXU), Jiménez *et al*. 279 (ECOSUR-TAP), 280 (OAX).
Prescottia Lindl. (1)
8 *Prescottia stachyodes* (Sw.) Lindl. Terrestrial. Matuda 2035 (MEXU), Jiménez *et al*. s.n. (hort.).

Subtribe Galeottiellinae Salazar & M.W.Chase (1)
Galeottiella Schltr. (1)
9 **Galeottiella sarcoglossa* (A.Rich. & Galeotti) Schltr (**Pr**). Terrestrial. Breedlove 15101 (NY), Breedlove 46280 (MEXU).

Subtribe Goodyerinae Klotzsch (4)
Aspidogyne Garay (2)
10 *Aspidogyne maculata* (Hook.) Meneguzzo. Terrestrial. Fryxell 3202 (CAS). Current name for the species formerly known as *Platythelys maculata* (Hook.) Garay.
11 *Aspidogyne vaginata* (Hook.) Meneguzzo. Terrestrial. Matuda 17017, 2104 (MEXU). Current name for the species formerly known as *Platythelys vaginata* (Hook.) Garay.
Goodyera R.Br. (1)
12 *Goodyera striata* Rchb.f. Terrestrial. Matuda 25858 (MEXU), Jiménez *et al*. 154, 159 (OAX), Jiménez *et al*. 119 (MEXU).
Kreodanthus Garay (1)
13 *Kreodanthus ovatilabius* (Ames & Correll) Garay. Terrestrial. Matuda 28553 (MEXU).
Microchilus C.Presl. (1)
14 *Microchilus luniferus* (Schltr.) Ormerod. Terrestrial. Jiménez *et al*. 109 (MEXU).

Subtribe Spiranthinae Lindl. ex Meisn. (13)
Aulosepalum Garay (1)
15 *Aulosepalum hemichreum* (Lindl.) Garay. Terrestrial. Soto 8336 (AMO).
Beloglottis Schltr. (1)
16 *Beloglottis mexicana* Garay & Hamer. Terrestrial. Matuda 6135 (TEX).
Cyclopogon C.Presl. (3)
17 *Cyclopogon papilio* Szlach. Terrestrial. Jiménez *et al*. 116, 117, 158, 161a (OAX).
18 *Cyclopogon prasophyllum* (Rchb.f.) Schltr. Terrestrial. Matuda 6135 (MEXU), Matuda 28557 (MEXU), Jiménez *et al*. 191 (OAX).
19 *Cyclopogon* sp. Epiphyte. Jiménez *et al*. 92 (MEXU).

Appendix 1. Continuation.

Deiregyne Schltr. (1)
20 *Deiregyne eriophora* (B.L.Rob. & Greenm.) Garay. Terrestrial. Soto & Martínez 5908 (AMO), 6164 (AMO), 6165 (AMO), 6166 (AMO), 6167 (AMO), 6168 (AMO), 6169 (AMO), 6171 (AMO).
Dichromanthus Garay (1)
21 *Dichromanthus aurantiacus* (Llave & Lex.) Salazar & Soto Arenas. Terrestrial. Soto & Martínez 6161 (AMO), Soto & López 9113B (AMO).
Funkiella Schltr. (2)
22 *Funkiella parasitica* (A.Rich. & Galeotti) Salazar & Soto Arenas. Terrestrial. Soto & Martínez 5909 (AMO).
23 *Funkiella stolonifera* (Ames & Correll) Garay. Terrestrial. Breedlove 26701 (DS).
Kionophyton Garay (1)
24 *Kionophyton seminudum* (Schltr.) Garay. Terrestrial. Soto & Martínez 5813, 5870, 5947 (AMO), Soto & López 9262 (AMO).
Mesadenella Pabst & Garay (1)
25 *Mesadenella petenensis* (L.O.Williams) Garay. Terrestrial. Matuda 6048 (TEX).
Pelexia Poit. ex Rich. (2)
26 *Pelexia congesta* Ames & C.Schweinf. Terrestrial. Damon s.n. (hort. and photo).
27 *Pelexia funckiana* (A.Rich. & Galeotti) Schltr. Terrestrial. Jiménez *et al*. 57 (ECOSUR-TAP), Damon s.n. (hort. and photo).
Sacoila Raf. (1)
28 *Sacoila lanceolata* (Aubl.) Garay. Terrestrial. Matuda 6035, 17454 (MEXU), Téllez 702 (MEXU), Damon s.n. (hort. and photo).
Sarcoglottis CPresl. (3)
29 *Sarcoglottis lobata* (Lindl.) P.N.Don. Terrestrial. Damon s.n. (hort. and photo).
30 *Sarcoglottis sceptrodes* (Rchb.f.) Schltr. Terrestrial. Soto *et al*. 1708 (AMO).
31 *Sarcoglottis schaffneri* (Rchb.f.) Ames. Terrestrial. Matuda 28545 (MEXU).
Schiedeella Schltr. (2)
32 *Schiedeella llaveana* (Lindl.) Schltr. Terrestrial. Soto et al. 1714, 1716 (AMO), Soto *et al*. 6637 (AMO).
33 *Schiedeella* sp. Terrestrial. Jiménez 181, 182, 183 (MEXU), 184, 185 (ECOSUR-TAP).
Stenorrhynchos Rich. ex Spreng (1)
34 *Stenorrhynchos glicensteinii* Christenson. Terrestrial. Breedlove 46292 (MEXU), Matuda 1635 (MEXU).

Tribe Orchideae (1)
Subtribe Orchidinae Verm. (1)
Habenaria Willd. (8)
35 *Habenaria alata* Hook. Terrestrial. Matuda 1679, 28546 (MEXU), Breedlove 71124 (MEXU), Téllez & Pankhurst 6943 (MEXU).
36 *Habenaria eustachya* Rchb.f. Terrestrial. Gálvez-Chang 20 (ECOSUR-TAP).
37 *Habenaria entomantha* (Llave & Lex.) Lindl. Terrestrial. Espinosa 559 (MEXU).
38 *Habenaria macroceratitis* Willd. Terrestrial. Miranda 7618 (MEXU), Cabrera 9817 (MEXU), Martínez & Stevens 23861 (MEXU).
39 *Habenaria monorrhiza* (Sw.) Rchb.f. Terrestrial. Calzada 3736 (MEXU), Ventura & López 650 (MEXU, ENCB, UAMIZ), Vernet 12 (MEXU).
40 *Habenaria odontopetala* (Rchb.f.) L.O.Williams. Terrestrial. Damon s.n. (hort. and photo).
41 *Habenaria tetranema* Schltr. Terrestrial. Téllez & Pankhurst 7046 (MEXU).
42 *Habenaria trifida* Kunth. Terrestrial. Matuda 20976 (MEXU).

SUBFAMILY Epidendroideae
Tribe Arethuseae (1)
Subtribe Arethusinae Bentham & Hookf. (1)
Arundina Blume (1)

Appendix 1. Continuation.

43 *Arundina graminifolia* (D.Don.) Hocr. Terrestrial. Damon s.n. (hort.). Invasive species and apparently naturalized in the study region.

Tribe Cymbidieae (7)
Subtribe Catasetinae Schltr. (4)
Catasetum Rich. ex Kunth (2)
44 *Catasetum integerrimum* Hook. Epiphyte. Soto *et al*. 1678 (AMO), Soto *et al*. 3534 (AMO), Reyes-García 1349 (MEXU).
45 *Catasetum* sp. Epiphyte. Damon s.n. (hort. and photo).
Clowesia Lindl. (1)
46 *Clowesia russelliana* (Hook.) Dodson. Epiphyte. Soto 8341 (AMO).
Cycnoches Lindl. (2)
47 *Cycnoches egertonianum* Bateman. Epiphyte. Matuda 28536 (MEXU).
48 **Cycnoches ventricosum* Bateman (A). Epiphyte. Matuda 6091 (MEXU, TEX), Matuda 18122, 19665, 19514 (MEXU), Nagel sub. Oestlund 4403 (AMES), Mondragón & Maldonado 103 (OAX), López-Cruz s.n. 121 (HEM).
Mormodes Lindl. (3)
49 *Mormodes aromatica* Lindl. Epiphyte. Damon s.n. (hort.).
50 *Mormodes lineata* Bateman ex Lindl. Epiphyte. Matuda 2578, 6203 (MEXU), Soto, *et al*. 3527, 3528, 3620 (AMO).
51 *Mormodes tuxtlensis* Salazar. Epiphyte. Martínez-Meléndez 1025 (HEM).

Subtribe Cyrtopodiinae Bentham (1)
Cyrtopodium R.Br. (1)
52 *Cyrtopodium macrobulbon* (Llave & Lex.) G.A.Romero & Carnevali. Terrestrial or rupicolous. Reyes-García & Martínez 55 (MEXU).

Subtribe Eulophiinae Bentham (2)
Eulophia R.Br. (1)
53 *Eulophia alta* (L.) Fawc. & Rendle. Terrestrial. Hernández-X 314 (MEXU), Matuda 2058, 17007, 18687 (MEXU), Ventura & López 556 (UAMIZ).
Oeceoclades Lindl. (1)
54 *Oeceoclades maculata* (Lindl.) Lindl. Terrestrial. Damon 36 (ECOSUR-TAP), Martínez-Meléndez 1893 (HEM), Damon s.n. (hort.). Invasive species, since the beginning of the 1990s it has colonized the warm-wet areas between the Centre of Veracruz and Northern Oaxaca up to Yucatan Peninsula (where it was reported for the first time in the country) and Chiapas.

Subtribe Maxillariinae Bentham (2)
Lycaste Lindl. (3)
55 *Lycaste aromatica* (Graham ex Hook.) Lindl. Epiphyte, occasionally terrestrial. Matuda s. n. (MEXU).
56 *Lycaste cruenta* (Lindl.) Lindl. Epiphyte. Soto *et al*. 1750 (AMO), Soto 8339 (AMO).
57 *Lycaste skinneri* (Bateman ex Lindl.) Lindl. Epiphyte. Matuda 368 (MEXU).
Maxillaria Ruiz & Pav. (17)
58 *Maxillaria atrata* Rchb.f. Epiphyte. Soto *et al*. 7070, 7071 (AMO), Jiménez *et al*. 294 (OAX, ECOSUR-TAP).
59 *Maxillaria brunnea* Linden & Rchb.f. Epiphyte. Damon (hort. and photo).
60 *Maxillaria crassifolia* (Lindl.) Rchb.f. Epiphyte. Soto *et al*. 1737, 1739 (AMO), Soto *et al*. 3545 (AMO).
61 *Maxillaria cucullata* Lindl. Epiphyte. Matuda 830 (MEXU), Matuda 5042, 19648 (MEXU), Soto *et al*. 3414 (AMO), E. Martínez, *et al*. 20743 (MEXU), Martínez *et al*. 20498, 22460 (MEXU).
62 *Maxillaria densa* Lindl. Epiphyte. Hernández-X 308 (MEXU), Soto *et al*. 1681 (AMO), Soto *et al*. 3536 (AMO), Soto *et al*. 1736 (AMO), Jiménez *et al*. 171 (OAX, ECOSUR-TAP).
63 *Maxillaria egertoniana* (Bateman ex Lindl.) Molinari. Current name for the species for-

Appendix 1. Continuation.

merly known as: *Trigonidium egertonianum* Bateman ex Lindl. Epiphyte. Matuda 2112, 6057 (MEXU), Soto *et al.* 3523, 3524, 3525, 3526, 3533 (AMO), Ventura & López 2844 (CHAPA).

64 *Maxillaria elatior* (Rchb.f.) Rchb.f. Epiphyte. Soto 8325 (AMO).

65 *Maxillaria friedrichsthalii* Rchb.f. Epiphyte. Soto *et al.* 1683, 1740 (AMO), Jiménez *et al*. 229, 246 (ECOSUR-TAP, OAX), 238 (ECOSUR-TAP), Damon s.n. (hort. and photo).

66 *Maxillaria hagsateriana* Soto Arenas. Epiphyte. Matuda 1805, 4057 (MEXU), Soto *et al*. 1748, 1784 (AMO), Soto & Martínez 5806 (AMO) Martínez & Reyes 20325, 22537 (MEXU), Jiménez *et al*. 155 (OAX), 230 (OAX, ECOSUR-TAP).

67 *Maxillaria houtteana* Rchb.f. Epiphyte or rupicolous. Matuda 2056 (TEX), Hernández 530 (MEXU), Jiménez *et al*. 192 (OAX).

68 *Maxillaria lineolata* (Fenzl) Molinari. Substitute name for *Trigonidium ringens* Lindl. (= *Mormolyca ringens* (Lindl.) Schltr.), because the combination of it in *Maxillaria* is not available by the prior existence of *Maxillaria ringens* Rchb.f., so a synonym name, *Mormolyca lineolata* Fenzl, should be used. Epiphyte. Damon 2 (hort. and photo).

69 *Maxillaria meleagris* Lindl. Epiphyte. Martínez-Meléndez 1220 (HEM) Martínez-Meléndez 1336 (HEM), Reynoso-Santos 308 (HEM).

70 *Maxillaria parviflora* (Poepp. & Endl.) Garay. Epiphyte. Soto *et al*. 1684 (AMO), 1907, 1908, 1909, 1910, 1911, 1912 (AMO), Jiménez *et al*. 224 (ECOSUR, OAX).

71 *Maxillaria ringens* Rchb.f. Epiphyte, sometimes rupicolous. Matuda 2520, 17948 (MEXU), Soto *et al*. 1682 (AMO).

72 *Maxillaria scorpioidea* Kraenzl. Epiphyte. Nagel sub Oestlund 4332 (AMO).

73 *Maxillaria soconuscana* Breedlove & D.Mally. Epiphyte. Breedlove 29445 (MEXU, MO), Breedlove 65961 (CAS), Soto & Martínez 5844 (AMO), Soto *et al.* 7056, 7072, 7075 (AMO), Soto 9077 (AMO), Martínez *et al.* 14097, 14106 (MEXU), Jiménez *et al*. 146 (ECOSUR-TAP, OAX), 206 (OAX).

74 *Maxillaria variabilis* Bateman ex Lindl. Epiphyte. Matuda 2072, 6053, 18569 (MEXU), Matuda 4090 (MEXU), Soto 8337 (AMO).

Subtribe Oncidiinae Bentham (18)

Brassia R. Br. (1)

75 *Brassia verrucosa* Bateman ex Lindl. Epiphyte. Soto *et al*. 3454 (AMO), Martínez 20610 (MEXU, CHAPA), Jiménez *et al*. 217 (ECOSUR-TAP), 218 (OAX), 243 (OAX, ECOSUR-TAP).

Comparettia Poepp. & Endl. (2)

76 *Comparettia falcata* Poepp. & Endl. Epiphyte. Damon s.n. (hort. and photo).

77 **Comparettia tuerckheimii* (Schltr.) M.W.Chase & N.H.Williams. (A). Epiphyte. Damon s.n. (hort. and photo). Current name for the species formerly known as *Scelochilus tuerckheimii* Schltr.

Cuitlauzina Lex. (3)

78 **Cuitlauzina candida* (Lindl.) Dressler & N.H.Williams (A). Epiphyte. Soto *et al*. 1696, 1849, 1850,1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858 (AMO), Soto *et al.* 3492, 3493, 3494, 3495, 3496, 3497, 3498 (AMO), Martínez 14189 (MEXU).

79 *Cuitlauzina convallarioides* (Schltr.) Dressler & N.H.Williams. Epiphyte. Matuda 38598 (MEXU).

80 *Cuitlauzina pulchella* (Bateman ex Lindl.) Dressler & N.H.Williams. Epiphyte. Soto *et al.* 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760 (AMO), Soto *et al.* 3547 (AMO), Soto *et al.* 4325-A (AMO).

Cyrtochiloides N.H.Williams & M.W.Chase (1)

81 **Cyrtochiloides ochmatochila* (Rchb.f.) N.H.Williams & M.W. Chase (**A**). Epiphyte. Matuda 6051 (MEXU).

Erycina Lindl. (2)

82 **Erycina crista-galli* (Rchb.f.) N.H.Williams & M.W.Chase (**Pr**). Epiphyte. Fisher s.n (AMO, NY), Mondragón & Maldonado 112 (AMO), Jiménez et al. 241 (AMO), Jiménez *et al*. 820, 822 (AMO).

83 *Erycina pusilla* (L.) N.H.Williams & M.W.Chase. Epiphyte. Matuda 6086 (MEXU), Matuda 17008 (MEXU), Martínez-Meléndez 1000 (HEM).

Appendix 1. Continuation.

Ionopsis Kunth (2)

84 **Ionopsis satyrioides* (Sw.) Rchb.f. (**Pr**). Epiphyte. Damon s.n. (hort.).

85 *Ionopsis utricularioides* (Sw.) Lindl. Epiphyte. Matuda 17826 (MEXU), Matuda 18226 (MEXU).

Leochilus Knowles & Westc. (4)

86 *Leochilus carinatus* (Knowles & Westc.) Lindl. Epiphyte. Damon (hort. and photo).

87 *Leochilus labiatus* (Sw.) Kuntze. Epiphyte. Matuda 18675 (MEXU), Soto *et al*. 3546 (AMO).

88 *Leochilus oncidioides* Knowles & Westc. Epiphyte. Miranda 1818 (MEXU), Matuda 2034 (MEXU), Martínez 19976 (MEXU), Ramírez s.n. (MEXU), Soto *et al*. 3518 (AMO), Damon 104 (OAX), Mondragón & Maldonado107 (OAX).

89 *Leochilus scriptus* (Scheidw.) Rchb.f. Epiphyte. Damon 398 (ECOSUR-TAP).

Lockhartia Hook (1)

90 *Lockhartia verrucosa* Lindl. ex Rchb.f. Epiphyte. Matuda 4369 (AMES, MEXU, SEL), Damon 60, 230 (ECOSUR-TAP).

Macroclinium Barb.Rodr. (1)

91 *Macroclinium bicolor* (Lindl.) Dodson. Epiphyte. Jiménez *et al*. 166, 167 (OAX), 168 (ECO SUR-TAP).

Notylia Lindl. (1)

92 *Notylia barkeri* Lindl. Epiphyte. Soto 8334 (AMO), Jiménez *et al*. 234 (ECOSUR-TAP), 235 (OAX).

Oncidium Sw. (14)

93 **Oncidium guatemalenoides* M.W.Chase & N.H.Williams (**A**). Epiphyte. Damon s.n. (hort. and photo). Substitute name for the species previously known as *Sigmatostalix guatemalensis* Schltr., because the combination of it in *Oncidium* was not available by the prior existence of *Oncidium guatemalense* Schltr. (= *O. oliganthum* (Rchb.f) L.O.Williams).

94 *Oncidium hagsaterianum* R.Jiménez & Soto Arenas. Epiphyte. Soto *et al*. 3477 (AMO).

95 *Oncidium laeve* (Lindl.) Beer. Epiphyte. Soto *et al*. 1791, 1792, 1793, 1794, 1995, 1796, 1797, 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805 (AMO), Soto et al. 3433, 3434, 3435, 3436, 3437, 3467, 3468, 3469, 3470, 3471 (AMO), Soto & Martínez 5816 (AMO), Soto *et al*. 6632 (AMO), Soto 8277, 8285, 8295, 8298, 9079, 9080, 9082 (AMO), Soto & López 9095 (AMO), Thurston sub Hágsater 5035 (AMO, K, MEXU), Martínez 20581, 20374 (MEXU), Martínez *et al*. 22459 (MEXU), Martínez *et al*. 20014, 20015 (MEXU), Martínez *et al*. 20513, 20514 (MEXU), Martínez & Reyes 20374, 20378 (AMO), Espejo 2278 (UAMIZ), Jiménez *et al*. 296 (ECOSUR-TAP), 297 (OAX).

96 **Oncidium leucochilum* Bateman ex Lindl. (**A**). Epiphyte. Soto & Martínez 5786 (AMO), Soto *et al*. 7013, 7015, 7030 (AMO), Matuda 4840 (MEXU).

97 *Oncidium lindleyi* (Galeotti ex Lindl.) R.Jiménez & Soto Arenas. Epiphyte. Damon s.n. (hort.).

98 *Oncidium oliganthum* (Rchb.f.) L.O.Williams. Epiphyte. Soto 3310 (AMO, CHIP, ENCB, ILL, K, MEXU, MO, S, UVAL), 3246 (AMO).

99 *Oncidium pergameneum* Lindl. Epiphyte. Soto & Martínez 5958 (AMO), Soto 8327 (AMO).

100 *Oncidium poikilostalix* (Kraenzl.) M.W.Chase & N.H.Williams. Epiphyte. Jiménez *et al*. 178 (OAX), Damon s.n. (ECOSUR-TAP), Damon s.n. (ECOSUR-TAP), Damon s.n. (OAX), Solano *et al*. 3093 (AMO). Current name for the species previously known as *Sigmatostalix poikilostalix* Kraenzl.

101 *Oncidium sotoanum* R.Jiménez & Hágsater. subsp. *papalosmum* R.Jiménez. Epiphyte. Ventura & López 2733 (ENCB), Martínez-Meléndez 1553 (HEM), Damon 88 (ECOSUR-TAP).

102 *Oncidium sphacelatum* Lindl. Epiphyte. Soto *et al*. 1722 (AMO), Soto *et al*. 7007 (AMO), Damon s.n. (hort.).

103 *Oncidium stenoglossum* (Schltr.) Dressler & N.H.Williams. Epiphyte. Matuda 28539 (MEXU).

104 *Oncidium suttonii* Bateman ex Lindl. Epiphyte. Jiménez *et al*. 121 (ECOSUR-TAP).

105 *Oncidium tenuipes* Kraenzl. Epiphyte. Jiménez *et al*. 819, 885 (AMO), Matuda 4091 (MEXU), Soto *et al*. 3244, 3369 (AMO) Soto & Martínez 6201 (AMO), Soto & Jiménez s.n (AMO).

106 **Oncidium wentworthianum* Bateman ex Lindl. (**Pr**). Epiphyte. Nagel sub Oestlund 4383 (AMO, AMES), Martínez *et al*. 14070 (MEXU), Jiménez *et al*. 121 (ECOSUR-TAP, OAX), 177 (OAX).

Appendix 1. Continuation.

Ornithocephalus Hook (1)

107 *Ornithocephalus tripterus* Schltr. Epiphyte. Gálvez-Chang s.n (ECOSUR-TAP).

Plectrophora H. Focke (1)

108 *Plectrophora alata* (Rolfe) Garay. Epiphyte. Nagel sub Oestlund 4338 (AMES), Jiménez *et al*. s.n. (ECOSUR-TAP), Solano *et al*. 3091 (OAX), 3092 (AMO).

Rhynchostele Rchb. f. (7)

109 *Rhynchostele bictoniensis* (Bateman) Soto Arenas & Salazar. Epiphyte. Damon s.n. (hort. and photo).

110 **Rhynchostele cordata* (Lindl.) Soto Arenas & Salazar (**A**). Epiphyte. Soto *et al*. 3420, 3421, 3422, 3423, 3424, 3425 (AMO), Soto & Martínez 5821, 5871 (AMO), Soto *et al*. 6638 (AMO), Soto 8296 (AMO), Jiménez *et al*. 137, 180, 187 (ECOSUR-TAP), 138, 179, 193 (OAX).

111 **Rhynchostele majalis* (Rchb.f.) Soto Arenas & Salazar (**P**). Epiphyte. Soto & Martínez 5899 (AMO).

112 **Rhynchostele pygmaea* (Lindl.) Rchb.f. (**Pr**). Epiphyte. Soto & Martínez 5893, 5894, 5895, 5896, 5897, 5898, 5910, 5911, 6178 (AMO), Jiménez *et al*. 160 (ECOSUR-TAP, OAX).

113 **Rhynchostele rossii* (Lindl.) Soto Arenas & Salazar (**A**). Epiphyte. Matuda 1706a, 28562 MEXU)

114 *Rhynchostele stellata* (Lindl.) Soto Arenas & Salazar. Epiphyte. Soto *et al*. 3455 (AMO), Soto & Martínez 5900, 6173, 5901, 6090, 6091, 6092, 6093, 6106, 6107 (AMO), Soto & López 9107 (AMO), Matuda 1710, 2839 (MEXU), Martínez 20654 (MEXU), Martínez *et al*. 20510 (MEXU), Martínez *et al*. 13180 (MEXU), Martínez & Ramírez 20804 (MEXU), Jiménez *et al*. 188, 207 (ECOSUR-TAP), 189 (OAX).

115 **Rhynchostele uroskinneri* (Lindl.) Soto Arenas & Salazar (**P**). Rupicolous. Jiménez *et al*. 188 (ECOSUR-TAP), 189 (ECOSUR-TAP, OAX), Damon s.n. (hort. and photo).

Rossioglossum (Schltr.) Garay & G.C.Kenn. (1)

116 **Rossioglossum grande* (Lindl.) Garay & G.C.Kenn. (**P**). Epiphyte. Soto *et al*. 1698, 1699 (AMO), Breedlove & Smith 31722 (DH), Matuda 4060 (MEXU), Salazar *et al*. 2214 (AMO), Martínez *et al*. 14174 (MEXU), Martínez *et al*. 22454 (MEXU), Espejo & López-Ferrari 3892 (UAMIZ).

Telipogon Kunth (1)

117 *Telipogon helleri* (L.O.Williams) N.H.Williams & Dressler. Epiphyte. Pérez sub Solano 3050 (OAX), García sub Solano 3090 (OAX).

Trichocentrum Poepp. & Endl. (8)

118 *Trichocentrum ascendens* (Lindl.) M.W.Chase & N.H.Williams. Epiphyte. Soto 8332 (AMO), Martínez *et al*. 19914 (MEXU).

119 *Trichocentrum bicallosum* (Lindl.) M.W.Chase & N.H.Williams. Epiphyte. Breedlove 41637, 66038 (MEXU), Soto *et al*. 1779, 1780, 1781, 1782, 1783 (AMO), Soto *et al*. 3472, 3471, 3473, 3474, 3475, 3476 (AMO), Soto *et al*. 7003 (AMO), Soto & López 9094 (AMO).

120 *Trichocentrum brachyphyllum* (Lindl.) R.Jiménez. Epiphyte. Soto *et al*. 1690 (AMO), Ventura & López 1053 (CHAPA, ENCB).

121 *Trichocentrum candidum* Lindl. Epiphyte. Soto *et al*. 1673, 1878, 1880 (AMO), Jiménez *et al*. 162, 164 (ECOSUR-TAP, OAX).

122 *Trichocentrum luridum* (Lindl.) M.W.Chase & N.H.Williams. Epiphyte. Soto 1685 (AMO), Soto *et al*. 3505, 3506 (AMO).

123 *Trichocentrum microchilum* (Bateman ex Lindl.) M.W.Chase & N.H.Williams. Epiphyte. Matuda s.n. (MEXU), Matuda 4850 (MO).

124 *Trichocentrum oerstedii* (Rchb.f.) R.Jiménez & Carnevali. Epiphyte. Martínez *et al*. 19891 (HEM), Damon s.n. (hort. and photo).

125 *Trichocentrum xquintanarooensis* (Cetzal & Balam) J.M.Hsaw. Originally published as *xCohnlophiaris quintanarooensis* Cetzal & Balam, hybrid between *Trichocentrum ascendens* (Lindl.) M.W.Chase & N.H.Williams *x T. oerstedii* (Rchb. f.) R.Jiménez & Carnevali. Epiphyte. Damon s.n. (hort. and photo).

Trichopilia Lindl. (1)

126 *Trichopilia tortilis* Lindl. Epiphyte. Soto 8282, 8283 (AMO), Matuda 1815 (MEXU), Nagel sub Oestlund 4321 (AMO AMES), Damon s.n. (hort. and photo).

Appendix 1. Continuation.

Subtribe Stanhopeinae Bentham (3)
Acineta Lindl. (1)
127 *Acineta salazarii* Soto Arenas. Epiphyte. Damon s.n. (hort.).
Gongora Ruiz & Pav. (3)
128 *Gongora cassidea* Rchb.f. Epiphyte. Damon 160, 205, 258, 342, 425 s.n. (ECOSUR-TAP).
129 *Gongora galeata* (Lindl.) Rchb.f. Epiphyte. López-Chagala 96 (HEM), Matuda 2550 (MEXU).
130 **Gongora tridentata* Whitten (**Pr**). Epiphyte. Soto 8280 (AMO), Ventura & López 4654 (AMO, ENCB), Nagel sub Oestlund 4359 (AMES).
Stanhopea J.Frost ex Hook (3)
131 *Stanhopea graveolens* Lindl. Epiphyte. Espejo *et al*. 2304 (UAMIZ).
132 *Stanhopea ruckeri* Lindl. Epiphyte. Jiménez *et al*. 165 (OAX).
133 *Stanhopea saccata* Bateman. Epiphyte. Matuda 17827, 17072 (MEXU), Soto *et al*. 1727, 1728, 1729, 1730, 1731 (AMO), Soto sub Hágsater 8553 (AMO), Jiménez *et al*. 219 (OAX).

Subtribe Zygopetalinae Schltr. (2)
Dichaea Lindl. (7)
134 *Dichaea glauca* (Sw.) Lindl. Epiphyte. Damon s.n. (hort.).
135 *Dichaea graminoides* (Sw.) Lindl. Epiphyte. Jiménez *et al*. 120 (OAX, ECOSUR-TAP).
136 *Dichaea muricatoides* Hamer & Garay. Epiphyte or rupicolous. Mondragón & Maldonado 108 (OAX), López & Ventura 2680 (MEXU), Martínez & Stevens 23819 (MEXU), Jiménez *et al*. 221 (OAX, ECOSUR-TAP), 233 (OAX, ECOSUR-TAP), 236 (OAX, ECOSUR-TAP), 237 (ECOSUR-TAP), 245 (OAX, ECOSUR-TAP).
137 *Dichaea neglecta* Schltr. Epiphyte. Soto *et al*. 1807, 1807-bis (AMO), Soto & Martínez 5808 (AMO).
138 *Dichaea squarrosa* Lindl. Epiphyte. Martínez & Reyes 20445 (MEXU), Fernández 5228 (MEXU), Martínez *et al*. 14065 (MEXU), Espejo *et al*. 2300 (UAMIZ), Martínez *et al*. 13203 (ENCB), Jiménez *et al*. 110, 199 (OAX), 255 (OAX, ECOSUR-TAP).
139 *Dichaea suaveolens* Kraenzl. Epiphyte. Soto & Martínez 5807 (AMO), Soto *et al*. 3416 (AMO), Soto *et al*. 6648A (AMO), Soto & López 9093 (AMO).
140 *Dichaea trichocarpa* (Sw.) Lindl. Epiphyte. Ventura & López 4432 (ENCB, UAMIZ).
Kefersteinia Rchb. f. (1)
141 **Kefersteinia tinschertiana* Pupulin (**Pr**). Epiphyte. Matuda 6195 (MEXU), Damon 419 (hort.).

Tribe Epidendreae (5)
Subtribe Bletiinae Bentham (2)
Bletia Ruiz & Pav. (2)
142 *Bletia purpurata* A.Rich. & Galeotti. Terrestrial. Ceja *et al*. 1328 (UAMIZ).
143 *Bletia purpurea* (Lam.) DC. Terrestrial. Ventura & López 4146 (AMO, ENCB, CHAPA); Jiménez *et al*. 214 (OAX), 215 (ECOSUR-TAP).
Chysis Lindl. (1)
144 **Chysis bractescens* Lindl. (**A**). Epiphyte, rarely rupicolous. Damon s.n. (hort. and photo).

Subtribe Calypsoinae (3)
Coelia Lindl. (3)
145 *Coelia bella* (Lem.) Rchb.f. Epiphyte, sometimes rupicolous. Damon s.n. (hort.).
146 *Coelia guatemalensis* Rchb.f. Epiphyte, sometimes rupicolous. Soto & López 9101 (AMO).
147 *Coelia macrostachya* Lindl. Epiphyte, sometimes rupicolous or terrestrial. Matuda 1784 (MEXU), Soto 8293 (AMO), Soto *et al*. 1786 (AMO), Salazar *et al*. 3520 (AMO).
Govenia Lindl. (6)
148 *Govenia bella* E.W.Greenw. Terrestrial. Soto & Martínez 5892, 6162 (AMO).
149 *Govenia greenwoodii* Dressler & Soto Arenas, Terrestrial or rupicolous. Matuda 28555 (MEXU).
150 *Govenia liliacea* (Llave & Lex.) Lindl. Terrestrial. Soto & Martínez 6159 (AMO), Matuda 1640, 1718 (MEXU), Matuda 4863 (MEXU).
151 *Govenia matudae* E.W.Greenw. & Soto Arenas. Terrestrial. Matuda 4365, 4541 (TEX), Soto & López 9102, 9104, 9105, 9110, 9111, 9112, 9113 (AMO).

Appendix 1. Continuation.

152 *Govenia mutica* Rchb.f. Terrestrial. Damon *et al*. 631 (ECOSUR-TAP).
153 *Govenia superba* (Llave & Lex.) Lindl. ex Lodd. Terrestrial. Matuda 4365, 4541 (MEXU), Soto & Martínez 5812 (AMO).

Corallorhiza Gagnebin (1)
154 *Corallorhiza bulbosa* (A.Rich. & Galeotti) Raf. Terrestrial. Matuda 4648 (TEX).
155 *Corallorhiza maculata* var. *mexicana* (Lindl.) Freudenstein. Terrestrial. Matuda 4648 (TEX), Soto & Martínez 6163 (AMO).

Subtribe Laeliinae Bentham (17)

Arpophyllum Llave & Lex. (3)
156 *Arpophyllum alpinum* Lindl. Epiphyte. Soto & Martínez 5902, 5903, 5904, 5905, 5906, 5907 (AMO), Breedlove 40322 (DH).
157 *Arpophyllum giganteum* Hartw. ex Lindl. Epiphyte. Martínez-Meléndez 647 (HEM), Velázquez *et al*. 63 (HEM).
158 *Arpophyllum medium* Rchb.f. Epiphyte. Soto & López 9066 (AMO), Soto *et al*. 7059, 7064 (AMO), Jiménez *et al.* 118 (OAX, ECOSUR-TAP), Jiménez *et al*. 157 (OAX).

Barkeria Knowles & Westc. (3)
159 *Barkeria obovata* (C.Presl) Christenson. Epiphyte. Espejo *et al*. 6120 (UAMIZ).
160 **Barkeria skinneri* (Bateman ex Lindl.) Lindl. ex Paxton. (**Pr**). Epiphyte, sometimes rupicolous. Soto *et al.* 7011, 7017, 7019, 7021, 7024, 7028, 7029, 7031, 7033, 7039, 7041, 7043, 7045, 7046, 7047, 7048, 7050 (AMO), Soto s.n (AMO), Fryxell & Lott 3324 (AMO, MEXU), Soto & Martínez 6245 (AMO).
161 *Barkeria spectabilis* Bateman ex Lindl. Epiphyte. Soto *et al*. 7023, 7025 (AMO), Jiménez *et al*. 293 (OAX).

Brassavola R.Br. (3)
162 *Brassavola cucullata* (L.) R.Br. Epiphyte. Matuda 17742 (MEXU), Soto 8322, 8323, 8326 (AMO).
163 *Brassavola nodosa* (L.) Lindl. Epiphyte. Matuda 18008 (MEXU), Téllez 539 (MEXU), Arcos 28 (MEXU), Martínez-Meléndez 861 (HEM).
164 *Brassavola venosa* Lindl. Epiphyte. Matuda 16739 (MEXU).

Caularthron Raf. (1)
165 **Caularthron bilamellatum* (Rchb.f.) R.E.Schult. (**Pr**). Epiphyte. Damon s.n. (hort. and photo).

Dinema Lindl. (1)
166 *Dinema polybulbon* (Sw.) Lindl. Epiphyte. Matuda 28341 (MEXU).

Domingoa Schltr. (2)
167 *Domingoa gemma* (Rchb.f.) van den Berg & Soto Arenas. Epiphyte. Beutelspacher s.n. (MEXU).
168 *Domingoa purpurea* (Lindl.) van den Berg & Soto Arenas. Epiphyte. Jiménez *et al.* 290 (ECO SUR-TAP), 291 (OAX), Matuda s.n. (MEXU), Miller *et al*. 2748 (MEXU), Soto *et al.* 6655, 7040, 7049 (AMO), Soto *et al.* 1761, 1762, 1763, 1764, 1765, 1766 (AMO).

Encyclia Hook (6)
169 *Encyclia cordigera* (Kunth) Dressler. Epiphyte. Soto *et al*. 3509, 3510, 3511, 3512, 3513 (AMO), Espejo *et al.* 2344 (UAMIZ), Martínez *et al*. 20701 (MEXU), Ramamoorthy *et al.* 1840 (MEXU).
170 *Encyclia incumbens* (Lindl.) Mabb. Epiphyte. Soto *et al.* 7000, 7036, 7009 (AMO).
171 *Encyclia nizandensis* Pérez-García & Hágsater. Epiphyte. Damon s.n. (hort. and photo). Matuda 16761, 17712 (MEXU).
172 *Encyclia papillosa* (Bateman) Ag.-Olav. Martínez 22369 (MEXU).
173 *Encyclia parviflora* (Regel) Withner. Epiphyte. Damon s.n. (hort.).
174 *Encyclia selligera* (Bateman ex Lindl.) Schltr. Epiphyte, rupicolous or terrestrial. Matuda 6092 (MEXU), Soto *et al*. 1767, 1768 (AMO), Soto 8168 (AMO), Soto *et al*. 6654 (AMO), Jiménez *et al*. 213 (OAX).

Epidendrum L. (39)
175 **Epidendrum alticola* Ames & Correll (**A**). Epiphyte. Soto *et al*. 1871, 1872, 1873, 1874, 1875 (AMO), Soto *et al.* 3443, 3444, 3445 (AMO), Martínez & Ramírez 20795 (MEXU).

Appendix 1. Continuation.

176 *Epidendrum arbuscula* Lindl. Epiphyte. Soto 7083 (AMO), van Ufford 322 (U), Soto *et al.* 1819, 1820, 1821 (AMO), Soto & Martínez 5815 (AMO), Soto 6197 (AMO), Croat 47398 (MO), Martínez 22492 (MEXU).
177 *Epidendrum beharorum* Hágsater. Epiphyte. Soto 8294 (AMO).
178 *Epidendrum camposii* Hágsater. Epiphyte. Martínez 22492 (MEXU)
179 *Epidendrum chloe* Rchb.f. Epiphyte. Breedlove 68900 (MEXU), Soto & Martínez 5829, 5830, 5842, 5849, 6094, 6101, 6118, 6120, 6121, 6145 (AMO), Soto *et al.* 7066 (AMO).
180 *Epidendrum chlorocorymbos* Schltr. Epiphyte. Soto *et al.* 7012 (AMO), Jiménez *et al.* 284 (OAX).
181 *Epidendrum ciliare* L. Epiphyte. Matuda 2054 (MEXU), Soto *et al.* sub Hágsater 8110 (AMO), Soto & Martínez 5783 (AMO), Soto *et al.* 7027, 7032 (AMO), Soto 8321, 9086 (AMO), Williams 10077 (MEXU).
182 *Epidendrum clowesii* Bateman ex Lindl. Epiphyte. Matuda 366 (AMES, MEXU, MICH, MO, US), Soto 5956 (AMO).
183 **Epidendrum cnemidophorum* Lindl. (**A**). Epiphyte. Fernández 3540 (AMO), Martínez & Reyes 20412 (MEXU), Martínez *et al.* 20479 (MEXU).
184 **Epidendrum* aff. *culmiforme* Schltr. (Pr). Epiphyte. Damon 693 (ECOSUR-TAP).
185 *Epidendrum dixorum* Hágsater. Epiphyte. Soto & Martínez 5950 (AMO), 5951 (UAMIZ), 5952 (AMO), 5953 (UAMIZ), 5954 (AMO), 5955 (AMO, UAMIZ), Soto et al. 3253 (AMO).
186 *Epidendrum eximium* L.O.Williams. Epiphyte. Soto *et al.* 3450, 3451, 3452, 3453 (AMO), Matuda 5488 (LL, AMES, MO, SMU, MEXU).
187 *Epidendrum flexuosum* G.Mey. Epiphyte. Aquino 122AA (MEXU).
188 *Epidendrum isomerum* Schltr. Epiphyte. Soto *et al.* 3539 (AMO).
189 *Epidendrum lacertinum* Lindl. Epiphyte or rupicolous. Soto & Martínez 5787, 5788, 5789 (AMO), Soto *et al.* 7016, 7018 (AMO), Soto 8167, 9087 (AMO), Thurston sub. Hágsater 1514 (AMES, BR, ENCB, MEXU, NY, AMO K, US), Hágsater & Thurston 5034 (AMO, MEXU), McCullough 1710 (AMO), Breedlove 69127, 68941 (CAS), Matuda 5533 (AMES), Matuda s.n. (MEXU), Cabrera-Cachón 107 (AMO, CHIP), Jiménez *et al.* 292 (OAX, ECOSUR-TAP).
190 *Epidendrum laucheanum* Rolfe ex Bonhof. Epiphyte. Soto *et al.* 1822, 1845, 1846, 1847, 1859, 1860, 1861, 1862, 1963, 1864, 1865, 1927 (AMO), Hágsater 8079 (AMO), Soto *et al.* 3405, 3406, 3407, 3409, 3410, 3411, 3412, 3413 (AMO), Soto *et al.* 6626, 6627, 6628, 6629, 6630, 6631 (AMO), Martínez *et al.* 20016 (CICY, F, MO, F, MEXU), Matuda 28549 (MEXU), Martínez & Stevens 23836 (MEXU), Breedlove 25713 (CAS).
191 *Epidendrum microcharis* Rchb.f. Epiphyte. Soto & Martínez 5913, 5914, 5915, 5916, 5917, 5918, 5919, 5920, 5921, 5922, 5923, 5924, 5925, 5926, 5927, 5928, 5929, 5930, 5931, 5932, 5933 (AMO).
192 *Epidendrum motozintlensis* Hágsater & L.Sánchez. Epiphyte. Soto *et al.* 3225 (AMO, MEXU), Breedlove 31860 (AMES, CAS), Hágsater 8080 (AMO), Nagel sub Oestlund 4315 (AMES), Soto 3223 (AMO).
193 *Epidendrum myrianthum* Lindl. Epiphyte. Matuda s.n. (MICH), Damon s.n. (hort. and photo).
194 *Epidendrum nelsonii* Hágsater. Epiphyte. Breedlove & Thorne 31101 (CAS).
195 *Epidendrum parkinsonianum* Hook. Epiphyte. Soto *et al.* 1749 (AMO), Soto & López 9092 (AMO).
196 *Epidendrum polyanthum* Lindl. Epiphyte or rupicolous. Soto *et al.* 3466 (AMO), Espejo & López 3974 (UAMIZ), Jiménez *et al.* 147 (OAX), 152 (OAX, ECOSUR-TAP) 153 (OAX).
197 *Epidendrum polychromum* Hágsater. Epiphyte. Soto 5814 (AMO), Soto *et al.* 3226 (AMO).
198 *Epidendrum pseudoramosum* Schltr. Epiphyte. Martínez *et al.* 19997 (MEXU), Martínez & Stevens 23829 (MEXU, MO), Martínez, *et al.* 20738 (MEXU).
199 *Epidendrum radicans* Pav. ex. Lindl. Terrestrial or rupicolous. Soto *et al.* 1679 (AMO), Calzada *et al.* 3735 (ENCB, MEXU, XAL), Ventura & López 3592 (MEXU), Matuda 379 (MEXU), Matuda 2436 (MEXU), Jiménez *et al.* 250 (ECOSUR-TAP, OAX).
200 *Epidendrum radioferens* (Ames, F.T.Hubb. & C.Schweinf.) Hágsater. Epiphyte or rupicolous. Soto & López 9091 (AMO), Soto *et al.* 7006 (AMO).
201 *Epidendrum ramosum* Jacq. Epiphyte. Soto *et al.* 1680 (AMO), Nagel sub Oestlund 4355 (AMES, AMO, BM, CAS, F, MO, SEL, US), Nagel sub Oestlund 4523 (BM, MO), Ventura &

Appendix 1. Continuation.

López 1110 (ENCB, MEXU), Jiménez *et al*. 172 (OAX, ECOSUR-TAP), 228 (OAX, ECOSUR), 244 (ECOSUR-TAP).

202 *Epidendrum repens* Cogn. Epiphyte. Soto *et al*. 1775, 1776, 1777, 1778, 1926, 1928 (AMO), Soto *et al*. 6642 (AMO), Soto 8317 (AMO), Breedlove 31030 (DH), Martínez *et al*. 20006 (MEXU), Martínez *et al*. 22482 (MEXU).

203 *Epidendrum roseoscriptum* Hágsater. Epiphyte. A specimen seen in rustic culture in the study area.

204 **Epidendrum sobralioides* Ames & Correll (**A**). Epiphyte. Jiménez *et al*. 96 (OAX).

205 *Epidendrum* undetermined. Epiphyte. Damon s.n. (hort. and photo). This plant seems to be a natural hybrid between species belonging to the *Epidendrum arbuscula* complex.

206 *Epidendrum stamfordianum* Bateman. Epiphyte. Matuda 2057, 17090 (MEXU), Soto *et al*. 1688 (AMO), Soto *et al*. 3502, 3503, 3504 (AMO), Soto 8287, 8340 (AMO), Breedlove & Almedo 47677 (CAS), Calzada *et al*. 3769 (ENCB).

207 *Epidendrum tacanaense* Hágsater, Soto Arenas & E.Santiago. Epiphyte. Martínez 14094 (MEXU), Soto *et al*. 3443 (AMO, AMES, MEXU).

208 *Epidendrum trachytece* Schltr. Epiphyte. Breedlove & Thorne 31040 (CAS).

209 *Epidendrum trianthum* Schltr. Epiphyte. Soto 8275 (AMO), Damon s.n. (hort. andphoto).

210 *Epidendrum veroscriptum* Hágsater. Epiphyte or rupicolous. Soto *et al*. 1702, 1868, 1869 (AMO), Nagel sub Oestlund 4402 (AMES), Martínez 20575 (MEXU).

211 *Epidendrum verrucipes* Schltr. Epiphyte. Soto 8279 (AMO).

212 *Epidendrum verrucosum* Sw. Epiphyte. Matuda 2506 (MEXU), Matuda 2538, 2539 (MEXU).

213 *Epidendrum wendtii* Hágsater & Salazar. Epiphyte. Soto & Martínez 6119 (AMO).

Guarianthe Dressler & W. E.Higgins (2)

214 *Guarianthe aurantiaca* (Bateman ex Lindl.) Dressler & W.E.Higgins. Epiphyte or rupicolous. Matuda 6034 (TEX), Soto *et al*. 3501, 3535 (AMO), Soto 8288, 8333, 9085 (AMO), Soto *et al*. 1687 (AMO), Salazar 1874 (AMO), Salazar *et al*. 1874 (AMES, AMO, BR, CAS, ENCB, FCME, IBUG, K, MEXU, MO, NY, UC), Croat 47213 (MO), Ramírez-Arriaga s.n (MEXU), López & Ventura 1056 (MEXU, TEX), Ventura & López 415 (CHAPA, ENCB), Martínez & Reyes 20341 (MEXU, TEX), Martínez *et al*. 19880 (MEXU), Espejo 2251 (MEXU, UAMIZ).

215 **Guarianthe skinneri* (Bateman) Dressler & W.E.Higgins (**A**). Epiphyte or rupicolous. Soto *et al*. 7010, 7034, 7042 (AMO), Soto 9084 (AMO), Martínez *et al*. 19910 (MEXU), Ventura & López 939 (ENCB, MEXU).

Homalopetalum Rolfe (1)

216 *Homalopetalum pumilio* (Rchb.f.) Schltr. Epiphyte. Nagel sub Oestlund 4310 (AMES).

Jacquiniella Schltr. (1)

217 *Jacquiniella cobanensis* (Ames & Schltr.) Dressler. Epiphyte. Jiménez *et al*. 247 (OAX, ECOSUR-TAP), Damon s.n. (hort.).

Laelia Lindl. (2)

218 *Laelia rubescens* Lindl. Epiphyte, occasionally rupicolous. Soto 8320 (AMO).

219 **Laelia superbiens* Lindl. (**A**). Epiphyte. Soto 9088 (AMO).

Meiracyllium Rchb. f. (1)

220 *Meiracyllium trinasutum* Rchb.f. Epiphyte. Matuda 18154 (MEXU), Soto *et al*. 1745 (AMO), Soto 8319, 8324 (AMO).

Nidema Britton & Millsp. (1)

221 *Nidema boothii* (Lindl.) Schltr. Epiphyte. Matuda 4407 (MEXU), Martínez 20589 (MEXU, CHAPA).

Oestlundia W.E.Higgins (1)

222 *Oestlundia luteorosea* (A.Rich. & Galeotti) W.E.Higgins. Epiphyte. Soto *et al*. 7014, 7020 (AMO).

Prosthechea Knowles & Westc. (12)

223 *Prosthechea baculus* (Rchb.f.) W.E.Higgins. Epiphyte. Matuda 1858 (MEXU), Matuda s.n. (MEXU), Soto *et al*. 1732 (AMO), Soto 8274, 8338 (AMO).

224 *Prosthechea brassavolae* (Rchb.f.) W.E.Higgins. Epiphyte, sometimes rupicolous. Matuda 2537 (MEXU), Damon 18, 239, 243, 720 (ECOSUR-TAP).

225 *Prosthechea chacaoensis* (Rchb.f.) W.E.Higgins. Epiphyte. Oestlund sub Nagel 4860 (MEXU), Matuda 1013 (MEXU), Matuda 17621, 17646 (MEXU), Soto *et al*. 1691 (AMO), Martínez *et*

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al. 20717 (CHAPA, MEXU), Ventura & López 1548 (MEXU, UAMIZ), Espejo *et al*. 2346 (UAMIZ), Jiménez *et al*. 226 (OAX).

226 *Prosthechea chondylobulbon* (A.Rich. & Galeotti) W.E.Higgins. Epiphyte, sometimes rupicolous. Damon 221 (ECOSUR-TAP).

227 *Prosthechea cochleata* (L.) W.E.Higgins. Epiphyte. Matuda 28627 (MEXU).

228 *Prosthechea glauca* Knowles & Westc. Epiphyte. Damon s.n. (hort.).

229 *Prosthechea livida* (Lindl.) W.E.Higgins. Epiphyte, sometimes rupicolous. Damon s.n. (hort.).

230 *Prosthechea maculosa* (Ames, F.T.Hubb. & C.Schweinf.) W.E.Higgins. Epiphyte. Breedlove 31668, 69136 (CAS, MO), Breedlove & Almeda 47657 (CAS), Cabrera-Chacón 26 (CHIP), Matuda 4406, 18796 (MEXU), Damon s.n. (hort. and photo).

231 *Prosthechea ochracea* (Lindl.) W.E.Higgins. Epiphyte. Breedlove 68867 (MEXU), Soto & Martínez 5791, 5792, 5809, 5810, 5811 (AMO), Soto *et al*. 1773, 1810, 1811 (AMO), Soto & López 9097, 9100 (AMO), Soto *et al*. 7022, 7026, 7035 (AMO), Soto 8284 (AMO), Utley & Utley 6812 (MEXU), Martínez *et al*. 19563 (MEXU), Martínez *et al*. 20511 (MEXU), Espejo 2301 (ENCB, UAMIZ), Matuda 378, 1722, 1768, 1810, 18153, 28543 (MEXU), Téllez 6963 (MEXU), Jiménez *et al*. 222, 289 (ECOSUR-TAP, OAX).

232 *Prosthechea radiata* (Lindl.) W.E.Higgins. Epiphyte. Matuda 4399 (MEXU), Soto *et al*. 1733 (AMO), Gálvez Chang s.n (ECOSUR-TAP), Ventura & López 1548 (ENCB).

233 *Prosthechea varicosa* (Lindl.) W.E.Higgins. Epiphyte. Breedlove 29447, 66107 (MEXU), Matuda 1954, 2387, 4084 (MEXU), Miller 2644 (MEXU), Soto *et al*. 3446 (AMO), 3447 (AMO), 3448, 3449 (AMO), Soto & Martínez 5843, 5845, 5846, 5847, 5848 (AMO), Soto *et al*. 6657 (AMO), Soto 8299 (AMO), van Ufford 319 (U), Miller *et al*. 2644 (AMO, MEXU), Martínez *et al*. 19615, 19587 (MEXU), Martínez *et al*. 20505 (MEXU), Jiménez *et al*. 141, 148 (ECOSUR-TAP), 140, 142, 161 (OAX).

234 **Prosthechea vitellina* (Lindl.) W.E.Higgins (**Pr**). Epiphyte. Matuda 5441 (MEXU).

Scaphyglottis Poepp. & Endl. (4)

235 *Scaphyglottis crurigera* (Bateman ex Lindl.) Ames & Correll. Epiphyte. Soto 8330 (AMO), Velázquez 60 (MEXU), Damon s.n. (hort. and photo).

236 *Scaphyglottis fasciculata* Hook. Epiphyte. Matuda 1918 (ARIZ), Soto 8328 (AMO).

237 *Scaphyglottis hondurensis* (Ames) L.O.Williams. Epiphyte. Martínez-Meléndez 1343 (HEM).

238 *Scaphyglottis lindeniana* (A.Rich.& Galeotti) L.O.Williams. Epiphyte. Breedlove 41698A (DH).

Subtribe Pleurothallidinae Lindl. ex G.Don (11)

Acianthera Scheidw. (4)

239 *Acianthera circumplexa* (Lindl.) Pridgeon & M.W.Chase. Epiphyte. Soto & López 9096 (AMO), Soto *et al*. 1806 (AMO), Soto & Martínez 5946 (AMO), Martínez *et al*. 22484 (MEXU).

240 *Acianthera herrerae* (Luer) Solano & Soto Arenas. Epiphyte. Suárez 4758 (specimen cultivated in La Encantada Orchid Garden, Oaxaca), Damon s.n. (hort.).

241 *Acianthera sotoana* Solano. Epiphyte. Damon s.n. (hort.).

242 **Acianthera violacea* (A.Rich. & Galeotti) Pridgeon & M.W.Chase. (**Pr**). Epiphyte. Damon (hort.).

Anathallis Barb.Rodr. (1)

243 **Anathallis abbreviata* (Schltr.) Pridgeon & M.W.Chase (**Pr**). Epiphyte. Jiménez *et al*. 272 (OAX).

Lepanthes Sw. (11)

244 *Lepanthes acuminata* Schltr. Epiphyte. Jiménez *et al*. 130, 132, 175, 252, 267, 268, 269, 270, 315 (OAX), 131, 176, 264, 265, 266 (ECOSUR-TAP).

245 *Lepanthes appendiculata* Ames. Epiphyte. Soto & Martínez 6158 (AMO).

246 *Lepanthes excedens* Ames & Correll. Epiphyte. Jiménez *et al*. 314, 309, 316 (OAX), 308 (ECOSUR-TAP), Martínez-Meléndez 5054 (HEM).

247 *Lepanthes lenticularis* Luer & Béhar. Epiphyte. Martínez *et al*. 13232 (ENCB, MEXU).

248 *Lepanthes matudana* Salazar & Soto Arenas. Epiphyte. Soto *et al*. 7079, 7062 (AMO), Soto & Martínez 5853, 6096, 6097, 6142 (AMO), Jiménez *et al*. 304 (ECOSUR-TAP), 305 (OAX).

Appendix 1. Continuation.

249 *Lepanthes motozintlensis* Salazar & Soto Arenas. Epiphyte. Soto & Martínez 5948, 6198 (AMO), Jiménez *et al*. 104 (ECOSUR-TAP), 105, 317 (OAX).

250 *Lepanthes oreocharis* Schltr. Epiphyte. Matuda 1688 (MEXU), Soto *et al*. 6662, 6663, 6664, 6665, 6667, 6668, 6669, 7051, 7052, 7053, 7054, 7055, 7057, 7060, 7061, 7078, 7080, 7082 (AMO), Soto 9067, 9068, 9069, 9070, 9071 (AMO), Soto & Martínez 5852, 5862, 5863, 6030, 6081, 6082, 6083, 6085, 6086, 6087, 6088, 6089, 6098, 6096, 6099, 6100, 6110, 6111, 6112, 6113, 6114, 6115, 6116, 6117, 6125, 6126, 6127, 6128, 6129, 6131, 6132, 6133, 6134, 6135, 6136, 6137, 6138, 6139, 6140, 6141, 6149, 6150, 6155, 6156, 6157 (AMO).

251 *Lepanthes scopula* Schltr. Epiphyte. Martínez-Meléndez 1197 (HEM).

252 *Lepanthes tecpanica* Luer & Béhar. Epiphyte. Soto & Martínez 5943, 5944 (AMO), Jiménez *et al*. 190, 306, 313 (OAX), 307 (ECOSUR-TAP).

253 *Lepanthes tenuiloba* R.E.Schult. & G.W.Dillon. Epiphyte. Soto & Martínez 5872, 5873, 5874, 5875, 5877, 5880, 5888, 5889, 5890, 5891, 6084, 6108, 6109, 6151, 6153, 6154 (AMO), Jiménez *et al*. 302, 318 (OAX), 303 (ECOSUR-TAP), Martínez-Meléndez 5985 (HEM).

254 *Lepanthes williamsii* Salazar & Soto Arenas. Epiphyte. Soto & Martínez 5936, 6171, 6172, 6179, 6180, 6181, 6189, 6193, 6195, 6196 (AMO).

Masdevallia Ruiz & Pav. (1)

255 *Masdevallia tuerckheimii* Ames. Epiphyte. Damon & Pérez 236, 252 (ECOSUR-TAP).

Platystele Schltr. (4)

256 *Platystele minimiflora* (Schltr.) Garay. Epiphyte. Damon s.n. (hort. and photo).

257 *Platystele ovalifolia* (Focke) Garay & Dunst. Epiphyte. Mondragón & Maldonado 115 (OAX), Damon s.n. (hort. and photo).

258 *Platystele ovatilabia* (Ames & C.Schweinf.) Garay. Epiphyte. Damon 15 (ECOSUR-TAP), Martínez-Meléndez 5436 (HEM).

259 *Platystele stenostachya* (Rchb.f.) Garay. Epiphyte. Damon 193, 288 (ECOSUR-TAP).

Pleurothallis R. Br. (8)

260 *Pleurothallis cardiothallis* Rchb.f. Epiphyte. Jiménez *et al*. s.n. (hort. and photo).

261 *Pleurothallis correllii* Luer. Epiphyte. Martínez *et al*. 19406 (HEM), Jiménez *et al*. s.n. (hort. and photo).

262 *Pleurothallis leucantha* Schltr. Epiphyte. Damon 34, 59, 92, 98, 109, 138, 156, 453, 762 (ECOSUR-TAP).

263 *Pleurothallis matudana* C.Schweinf. Epiphyte. Matuda 1577 (TEX), Matuda 2395, 3991 (MEXU), Soto *et al*. 1813, 1814, 1815, 1816, 1817, 1818 (AMO), Soto & Martínez 5960, 5962, 6102 (AMO), Soto 3062, 8316 (AMO), Fernández-Nava 3531 (ENCB), Jiménez *et al*. 95 (OAX), 149 (OAX, ECOSUR-TAP), Martínez 19406, 22518, 22486 (MEXU), Martínez 19989 (MEXU, TEX), Martínez 23828 (MEXU, TEX).

264 **Pleurothallis nelsonii* Ames (**Pr**). Epiphyte. Soto *et al*. 1700 (AMO), Soto *et al*. 3462, 3463 (AMO), Soto 8278 (AMO), Nagel sub Oestlund 4302 (AMO), Martínez & García 22156 (AMO, IEB, TEX), Espejo *et al*. 2272 (UAMIZ), Jiménez *et al*. 93, 209, 248 (OAX, ECOSUR-TAP), 99 (OAX).

265 *Pleurothallis pansamalae* Schltr. Epiphyte. Damon 69, 292, 713 (ECOSUR-TAP).

266 *Pleurothallis quadrifida* (Llave & Lex.) Lindl. Epiphyte. Matuda 6163 (MEXU, TEX), Soto 8329 (AMO), Damon s.n. (hort. and photo).

267 **Pleurothallis saccatilabia* C.Schweinf. (**Pr**). Epiphyte. Matuda 2546 (MEXU), Damon 286, 420, 721 (ECOSUR-TAP).

Restrepia Kunth (2)

268 *Restrepia muscifera* (Lindl.) Rchb.f. ex Lindl. Epiphyte. Soto 8289 (AMO).

269 **Restrepia trichoglossa* F.Lehm. ex Sander (**A**). Epiphyte. Soto *et al*. 3408 (AMO), Jiménez *et al*. 173 (OAX), 174 (ECOSUR-TAP), 271 (ECOSUR, OAX).

Restrepiella Garay & Dunst. (1)

270 *Restrepiella ophiocephala* (Lindl.) Garay & Dunst. Epiphyte. Matuda 2083 (MEXU), Matuda 6056 (MEXU, TEX), Pérez-Calix 61 (MEXU).

Specklinia Lindl. (8)

271 *Specklinia brighamii* (S.Watson) Pridgeon & M.W.Chase. Epiphyte. Martínez & Téllez 13347 (MEXU), Damon s.n. (hort. and photo).

Appendix 1. Continuation.

272 *Specklinia fuegi* (Rchb.f.) Solano & Soto Arenas. Epiphyte. Soto *et al*. 3397 (AMO), Fernández-Nava 3533 (MEXU), Martínez *et al*. 22487 (MEXU), Jiménez *et al*. 100, 101, 273 (ECOSUR-TAP), 102, 103, 274, 275 (OAX), Martínez-Meléndez 6044 (HEM).

273 **Specklinia glandulosa* (Ames) Pridgeon & M.W.Chase (**Pr**). Epiphyte. Matuda 2532 (MEXU), Damon s.n. (hort. and photo).

274 **Specklinia lateritia* (Rchb.f.) Pridgeon & M.W.Chase (**Pr**). Epiphyte. Gálvez-Chang s.n (ECOSUR-TAP), Jiménez *et al*. 239 (OAX), 240 (ECOSUR-TAP), Matuda 28541 (MEXU), Damon s.n. (hort. and photo).

275 *Specklinia marginata* (Bateman ex Lindl.) Pridgeon & M.W.Chase. Epiphyte. López-Molina 595 (HEM, MO), Martínez-Meléndez 975 (HEM).

276 *Specklinia segregatifolia* (Ames & C.Schweinf.) Solano & Soto Arenas. Epiphyte. Damon s.n. (hort. and photo).

277 **Specklinia spectabilis* (Ames & C.Schweinf.) Pupulin & Karremas (**Pr**). Epiphyte. Martínez-Meléndez 1563 (HEM), Matuda 2533 (MEXU), Pérez-Castillo 85 (HEM). Correct name for the species previously known in Mexico as *Specklinia endotrachys* (Rchb.f.) Pridgeon & M.W.Chase.

278 *Specklinia tribuloides* (Sw.) Pridgeon & M.W.Chase. Epiphyte. Martínez 15663 (MEXU), Reyes-Escobar 20 (HEM).

Stelis Sw. (17)

279 *Stelis annedamoniae* Solano. Epiphyte. Damon s.n. (AMO, OAX), Damon s.n. (OAX).

280 *Stelis deregularis* Barb.Rodr. Epiphyte. Damon s.n. (hort. and photo).

281 *Stelis emarginata* (Lindl.) Soto Arenas & Solano. Epiphyte. Cabrera Chacón 91 (MEXU), Matuda s.n (MEXU).

282 *Stelis greenwoodii* Soto Arenas & Solano. Epiphyte. Damon s.n. (photo).

283 *Stelis hagsaterii* Solano. Epiphyte. Damon s.n. (OAX), Damon s.n. (hort. and photo).

284 *Stelis hymenantha* Schltr. Epiphyte, sometimes terrestrial. Matuda 1649 (ARIZ, TEX), Matuda 2398 (TEX), Soto *et al*. 1825, 1812 (AMO), Soto *et al*. 3432 (AMO), Salazar 5177 (AMO, ENCB, UAMIZ), Soto 8300 (AMO), Martínez & Stevens 23834 (MEXU), Martínez *et al*. 20005 (AMO, IEB, TEX), Martínez *et al.* 1987 (MEXU), Martínez *et al.* 22475 (MEXU), Martínez *et al*. 13266 (MEXU), Fernández Nava 3532 (MEXU), Matuda s.n. (MEXU), Jiménez *et al*. 97, 108, 126, 128, 196 (OAX), 106, 107, 127, 129 (ECOSUR-TAP), 139, 249, 254, 256 (ECO SUR-TAP, OAX).

285 *Stelis lamprophylla* (Schltr.) Karremans. Epiphyte. Soto *et al*. 1703 (AMO), Soto *et al*. 3430, 3431, 3456,3457,3458, 3459, 3460, 3461 (AMO), Soto & Martínez 5822, 5823, 5824, 5825, 5826, 5827, 5828, 5965, 6103, 6104, 6105 (AMO), Soto *et al.* 6641 (AMO), Soto 9076 (AMO), Espejo *et al.* 3975 (UAMIZ), Matuda 5407 (MEXU, TEX), Martínez *et al*. 20495 (MEXU) Martínez 20661 (MEXU) Jiménez *et al*. 145, 195 (OAX), 259, 281 (OAX, ECOSUR-TAP), 300 (ECOSUR-TAP), Martínez-Meléndez 5946 (HEM). Substitute name for the species formerly known as *Anathallis dolichopus* (Schltr.) Pridgeon & M.W.Chase (= *Pleurothallis dolichopus* Schltr.), because the combination of it in *Stelis* is not was available by the prior existence of *Stelis dolichopus* Schltr.

286 *Stelis megachlamys* (Schltr.) Pupulin. Epiphyte. Matuda 5991 (TEX), Nagel sub Oestlund 4309 (AMO, AMES), Damon s.n. (hort. and photo).

287 *Stelis nicaraguensis* (Liebm.) Solano & Soto Arenas. Epiphyte. Matuda 17429 (MEXU), Martínez 22579-A (MEXU).

288 *Stelis ovatilabia* Schltr. Epiphyte. Soto & Martínez 5864, 5865, 5866, 5867, 5869, 5876, 5879 (AMO), 5878 (AMO, K), 5886 (AMES, AMO, UAMIZ), 5889 (AMO, NY), Soto *et al*. 6634, 6643, 6644, 6645, 6646, 6647, 6648, 6656, 6659, 7065, 7068, 7069, 7074 (AMO), Soto 8301, 9072, 9073 (AMO), Soto *et al*. 3487 (ENCB), Solano & Soto 391 (AMO), Miller *et al*. 2657 (AMO, CHIP, MO, UAMIZ), Martínez *et al*. 20783 (MEXU), Martínez 2085, 20537, 20657 (MEXU), Martínez *et al*. 20494 (CHAPA, MEXU), Martínez *et al*. 13231 (MEXU), Matuda 4320 (TEX), Matuda 5365 (MEXU, TEX), Jiménez *et al*. 112, 257, 258, 282 (ECOSUR-TAP, OAX), 169, 301, 311 (OAX), 288, 310 (ECOSUR-TAP), Damon s.n. (hort. and photo).

289 *Stelis pachyglossa* (Lindl.) Pridgeon & M.W.Chase. Epiphyte. Damon s.n. (hort. and photo).

Appendix 1. Continuation.

290 *Stelis punctulata* (Rchb.f.) Soto Arenas. Epiphyte. Soto & Martínez 5793, 5800, 6160 (AMO).
291 *Stelis soconuscana* Solano. Epiphyte. Jiménez *et al*. 251 (AMO, MEXU, OAX), 262 (ECOSUR-TAP), 263 (OAX), Solano 2561 (OAX).
292 *Stelis tacanensis* Solano & Soto Arenas. Epiphyte. Soto *et al*. 1701-A (AMO), Salazar *et al*. 2939 (AMO, K, MEXU, MO), Martínez 20735 (AMO, IEB), Cabrera 90, 91 (MEXU), Jiménez *et al*. 210 (OAX).
293 *Stelis tenuissima* Schltr. Epiphyte. Matuda 4313 (TEX), Soto 8281 (AMO), Martínez *et al*. 20742 (MEXU), Jiménez *et al*. 202 (OAX), 203 (ECOSUR-TAP).
294 *Stelis vespertina* Solano & Soto Arenas. Epiphyte. Matuda 2388, 3972 (MEXU), Martínez 14068 (MEXU), Soto *et al*. 1787, 1788, 1790, 1772 (AMO), Soto *et al*. 3144, 3401, 3438 (AMO), Soto 8296A, 8297 (AMO), Soto s.n (AMO, SEL), Jiménez *et al*. 197 (ECOSUR-TAP, OAX), 204 (ECOSUR-TAP), 205, 211 (OAX).
295 *Stelis villosa* (Knowles & Westc.) Pridgeon & M.W.Chase. Epiphyte. Soto 9074, 9075 (AMO), Soto & Martínez 5831, 5832, 5833, 5834, 5835, 5836, 5837, 5838, 5839, 5840, 5841, 6118A, 6122, 6123, 6124, 6144, 6147, 6148 (AMO), Jiménez *et al*. 94 (ECOSUR-TAP, OAX), 111 (OAX), 133 (ECOSUR-TAP), 144 (OAX, ECOSUR-TAP), 283 (OAX), 298 (ECOSUR-TAP), 299 (OAX), 205 (OAX).

Trichosalpinx Luer (3)
296 *Trichosalpinx blaisdellii* (S.Watson) Luer. Epiphyte. Damon s.n. (hort. and photo).
297 *Trichosalpinx memor* (Rchb.f.) Luer. Epiphyte. Soto 1842, 1843 (AMO), Soto *et al*. 3386, 3387, 3388, 3389, 3390, 3391, 3392, 3393, 3394 (AMO), Soto *et al*. 6651 (AMO), Martínez *et al*. 19994 (IEB), Soto *et al*. 6649, 6650, 6652, 6653 (AMO), Martínez *et al*. 22485 (MEXU, TEX), Martínez & Stevens 23827 (MEXU, TEX), Martínez & Márquez 19994 (MEXU, TEX), Jiménez *et al*. 156 (OAX).
298 *Trichosalpinx pringlei* (Schltr.) Luer. Epiphyte. Soto *et al*. 1769 (AMO).

Subtribe Ponerinae Pfitzer (3)
Helleriella A.D.Hawkes (1)
299 *Helleriella nicaraguensis* A.D.Hawkes. Epiphyte or rupicolous. Soto & Martínez 5805 (AMO).

Isochilus R.Br. (5)
300 *Isochilus alatus* Schltr. Epiphyte. Martínez *et al*. 20767 (MEXU), Jiménez *et al*. 98 (OAX), Jiménez *et al*. 113 (ECOSUR-TAP), 114 (OAX), Nagel sub. Oestlund 4376 (AMES, SEL).
301 *Isochilus aurantiacus* Hamer & Garay. Epiphyte. Soto & Martínez 5887, 6152, 6146 (AMO), Soto *et al*. 6660, 6661 (AMO), Martínez, *et al*. 14107 (MEXU), Martínez 20553 (MEXU), Fernández Nava 3530 (ENCB), Jiménez *et al*. 295 (OAX, ECOSUR-TAP).
302 *Isochilus carnosiflorus* Lindl. Epiphyte. Damon 154 (ECOSUR-TAP).
303 *Isochilus chiriquensis* Schltr. Epiphyte. Soto *et al*. 3548 (AMO), Martínez & Stevens 23811 (MEXU), Martínez *et al*. 20739 (MEXU).
304 *Isochilus latibracteatus* A.Rich. & Galeotti. Epiphyte. Jiménez *et al*. 232 (OAX, ECOSUR-TAP), Jiménez *et al*. 312 (ECOSUR-TAP).

Nemaconia Knowles & Westc. (3)
305 *Nemaconia glomerata* (Correll) van den Berg, Salazar & Soto Arenas. Epiphyte. Martínez *et al*. 22458 (MEXU).
306 **Nemaconia pellita* (Rchb.f.) van den Berg, Salazar & Soto Arenas (Pr). Epiphyte. Soto & Martínez 5802 (AMO), Soto & López 9098, 9099, 9103 (AMO).
307 *Nemaconia striata* (Lindl.) van den Berg, Salazar & Soto Arenas. Epiphyte. Damon 168 (ECOSUR-TAP), Jiménez *et al*. s.n. (hort.).

Tribe Malaxideae (2)
Subtribe Dendrobiinae (1)
Bulbophyllum Thouars (2)
308 *Bulbophyllum oerstedii* (Rchb.f.) Hemsley. Epiphyte. Damon s.n. (hort.), Matuda 2055 (TEX).
309 *Bulbophyllum sordidum* Lindl. Epiphyte. Nagel 4368 (AMES), Damon s.n. (hort. and photo).

Appendix 1. Continuation.

Subtribe Malaxidiinae (1)
Malaxis Sol. ex Sw. (8)
310 *Malaxis brachyrrhynchos* (Rchb.f.) Ames. Terrestrial. Soto & Martínez 5820 (AMO), Utley & Utley 6819 (AMO).
311 *Malaxis carnosa* (Kunth.) C.Schweinf. Terrestrial. Matuda 373a (MEXU), Martínez 13265 MEXU).
312 *Malaxis corymbosa* (S.Watson) Kuntze. Terrestrial. Soto & Martínez 5818 (AMO).
313 *Malaxis histionantha* (Link, Klotzsch & Otto) Garay & Dunst. Terrestrial. Soto *et al.* 1713 (AMO), Jiménez *et al.* 163 (OAX).
314 *Malaxis lepanthiflora* (Schltr.) Ames. Terrestrial. Soto & Martínez 5819, 5959 (AMO), Soto *et al.* 7008 (AMO), Jiménez *et al.* 151, 201, 276, 278 (OAX), 277 (ECOSUR-TAP).
315 *Malaxis lepidota* (Finet) Ames. Terrestrial. Soto *et al.* 1718 (AMO).
316 *Malaxis majanthemifolia* Schltdl. & Cham. Terrestrial. Jiménez *et al*. 143 (OAX).
317 **Malaxis pandurata* (Schltr.) Ames (**Pr**). Terrestrial. Espejo 2258 (UAMIZ).

Tribe Sobralieae (2)
Elleanthus C.Presl. (1)
318 *Elleanthus cynarocephalus* (Rchb.f.) Rchb.f. Epiphyte, rupicolous or terrestrial. Matuda 2587, 4207, 4701 (TEX), Soto *et al*. 1785 (AMO), Soto *et al*. 3439 (AMO), Martínez *et al*. 19995 (MEXU), Martínez *et al.* 20484 (MEXU), Espejo & López-Ferrari 3962 (UAMIZ), Damon II (OAX, ECOSUR-TAP), Jiménez *et al*. 186, 253 (OAX, ECOSUR-TAP).
Sobralia Ruiz & Pav. (3)
319 *Sobralia decora* Bateman. Rupicolous or terrestrial. Gómez-Domínguez 1504 (HEM), Hernández-X. 495 (MEXU), Matuda 1734, 17034, 17864, 18663 (MEXU), Martínez-Camilo 673 (HEM), Pérez-Farrera 1607 (HEM).
320 *Sobralia macdougallii* Soto Arenas, Pérez-García & Salazar. Rupicolous or terrestrial. Matuda 5338 (MEXU), Velázquez-Martínez 84 (HEM).
321 *Sobralia macrantha* Lindl. Epiphyte, sometimes rupicolous. Breedlove 51474 (MEXU), Cabrera-Chacón 104 (MEXU), Heath 1048 (MEXU), Jiménez *et al.* 208 (ECOSUR-TAP, OAX), 260 (OAX). Martínez-Meléndez 1881 (HEM), Reyes-Escobar 44 (HEM).

Tribe Vandeae (2)
Subtribe Angraecinae Summerh. (2)
Campylocentrum Bentham (2)
322 *Campylocentrum micranthum* (Lindl.) Rolfe. Epiphyte. Matuda 2743, 16833 (MEXU), Mondragón & Maldonado 105 (OAX), Ventura & López 402 (UAMIZ, ENCB), Jiménez *et al.* 223 (OAX).
323 *Campylocentrum microphyllum* Ames & Correll. Epiphyte. Jiménez *et al*. 242 (OAX, ECOSUR-TAP).
Dendrophylax Rchb. f. (1)
324 *Dendrophylax porrecta* (Rchb.f.) Carlsward, Whitten & N.H.Williams. Epiphyte. Matuda 18674 (MEXU).

Subtribe Polystachyinae Schltr. (1)
Polystachya Hook (1)
325 *Polystachya cerea* Lindl. Epiphyte. Espejo *et al*. 2338 (AMO, UAMIZ), Ventura & López 403 (ENCB, UAMIZ), Jiménez *et al.* 225 (ECOSUR-TAP), 227 (OAX), Damon s.n. (hort. and photo).