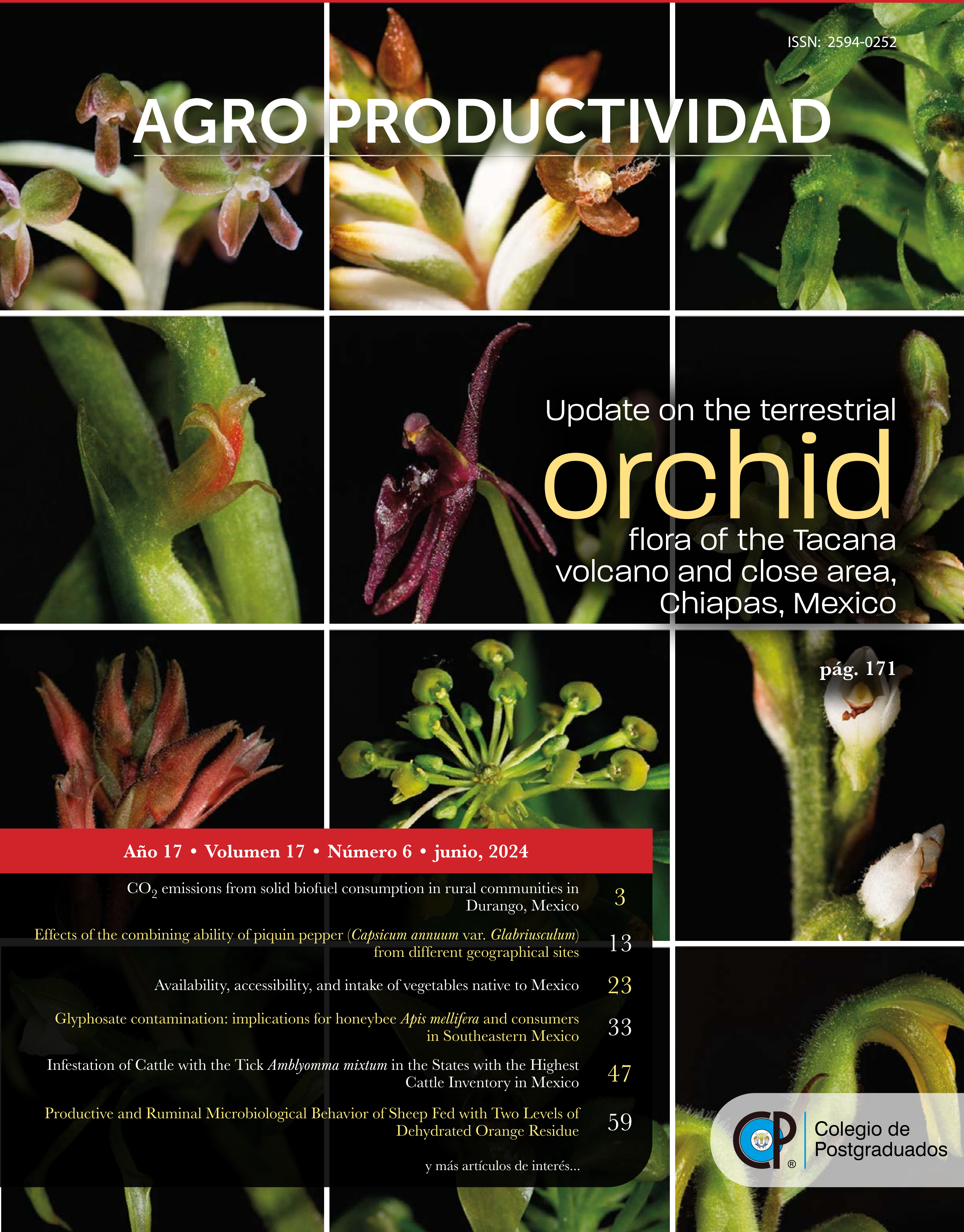

ISSN: 2594-0252

AGRO PRODUCTIVIDAD

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Año 17 • Volumen 17 • Número 6 • junio, 2024

Colegio de Postgraduados

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Update on the terrestrial orchid flora of the Tacana volcano and close area, Chiapas, Mexico

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ABSTRACT
Objective: To assess the number of terrestrial orchid species on the Tacaná volcano, Chiapas, and to empirically observe distribution/elevation patterns and ecological conditions.
Design/Methodology/Approach: Random line transect sampling, over two years, for a total of 8 sites, each starting from the vicinity of rural villages. Samples were deposited in the CICY herbarium and analysed using dichotomous keys and field photographs. New records were compared with the GBIF data distribution.
Results: 52 different taxa have been identified. 24 species are new records for the Soconusco region, where the Tacaná volcano is located. In this way, the Soconusco region becomes the richest Mexican region for the number of orchid species, joining a total of 351 species.
Study Limitations/Implications: Building an accurate prediction model based on environmental and topographic variables could suggest microsites within the Tacaná Park that we have not visited for practical and technical reasons.
Findings/Conclusions: The total number of taxa in the Soconusco region increases to 351. Terrestrial orchids are not usually studied in depth in tropical places, but they are also important in the ecological balance of the natural site. A specific inventory could show more richness of tropical ecosystems.

Keywords: checklist, new botanical records, Orchidaceae, protected area, Soconusco.

Citation: Bertolini, V., Cetzal-Ix, W., Mó, E., Tamayo-Cen, I. (2024). Update on the terrestrial orchid flora of the Tacana volcano and close area, Chiapas, Mexico. *Agro Productividad*. https://doi.org/10.32854/agrop.v17i6.2897

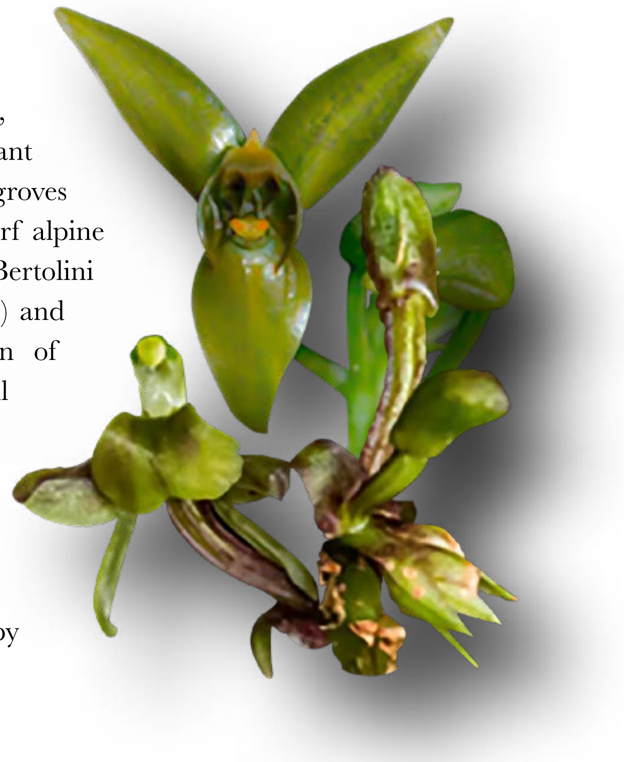
Academic Editor: Jorge Cadena Iñiguez
Guest Editor: Daniel Alejandro Cadena Zamudio

Received: February 06, 2024.
Accepted: May 07, 2024.
Published on-line: July 09, 2024.

Agro Productividad, 17(6). June. 2024. pp: 171-183.

INTRODUCTION

The Soconusco region of Chiapas, located on the Pacific slope of southeastern Mexico, is home to highly fertile soils and an important diversity of ecosystems, ranging from mangroves on the coast to tropical, temperate and dwarf alpine forests on the Tacaná volcano (4,092 m) (Bertolini *et al.*, 2016b). According to Rzedowski (1978) and Breedlove (1981), Soconusco has vegetation of tropical evergreen forest, mountain mesophyll forest, coniferous forest, *Quercus* forest and grasslands, and moor at the top. In addition, it has two priority terrestrial regions (Spanish acronym: RTP): El Triunfo-La Encrucijada-Palo Blanco (RTP 133) and Tacaná-Boquerón (RTP 135), set up by



the National Commission for the Use and Conservation of Biodiversity (CONABIO), and three biosphere reserves: Volcán Tacaná, La Encrucijada and El Triunfo, catalogued by the National Commission of Protected Areas (CONANP) (Arriaga *et al.*, 2000; Damon, 2013). The orographic-environmental heterogeneity of the area is suitable for a wide variety of ecosystems-ecological niches that allow for an important biodiversity. Soconusco, part of the Sierra Madre de Chiapas (SMC), has been the subject of research for about eight decades, with explorations by renowned botanists such as Matuda (1950a, 1950b), Miranda (1953) and Breedlove (1981, 1986). Recently, the SMC's floristic knowledge has been enhanced by botanists from various national institutions, with a focus on protected areas such as El Triunfo (Long y Heath, 1991; Williams, 1991; López-Molina, 2000; Pérez-Farrera, 2004; Pérez-Farrera y Miceli-Méndez, 2004; Pérez-Farrera *et al.*, 2012; Martínez-Meléndez *et al.*, 2008, 2009), La Frailesca (Bachem & Rojas, 1994) and La Sepultura (Castillo, 1996; Reyes-García, 2008).

In this sense, floristic knowledge is incomplete for areas such as the orographic system formed by Tacaná volcano and Cerro Boquerón, referred to here as the Tacaná-Boquerón region (RTB), which forms part of the Mesoamerican-Mexican Biological Corridor (CBMM). This corridor extends from the area of the great volcanoes of Guatemala and enters Mexico through the Sierra Madre de Chiapas, providing an important link between the reserves of the Tacaná volcano, El Triunfo, La Sepultura and La Encrucijada; la Selva del Ocote also maintains the unity of the protected natural areas of northeastern Chiapas, which extend into Guatemala through the Petén (CONABIO, 2024). The corridor allows the integration, continuity and conservation of biological and ecological processes of a Nearctic and Neotropical biota, as well as elements that probably originated in Mesoamerica (Mittermeier *et al.*, 1999). The RTB represents an environmental gradient (50 km long) from sea level on the Pacific coast to the summit of the Tacaná volcano, with variations in soil types, climates, plant communities and agro-ecosystems, and therefore a high biological richness, which is a priority for conservation in Mexico (Arriaga *et al.*, 2000). However, the lowland and intermediate areas of the RTB are affected by severe deforestation, intensive and extensive agricultural and livestock farming practices, increasing human population, poor road construction techniques and the effects of climate change (Arriaga *et al.*, 2000; Soto Arenas *et al.*, 2007a, 2007b; Challenger *et al.*, 2010). In addition, their highly fragmented habitats, with little continuity between forest remnants and loss of transition zones, affect the local flora and fauna of the areas concerned, increasing possible local extinctions (personal observation).

The Orchidaceae are one of the most charismatic groups of the Chiapas flora due to their great biological and ecological diversity. It has an estimated richness of 723 species (Beutelspacher and Moreno, 2018), more than half of the richness reported for Mexico, which is approximately 1,200-1,300 species (Hágsater *et al.*, 2005; Villaseñor, 2016). Chiapas occupies the first places of orchid diversity in Mexico (Damon, 2010) and Soconusco contributes an important part of its diversity: its geographical location is strategic for the connectivity of biodiversity of North and South America. Floristic studies of orchids in Chiapas are concentrated in protected areas such as La Lacandona (Soto Arenas, 1994), Montebello (Cabrera-Chacón, 2000; Soto Arenas, 2001), El Cañón del

Sumidero (Miceli *et al.*, 2009; Espinosa-Jiménez *et al.*, 2011), El Triunfo (Pérez-Farrera y Miceli-Méndez, 2004; Martínez-Meléndez *et al.*, 2009, 2011; Martínez-Camilo *et al.*, 2012) and la Selva del Ocote (Miceli, 2002; Moreno-Molina, 2010).

The RTB and adjacent areas have ideal abiotic conditions (such as diverse forest types) for Orchidaceae, considering the high presence of orchids (325 species) in the region, positioning it as the second richest in Mexico for Orchidaceae. (Solano *et al.*, 2016), second only to the area of El Momón-Las Margaritas-Montebello (Chiapas) with 333 especies (Soto-Arenas, 2001). Two new records have recently been reported for the site, *Svenkoeltzia congestifolia* (Orchidaceae) (Bertolini *et al.*, 2016a) and *Lockhartia hercodonta* (Orchidaceae) (Martínez-Meléndez *et al.*, 2017), total of 327 species for the RTB.

The following paper updates the knowledge of the terrestrial orchids of the Tacaná volcano. The scarce or non-existent information on terrestrial orchids from some parts of the area shows the great challenge of locating and identifying them, perhaps because most of them are tiny and seasonal.

MATERIALS AND METHODS

In 2016 and 2017, 102 specimens of terrestrial orchids were collected in the Tacana Volcano biosphere reserve. [licences SEMARNAT and CONANP y *Reserva de la Biosfera volcán Tacana*; files: SGPA/DGVS/04089/15, SGPA/DGGFS/712/4131/15 and REBIVTA /032/2015). 8 sites were sampled, four per year, using 1-3 random transects 5-8 km long and 4 m wide. 68 surveys were carried out, each lasting 4-6 hours. The 8 sites were located with the rural communities Peloponeso and Finca Perú Paris (municipality of Tapachula); Agua Caliente, Benito Juárez "El Plan", Milán and Santa María La Vega (municipality of Cacahoatán); Los Alpes and Chiquihuites (municipality of Unión Juárez) (Figure 1).

During the field trips, the habitat and its conservation were empirically assessed for future analysis. Collected samples were herbarised at the ECO-TA-H herbarium (Ecosur, Tapachula), 2 flowers per samples were preserved in a 90% alcohol solution of benzoic acid and glycerol. Blooms were photographed using a Sony alpha 37® camera and specimens were georeferenced using a Garmin GPS, Oregon 650®. The specimens were deposited in the CICY herbarium (*Centro de Investigación Científica de Yucatán, A.C.*).

RESULTS AND DISCUSSION

The 102 herbarium specimens were classified into 52 species of geophytic orchids (Table 1; Figure 2).

The altitudinal data show a higher frequency of species between 1,500 and 2,000 m a.s.l. with just over 30 species. On the other hand, between 2,000 and 2,500 m a.s.l. there were 20 species (Figure 3).

The highest number of specimens collected came from the villages of the municipality of Cacahoatán, with four different villages visited. The lowest number of specimens collected came from the municipality of Tapachula (Figure 4).

Habitats with the highest number of samples were from Tropical montane cloud forest (TMCF), coffee plantation (CP) and secondary forest (SF). Mood (M) and Pine forest (PF) were the poorest (Figure 5).

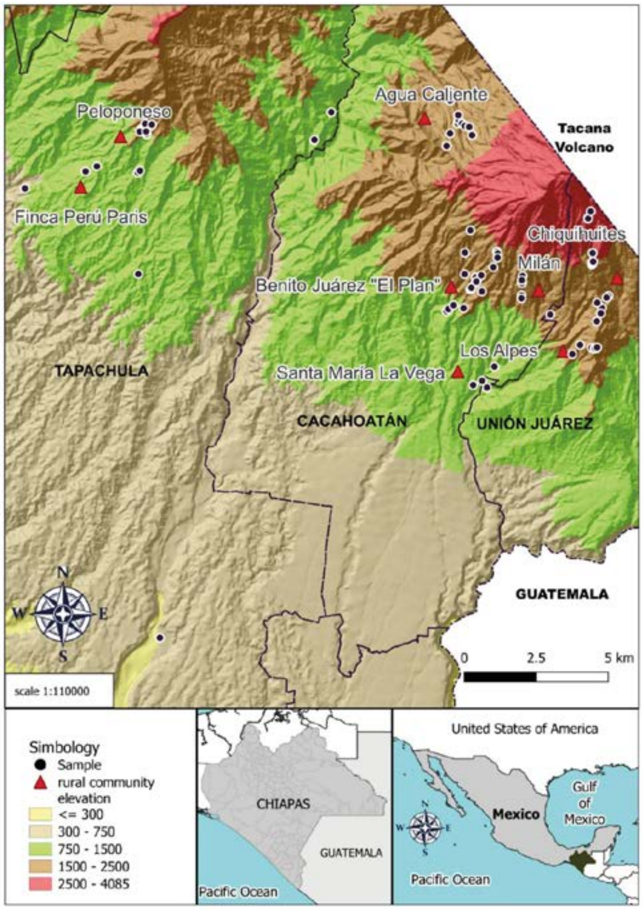


Figure 1. The location of sampled specimens: Tacaná volcano and the close area.

The empirical observations made on the state of conservation suggest that there is a degree of disturbance due to the anthropic impact of settlements and associated productive agricultural activities. The site we consider the best conserved is Agua Caliente, followed by Benito Juárez el Plan (both in Cacahoatán), and the least conserved is Chiquihuites (Unión Juárez), because we have observed microsites with high levels of disturbance and soil erosion due to logging.

These results show that ten of the records are novel for the state of Chiapas compared to previous estimates (Villaseñor *et al.*, 2016). In addition, 24 records are new for the study area compared with Solano *et al.* (2016). Underestimation of sampling in areas of low conservation interest could be a source of bias in the process of global biodiversity consensus, in our case for Orchidaceae in Mexico and Chiapas. These results highlight the importance of continuing to explore the various forests of the country, despite the fact that they are not priority areas for conservation or hard to explore. In addition, future botanical explorations and even detailed herbarium research, including sampling in areas of little interest as well as areas never explored, are likely to add to our knowledge of the country's floristic biodiversity with new records or the discovery of new species (ex.: Martínez-Camilo *et al.*, 2019).

Table 1. Taxa of terrestrial orchids found on Tacaná volcano and close areas. *TDF=Tropical dry forest; TMCF: Tropical montane cloud forest; CP=Coffee plantation, PF=Pine forest; M=Moor; FL=Fallow land; SF=Secondary forest. Distribution report for the area (DRA): NRS=new records versus Solano *et al*. (2016), NRV=new records versus both Solano *et al*. (2016) and Villaseñor (2016), Conservation status (+) according with NOM-059-SEMARNAT-2010 (SEMARNAT, 2010). Voucher CICY herbarium (VCH): number of samples (collector: V. Bertolini).

Taxa	Municipality	Elevation (m)	Habitat	VHC	DRA
Aulosepalum hemichreum (Lindl.) Garay	Tapachula	1107	TDF*	*10*	
Aulosepalum hemichreum (Lindl.) Garay	Unión Juárez	1815	TMCF*	*173*	
Bletia purpurata A. Rich. & Galeotti	Cacahoatán	1803	Road	*121*	
Bletia purpurea (Lam.) A.DC.	Cacahoatán	1107	TDF	*11*	
Cranichis apiculata Lindl.	Tapachula	1606	TMCF	*154*	NRS
Cranichis apiculata Lindl.	Cacahoatán	2031	TMCF	*162*	
Cranichis muscosa Sw.	Cacahoatán	898	CP*	*226*	
Cranichis notata Dressler	Cacahoatán	965	CP	*232*	NRV
Cranichis revoluta Hamer & Garay	Cacahoatán	1781	TDF	*118*	NRS
Cranichis wageneri Rchb.f	Cacahoatán	1803	TMCF	*120*	
Cranichis wageneri Rchb.f	Cacahoatán	1433	CP	*149*	
Cranichis wageneri Rchb.f	Cacahoatán	2133	TMCF	*168*	
Cranichis wageneri Rchb.f	Cacahoatán	1462	TMCF	*233*	
Cyclopogon comosus (Rchb. f.) Burns-Bal. & E.W. Greenw.	Cacahoatán	1749	SF*	*23*	NRS
Cyclopogon comosus (Rchb. f.) Burns-Bal. & E.W. Greenw.	Tapachula	1513	SF	*151*	
Cyclopogon comosus (Rchb. f.) Burns-Bal. & E.W. Greenw.	Unión Juárez	2340	TMCF	*203*	
Cyclopogon cranichoides (Griseb.) Schltr.	Unión Juárez	2570	TMCF	*17*	
Cyclopogon elatus (Sw.) Schltr.	Unión Juárez	3103	M*	*228*	NRS
Cyclopogon luteo-albus (A. Rich. & Galeotti) Schltr.	Cacahoatán	1703	SF	*19*	NRS
Cyclopogon luteo-albus (A. Rich. & Galeotti) Schltr.	Unión Juárez	1654	TMCF	*94*	
Cyclopogon luteo-albus (A. Rich. & Galeotti) Schltr.	Tapachula	1606	TMCF	*184*	
Cyclopogon luteo-albus (A. Rich. & Galeotti) Schltr.	Cacahoatán	1462	CP	*192*	
Cyclopogon miradorensis Schltr.	Cacahoatán	1983	TMCF	*25*	NRV
Cyclopogon miradorensis Schltr.	Unión Juárez	1639	TMCF	*29*	
Cyclopogon miradorensis Schltr.	Unión Juárez	1811	TMCF	*42*	
Cyclopogon miradorensis Schltr.	Tapachula	1513	SF	*151*	
Cyclopogon papilio Szlach.	Cacahoatán	1704	TMCF	*135*	
Cyclopogon papilio Szlach.	Cacahoatán	2020	TMCF	*166*	
Cyclopogon papilio Szlach.	Cacahoatán	1704	TMCF	*134*	
Cyclopogon prasophyllum (Rchb. f.) Schltr.	Cacahoatán	1785	SF	*24*	
Cyclopogon saccatus (Rchb. f.) Burns-Bal. & E.W. Greenw.	Cacahoatán	1719	SF	*222*	NRS
Epidendrum radicans Pav. ex Lindl.	Unión Juárez	1856	Road	*63*	
Epidendrum ramosum Jacq.	Unión Juárez	1856	CP	*56*	
Epidendrum verrucosum Sw.	Cacahoatán	1769	TDF	*117*	
Funkiella rubrocallosa (BL Rob. & Greenm.) Salazar & Soto Arenas	Unión Juárez	3159	PF*	*230*	NRV
Goodyera dolabripetala (Ames) Schltr.	Cacahoatán	2438	TMCF	*82*	NRS
Goodyera major Ames & Correll	Unión Juárez	1812	TMCF	*106*	NRV

Table 1. Continues...

Taxa	Municipality	Elevation (m)	Habitat	VHC	DRA
Goodyera striata Rchb.f	Cacahoatán	2328	TMCF	*132*	
Goodyera striata Rchb.f	Cacahoatán	2127	TMCF	*223*	
Goodyera striata Rchb.f	Unión Juárez	2441	TMCF	*227*	
Govenia superba (Lex.) Lindl.	Tapachula	1488	TMCF	*71*	
Govenia superba (Lex.) Lindl.	Cacahoatán	2250	TMCF	*74*	
Govenia superba (Lex.) Lindl.	Tapachula	1488	Road	*98*	
Habenaria distans Griseb	Cacahoatán	1759	TDF	*116*	NRS
Habenaria distans Griseb	Unión Juárez	1818	SF	*142*	
Habenaria distans Griseb	Unión Juárez	2449	CP	*144*	
Habenaria distans Griseb	Cacahoatán	1433	SF	*155*	
Habenaria distans Griseb	Cacahoatán	2031	SF	*165*	
Habenaria distans Griseb	Tapachula	1513	FL	*182*	
Habenaria distans Griseb	Cacahoatán	2127	TMCF	*224*	
Habenaria distans Griseb	Cacahoatán	1462	TMCF	*231*	
Habenaria distans Griseb	Cacahoatán	1462	TMCF	*233*	
Habenaria eustachya Rchb. F	Cacahoatán	2328	SF	*136*	
Habenaria eustachya Rchb. F	Unión Juárez	1818	TMCF	*138*	
Habenaria eustachya Rchb. F	Cacahoatán	1433	CP	*150*	
Habenaria eustachya Rchb. F	Cacahoatán	1885	CP	*157*	
Habenaria eustachya Rchb. F	Cacahoatán	2060	SF	*161*	
Habenaria eustachya Rchb. F	Cacahoatán	1440	CP	*179*	
Habenaria eustachya Rchb. F	Tapachula	890	SF	*189*	
Habenaria eustachya Rchb. F	Tapachula	1088	SF	*221*	
Kreodanthus casillasii R. González	Tapachula	1624	CP	*153*	NRS
Liparis arnoglossophylla (Rchb. f.) Hemsl.	Unión Juárez	2378	TMCF	*215*	NRV
Liparis cordiformis C. Schweinf.	Unión Juárez	2332	TMCF	*212b*	NRS
Liparis fantastica Ames & C. Schweinf	Unión Juárez	2332	TMCF	*212*	NRV
Liparis nervosa (Thunb.) Lindl	Cacahoatán	1462	SF	*225*	NRS
Malaxis histionantha (Otto) Garay & Dunst.	Tapachula	1282	FL	*66*	NRV
Malaxis lepanthiflora (Schltr.) Ames	Tapachula	2062	TMCF	*211*	
Malaxis lepanthiflora (Schltr.) Ames	Cacahoatán	2097	TMCF	*217*	
Malaxis macrostachya (Lex.) Kuntze	Cacahoatán	1882	TMCF	*124*	
Malaxis maianthemifolia Schltdl. & Cham.	Cacahoatán	1882	TMCF	*123*	NRV
Malaxis pandurata (Schltr.) Ames (+)	Unión Juárez	1935	TMCF	*61*	
Malaxis parthonii C. Morren	Cacahoatán	1746	TMCF	*78*	NRV
Malaxis parthonii C. Morren	Cacahoatán	2132	TMCF	*81*	
Malaxis parthonii C. Morren	Cacahoatán	1774	SF	*216*	
Malaxis parthonii C. Morren	Cacahoatán	1549	SF	*47*	
Malaxis parthonii C. Morren	Unión Juárez	1823	TMCF	*88*	
Malaxis parthonii C. Morren	Unión Juárez	2025	TMCF	*92*	

Table 1. Continues...

Taxa	Municipality	Elevation (m)	Habitat	VHC	DRA
Malaxis parthonii C. Morren	Unión Juárez	2004	TMCF	*93*	
Malaxis parthonii C. Morren	Unión Juárez	2004	TMCF	*95*	
Malaxis parthonii C. Morren	Unión Juárez	2004	TMCF	*96*	
Malaxis soulei LO Williams	Tapachula	1566	TMCF	*100*	NRS
Malaxis soulei LO Williams	Cacahoatán	2060	TMCF	*163*	
Microchilus lunifer (Schltr.) Ormerod	Cacahoatán	2056	TMCF	*167*	
Oeceoclades maculata Lindl.	Tapachula	1257	CP	*64*	
Pelexia funckiana (A. Rich. & Galeotti) Schltr	Cacahoatán	1705	TMCF	*176*	
Pelexia funckiana (A. Rich. & Galeotti) Schltr	Cacahoatán	1780	TMCF	*191*	
Pelexia funckiana (A. Rich. & Galeotti) Schltr	Cacahoatán	1661	TMCF	*201*	
Platythelys maculata (Hook.) Garay	Cacahoatán	1691	TMCF	*126*	
Platythelys maculata (Hook.) Garay	Unión Juárez	1744	TMCF	*84*	
Platythelys maculata (Hook.) Garay	Tapachula	1663	FL	*102*	
Platythelys maculata (Hook.) Garay	Cacahoatán	1433	CP	*148*	
Platythelys maculata (Hook.) Garay	Unión Juárez	973	CP	*214*	
Platythelys venustula (Ames) Garay	Tapachula	1624	CP	*152*	
Ponthieva triloba Schltr.	Cacahoatán	2328	TMCF	*131*	
Ponthieva tuerckheimii Schltr.	Cacahoatán	1704	TMCF	*110*	
Prescottia stachyodes (Sw.) Lindl.	Cacahoatán	2328	TMCF	*133*	
Prescottia stachyodes (Sw.) Lindl.	Unión Juárez	2449	CP	*145*	
Prescottia stachyodes (Sw.) Lindl.	Cacahoatán	1990	TMCF	*170*	
Psilochilus macrophyllus (Lindl.) Ames	Tapachula	1642	TMCF	*4*	NRS
Rhynchostele bictoniensis (Bateman) Soto Arenas & Salazar	Cacahoatán	2031	TDF	*164*	
Sacoila lanceolata (Aubl.) Garay	Tapachula	326	Urban street	*46*	
Sacoila lanceolata (Aubl.) Garay	Cacahoatán	947	Urban street	*206*	
Sarcoglottis cerina (Lindl.) PN Don (+)	Cacahoatán	1788	TDF	*196*	
Sobralia rogersiana Christenson	Cacahoatán	1780	TDF	*53*	NRS
Sobralia rogersiana Christenson	Tapachula	1488	TMCF / CP	*72*	NRS
Triphora trianthophoros (Sw.) Rydb.	Cacahoatán	1885	TMCF	*112*	NRV
Triphora trianthophoros (Sw.) Rydb.	Cacahoatán	1882	TMCF	*122*	

Between 1,500 and 2,500 m.a.s.l., the greatest diversity of specimens was obtained in terms of individuals collected (Table 1), as well as species diversity. At that elevation we can find the TMCF, the ecological niche with highest biodiversity in México and priority of conservation policy (CONABIO, 2024; González-Espinosa *et al*., 2016, Ochoa-Ochoa *et al*., 2010; Ochoa-Ochoa *et al*., 2021). High altitude and mountain conditions appear to favour an increase in species diversity, and it is also suggested that these are conditions that have had a positive effect on species diversification in the past compared to other ecosystem types (Givnish *et al*., 2016).

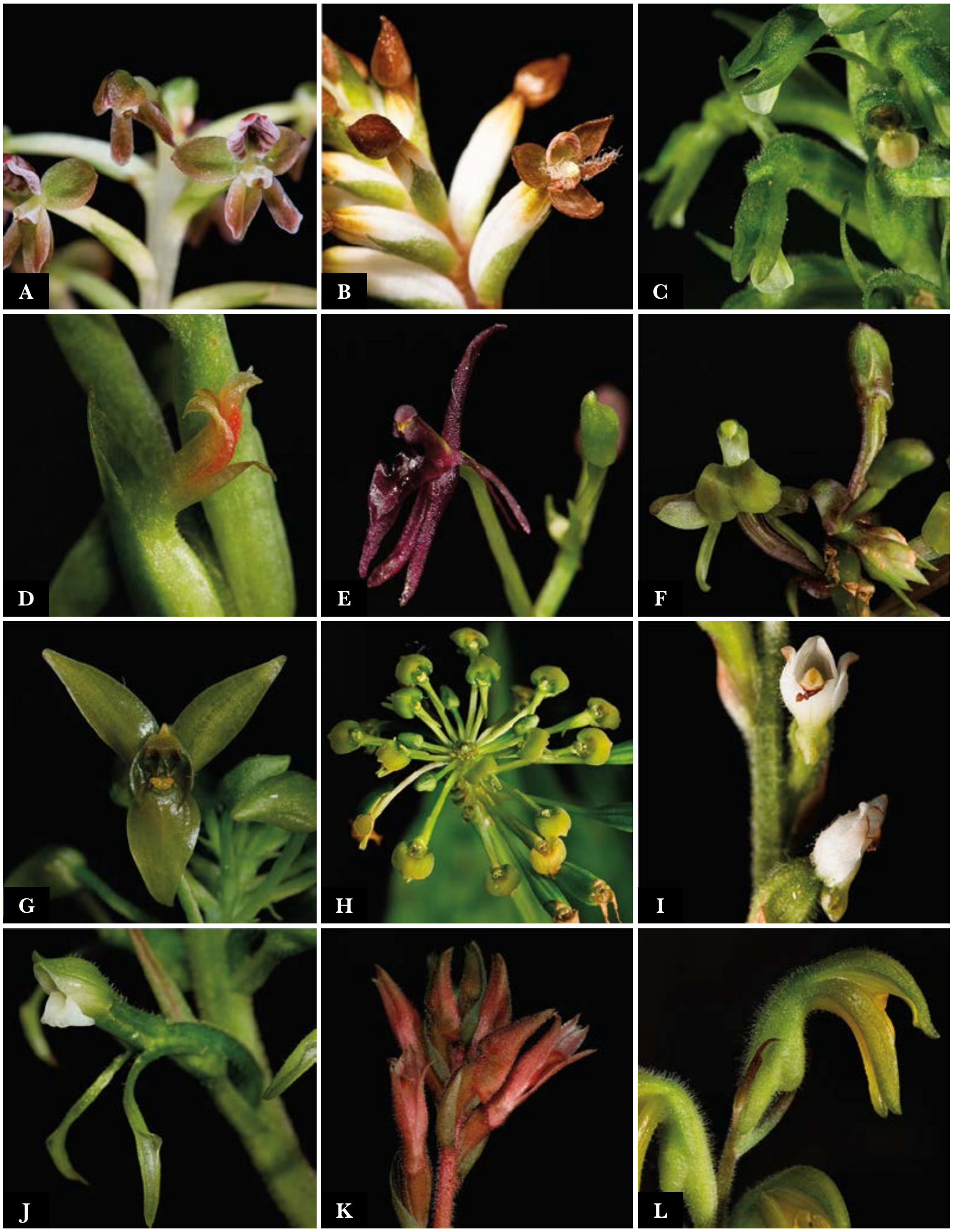


Figure 2. Example of microphotography of some specimens of terrestrial orchid of Tacaná. A) *Cranichis apiculata* Lindl; B) *Cranichis wageneri* Rchb.f; C) *Cyclopogon luteo-albus* (A. Rich. & Galeotti) Schltr; D) *Funkiella rubrocallosa* (BL Rob. & Greenm.) Salazar & Soto Arenas; E) *Liparis cordiformis* C. Schweinf; F) *Liparis nervosa* (Thunb.) Lindl; G) *Malaxis lepanthiflora* (Schltr.) Ames; H) *Malaxis parthonii* C. Morren; I) *Microchilus lunifer* (Schltr.) Ormerod; J) *Pelexia funckiana* (A. Rich. & Galeotti) Schltr; K) *Sacoila lanceolata* (Aubl.) Garay; L) *Sarcoglottis cerina* (Lindl.) PN Don (photographer: M.Sc. Eduardo Rafael Chamé Vázquez).

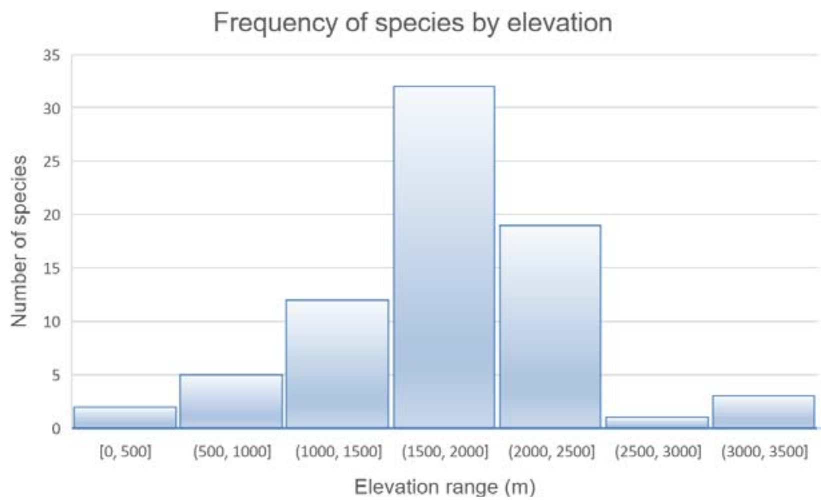


Figure 3. Frequency of species by elevation.

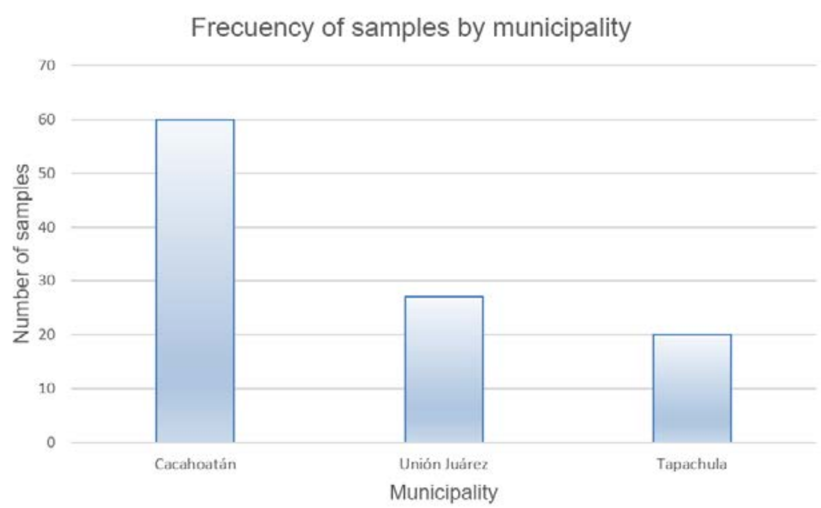


Figure 4. Municipality and number of samples.

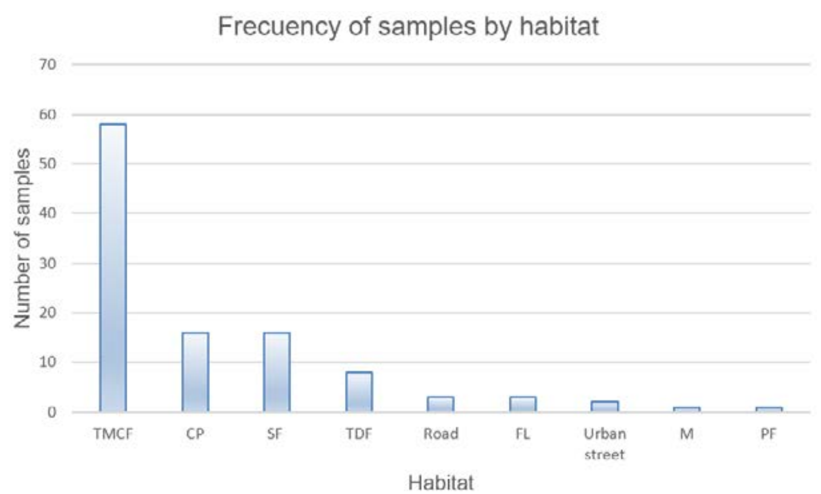


Figure 5. Different habitats and number of samples found.

Figure 6. *Psilochilus macrophyllus* (Lindl.) Ames *in situ*. Left picture shows a plant in bloom, the right one a plant with capsule.

Although fragmented, observations (*e.g.* increased vegetation cover, isolation from urban sprawl) suggest that there is still a high level of forest conservation. The conservation status of the sampled habitats lacks formal conservation studies and should therefore be prioritised for a systematic and timely assessment of scientific and certainly social interest (*e.g.* the important contribution of ecosystem services provided by forests) to provide objective and representative data to determine the conservation status of the flora.

Malaxis pandurata (Schltr.) Ames and *Sarcoglottis cerina* (Lindl.) PN Don are listed as priorities according to the NOM059-2010 (SEMARNAT, 2010). The data from this study position the RTP 135 Tacaná-Boquerón as the Mexican region with the highest number of Orchidaceae species in Mexico, followed by El Momón-Las Margaritas-Montebello with 333 species. These results suggest a total of 351 orchid species for this region of Mexico, which should be maintained as a high conservation priority. The orchid diversity is likely to increase with future explorations into less accessible areas of the Tacaná. For example, for Peru, for many years (Tamayo-Cen *et al.*, 2020), the genus Encyclia was only considered present in the country with eight species; however, during the last explorations, its diversity has risen to 13, of which three are new reports for the country and two are new entities in the process of publication (Tamayo-Cen *et al.* in press; Ocupa-Horna *et al.*, 2024). Finally, we recommend that researchers include a multidisciplinary approach in future floristic lists (when it is possible), which include as much information as possible from each collection, allowing these data to be useful in future research, such as conservation status analyses. Even the possibility of making calculations such as phylogenetic or taxonomic diversity should be included to provide different metrics-evidence that fit the needs of particular areas for conservation decision-making.

CONCLUSIONS

The terrestrial priority region 135 Tacaná-Boquerón represents an important source of biodiversity for Mexico. On this occasion we determined that the orchid record for this site is still incomplete, in reference to the terrestrial elements of this family. This is probably the case for many sites in Mexico. A careful scheme of field trips during different seasons of the year could detect new records providing further knowledge of Mexican biodiversity. With these latest findings, the Tacaná region reaches a total of 351 taxa of orchid species equal to taxonomic units.

ACKNOWLEDGEMENT

This contribution is part of the activities of the Orchid Network of the Subcommittee on Agricultural Genetic Resources, coordinated by the National Seed Inspection and Certification Service (SNICS) of the Ministry of Agriculture and Rural Development (AGRICULTURA) of Mexican Government.

In addition, the first author would like to thank Ph.D. Dr. Anne Damon for her support in choosing the collection sites, M.Sc. Fredy Archila Morales for resolving some specific doubts at the beginning of the research, Mr. Nelson Pérez and M.Sc. René H. Andrade Gallegos for their invaluable accompaniment during the field trips, as well as all the rural communities, farm and plot owners who have given their support for the field work.

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