

**CLADOCOLEA OLIGANTHA (LORANTHACEAE) A NEW RECORD FOR VERACRUZ,
MEXICO, AND GENERAL DATA ON THIS TAXON**

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ABSTRACT

Cladocolea oligantha is first recorded for Veracruz State (eastern-central Mexico), as a 500 km disjunction, perhaps resulting from recent long distance dispersal by frugivorous birds. This hemiparasitic mistletoe seems to prefer trees of *Bursera* spp. in tropical dry forests. Thus, it is abundant and frequent in drier western Mexico and extremely rare in moist eastern Mexico.

Key words: mistletoe, disjunction, Gulf of Mexico, long distance dispersal, frugivorous birds

RESUMEN

Cladocolea oligantha (Loranthaceae) es reportada por primera vez para el estado de Veracruz, México, como una disyunción de más de 500 km, quizá como resultado de introducción

reciente por aves frugívoras. Esta especie hemiparásita de muérdago parece preferir árboles de *Bursera* ssp. en bosque tropical caducifolio, por lo cual es abundante y frecuente en la más seca vertiente del Pacífico, en el occidente de México y extremadamente rara en la más húmeda vertiente del Golfo de México.

INTRODUCTION

Preliminary studies of Loranthaceae and Viscaceae in central Veracruz and in neighboring areas of Puebla reported 23 species in four genera, *Arceuthobium*, *Phoradendron*, *Psittacanthus* and *Struthanthus* (Oliva 1983; Cházaro and Olive, 1987a, 1987b, 1988a, 1988b, 1988c; Cházaro, 1989b). As a result of these studies, several novelties were detected, such as the presence of *Dendrophthora costaricensis* Urban, Municipality of Xico, Veracruz, as a new record for the flora of Mexico (Cházaro and

Oliva, 1991). This has also informed the Loranthaceae and Viscaceae inventory for the state of Veracruz (Sosa & Gómez-Pompa, 1994) (Table 1).

The purpose of this study is to register for the first time the presence of *Cladocolea oligantha* in the state of Veracruz, provide hypotheses about its observed disjunction and provide additional chorological, phenological and ecological data.

MATERIALS AND METHODS

An inventory of Loranthaceae and Viscaceae in central Veracruz and in the neighboring areas of Puebla began systematically since 1981, with frequent field trips every two weeks the first year (Olive, 1983; Cházaro and Olive, 1987a, 1987b, 1988a, 1988b, 1988c; Cházaro, 1989b). The information was supplemented by consulting specimens from the following national herbaria: CORU, CHAP, CHAPA, EBUM, ENCB, GUADA, IBUG, IEB, Interpretation, MEXU, SLPM, XAL and XALU, and foreign ones: CAS, F, MICH, MO, UC and WIS.

RESULTS AND DISCUSSION

Cladocolea Van Tieghem

Is a primarily Mexican genus with 22 species, 17 of which occur in the Mexican Republic mainly in tropical deciduous forest of the Pacific slope, in the Balsas Basin, Guerrero, Michoacan and Oaxaca (Kuijt, 1975, 1991, 1992 .) Here is the first report for the states of Veracruz and Zacatecas (fig. 1).

Cladocolea oligantha (Standl. & Steyerl.) Kuijt. 1975.

Struthanthus oliganthus Standl. & Steyerl. 1944. Type: GUATEMALA, Department of Huehuetenango, San Ildefonso above Ixhuacan, 1600-1700 m, 15 August 1942, Julian A. Steyerl. No. 50 672 (F). Its specific epithet refers to its few flowers, 3 per inflorescence, from Latin oligos = few and anthos = flower. *Cladocolea oligantha* is a perennial herb, dioecious, stems sparsely branched, completely

glabrous, up to a meter in length, terete, thick, erect, somewhat fleshy, gray bark, without epicortical roots, alternate to subopposite leaves, fleshy, variably, lanceolate to oblanceolate, apex rounded to acute, base tapering to the petiole, this 2-4 mm long. Flowers 5 x 2 mm, tetramerous, grouped into three (triads), covering a peduncle of 0.5 cm long, petals greenish stained red, fruit round, 5 x 7 mm, red, turning glossy black when ripe (Kuijt, 1975 and Standley and Steyerl., 1946) (fig. 2).

Distribution: Here we report for the first time two populations of *C. oligantha* from the state of Veracruz, which represents the first record of the genus *Cladocolea* for that entity and the slope of the Gulf Mexico, as it was only known from the Pacific Ocean side and the center of the country. Although *C. oligantha* is reported as endemic to the department of Huehuetenango, Guatemala (Standley and Steyerl., 1946), we now know it is the species with the broadest geographic distribution of the genus, occurring in Mexico from Jalisco to Chiapas and Central America from Guatemala to Panama at altitudes of 50 to 1850 m (Kuijt, 1975; Breedlove, 1986). Although its occurrence is expected in certain states such as Nayarit, Michoacan and Morelos, this has not has been documented (Rodriguez and Espinosa, 1996, Tellez, 1994 and Bonilla and Villaseñor, 2003). Neither has it hitherto been known from El Salvador, Honduras, Nicaragua, Costa Rica and northern Panama, so the population of central Panama represents a major disjunction of 2000 km (Kuijt, 1978; Burger & Kuijt, 1983). The report of *Cladocolea hintonii* Kuijt (Anonymous, 1992), cited in the *Diccionario de Especies de la Flora de Veracruz*, is invalid because it is a determination error. According to a specimen from the CHAPA herbarium, which this report was based, we affirm that the correct determination is *Struthanthus deppeanus* (Schlecht. & Cham.) Blume.

Habitat and phenology: tropical deciduous forest sensu Rzedowski (1978), tropical deciduous forest of Miranda and Hernández X (1963) and

subtropical matorral Rzedowski and McVaugh (1966). It blooms from April to August and fruits from October to January.

Hosts: according to the specimens observed in herbaria and direct observations, it seems to be specific to trees of the genus *Bursera* (called llamados copal or papelillos [confetti]), reported on: *B. simaruba*, *B. pinnata*, *B. palmeri*, *B. schlechtendalii*, and *B. copallifera*. Only on the coast of Jalisco has it been found on *Amphypterygium glaucum* and *A. adstringens* (cuachalalate), species in the family Anacardiaceae, closely related phylogenetically to *Bursera*, as can be inferred by the presence of mistletoe on both genera (Mabberley, 1987).

Specimens examined (arranged north to south).

ZACATECAS: Municipality. of Juchipila, Pinion Hill, W of Pueblo Viejo, parasitizing *Bursera copallifera*. September 1, 1991, flowers cream, *M. Cházaro B.*, *A. Flores M.* and *R. Acevedo R.* 6708 (XAL, WIS). **JALISCO:** Municipality La Huerta. Chamela Biological Station, parasitizing *Amphypterygium adstringens*. June 29, 1982, flowers salmon - pink *E. J. Lott* 1106 (MEXU, ENCB). Mpio. Tomatlán, 4 km W of Tomatlán on the road that connects to the coastal road, 50 meters, parasitizing *Bursera* sp. August 26, 1976, flowers yellow-green, scarce. *J. Rzedowski & R. McVaugh* 1347. (ENCB, MICH). Mpio. Cabo Corrientes, between Tehuamixtle and Maito, 50 m, parasite on *Amphypterygium glaucum*. January 6, 1990, black fruits. *T. S. Cochrane*, *M. Cházaro B.* and *M. Leach* 12002 (WIS). Mpio. Jocotepec, Cerro Viejo, channel de la Peña Blanca, N of Zapotitán to Hidalgo, parasitic on *Bursera bipinnata*. July 15, 1990, flowers cream, *J. A. Machuca* 6543 (IEB, XAL, WIS). Mpio. Jocotepec, Sierra de las Vigas, N of San Juan Cozala, 1800-1900 m, parasitic on *Bursera palmeri*. December 16, 1990, black fruits, *M. Cházaro B.* and *J. A. Machuca N.* 6482. (XAL, IEB, WIS). **COLIMA:** 20 km SSW of Colima, on the road to Manzanillo, 400 meters, parasitizing *Bursera schlechtendalii*. August 28, 1976. *J. Rzedowski & R. McVaugh* 1425 (ENCB,

MICH). Rancho Guerrero *M. E. Jones* 423 (U.S.). (Taken from Kuijt, 1975.) **GUERRERO:** Mpio. Zumpango del Río; plateau at the top of a hill 5.5 km S of Valerio Trujano, parasitizing *Bursera*. July 1, 1986, yellow-green flowers *J. L. Contreras* 370. (FCME, MEXU); Mpio. Chilpancingo, Cerro de Alquitrán, near Mazatlán. M.s.n.m. 1500, parasitic on *Bursera bipinnata*. July 5, 1972, flower buds *J. Rzedowski* 22674 (ENCB, CAS), Mpio. Zumpango del Río, near Mezcala, 1000 meters, parasitic branches of *Bursera* sp., November 10, 1995, *M. Cházaro B.* and *B. L. Mostul* 7563 (IEB, IBUG), Mpio. Chilpancingo, west of Mazatlán, 1340 m, 9 November 1995, a parasite of *Bursera bipinnata*. *M. Cházaro B.*, *B. L. Mostul* and *O. E. Magellan* 7571 (IEB, IBUG, XAL). Mpio. Chilpancingo, microwave Cabin, road Chipalcingo to Chichihualco, 1450 m, November 10, 1995, black fruits, infesting the branches of *Bursera* sp., *M. Cházaro B.*, *B. L. Mostul* and *F. Maradiaga C.* 7574 (IEB, IBUG, XAL). **EDO DE MEXICO:** Temascaltepec District, Naranjo, 860 meters, a parasitic on a ciríán. *G. B. Hinton* 4730 (CAS). Collected by Kuijt, (1975). **PUEBLA:** Mpio. Jolalpan of Teotlalco to Jolalpan, 1106 m, 1 November 1994, black fruits, parasitizing the branches of *Bursera copallifera*, *M. Cházaro B.*, *B. L. Mostul* and *A. Guerrero García* 7469 (IEB, IBUG, XAL). Mpio. Petlalcingo, 12 km NW of Petlalcingo, along the Pan American Highway on the road to Acatlán. 1350 m.a.s.l. *H. H. Iltis & Koeppen* 1616 (MICH, U.S., WIS). Taken from Kuijt (1975). Mpio. Izúcar Matamoros, 7 miles southeast of Matamoros Izúcar 1659 meters, on *Bursera* sp., *G. Webster, Miller & Miller* 11446 (GH). Taken from Kuijt (1975). **OAXACA:** Mpio. Huatulco. Top of the hill, 5 km from the main road through the gap to the beaches of Cacaluta, 70 m.a.s.l, November 7, 1992. Fruits green. *G. C. Castillo, P. Zamora C.* and *F. González* 9586 (XAL). Mpio. Juchitán, Pan American Highway. 12.5 km E of Juchitán, 0-50 m.a.s.l. *R. McVaugh* 21853. (MICH). Taken from Kuijt (1975). Mpio. Mitla, mountains 3 km north of Mitla towards Ayutla (Sierra Mixe), 1700-1800 m, November 4, 1994, black fruits,



Fig. 1. *Cladocolea oligantha* (Standl. & Steyer.) Kuijt. A. Flower (J.A. Machuca 6543) (XAL). B. Fruit M. Cházaro B. 6482 (IEB).

parasitic *Bursera* sp., *M. Cházaro B.*, *B. L. Mostul* and *A. Guerrero García 7487* (IEB, IBUG, XAL). Mpio. Oaxaca, next to the archeological ruins of Monte Albán, 1800 m, November 3, 1994, black fruits, parasitic on *Bursera bipinnata*. *M. Cházaro B.*, *B. L. Mostul* and *A. Guerrero García 7482* (IEB, IBUG, XAL). **VERACRUZ:** Mpio. Puente Nacional, roadside Pachuquilla- Col. Barrios. 200 m.a.s.l. October 15, 1992, blackish fruits, parasitizing *Bursera simaruba*. *H. Oliva R. and F. Ramón Farías 1221* (CORU, WIS). Mpio. Xalapa, the gap to El Terrero to El Lencero, near the ranch Ojuelos, 1000 meters, parasitic on *Bursera simaruba*. April 9, 1993, floral buds, *M. Cházaro B.*, *Rudy Cházaro Hernández and Paskynnell Cházaro Hernández 7148* (XAL). **CHIAPAS:** Mpio. Amatenango de la Frontera, between Frontera Comalapa and Amatenango de la Frontera, 860 meters, October 12, 1980, immature fruits. *D. E. Breedlove & J. Strother 46139* (CAS).

Hypothesis

The disjunction of *C. oligantha*, with only two known populations from the slope of the Gulf of Mexico, raises the questions and hypotheses about how and when did it arrive in eastern Mexico?

1A. Deliberately introduced species? A known case of purposeful introduction is from the seeds of the mistletoe *Viscum album*, a Eurasian species whose seeds were deliberately brought from England by American horticulturist Luther Burbank in 1900 to his home in Sebastopol, California, USA, and implanted on an apple tree. From there, the American robins (*Turdus*) and cedar waxwings (*Bombycilla cedrorum*) began to disperse the seeds in all directions, as documented in Hawksworth et al. (1991). Since *C. oligantha* has not been reported in fruit trees or orchards, this hypothesis seems unlikely.

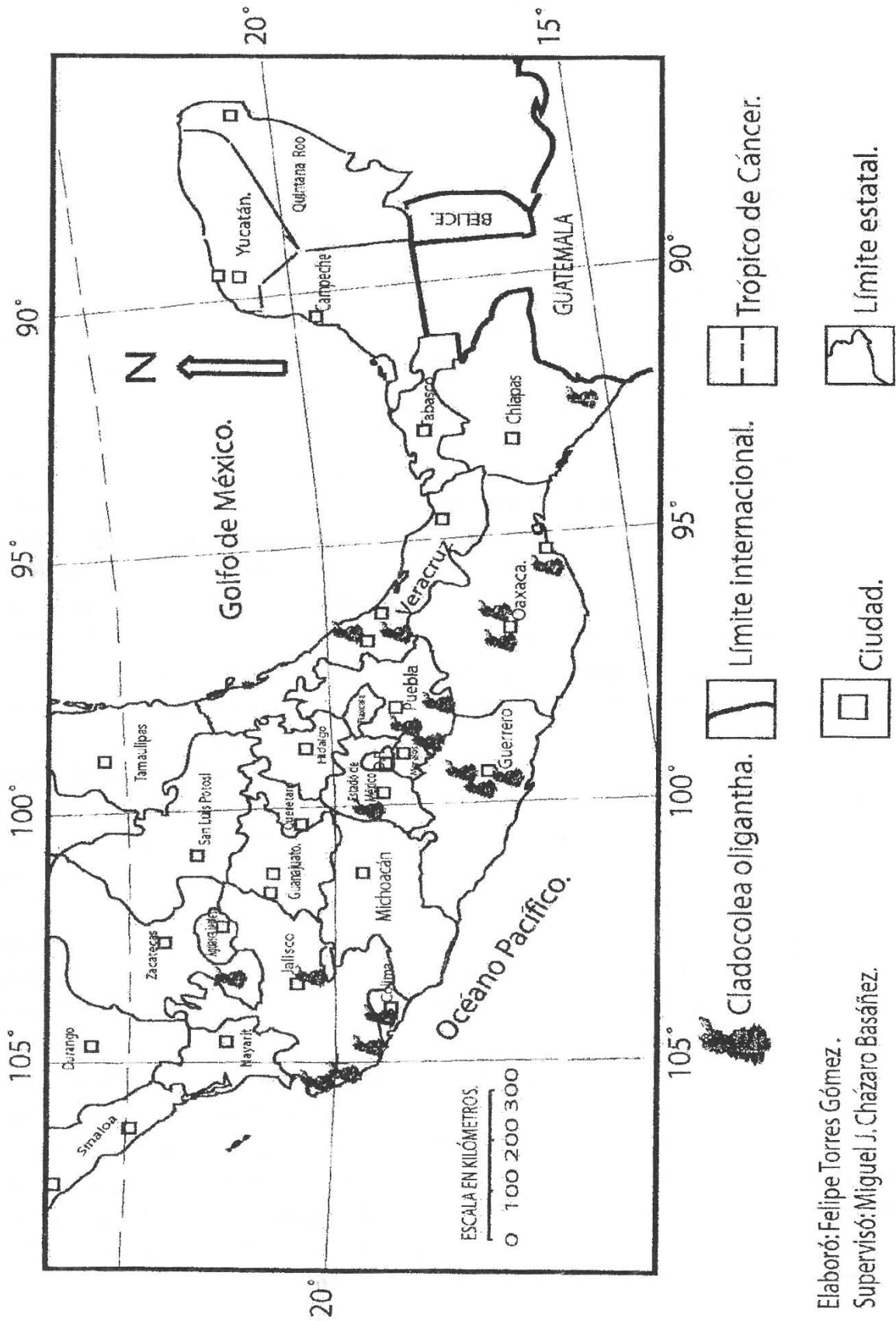
1B. Accidentally introduced species? There are some cases of mistletoe that have been introduced to urban areas outside their natural range. Wax leaf privet trees (*Ligustrum lucidum*)

grown in a nursery and infected *in situ* by a mistletoe, were transported with the parasite unnoticed and planted as urban vegetation. Privet and mistletoe grew simultaneously and when the latter reached maturity, the fruits were eaten by birds who were responsible for dispersing from one ornamental tree to another, as has been documented for the following three species.

Cladocolea loniceroides (van Tieghem) Kuijt (fig. 3) was the first mistletoe accidentally introduced, which has been documented for Mexico. *C. loniceroides* occurs naturally in Jalisco, Michoacán, Guerrero, Mexico, Morelos and Oaxaca. In 1971 it was observed on privet plants, *Ligustrum*, in Mexico City: *J. Gimete Leyva s/n* (ENCB and MICH), and we believe that the privet was taken from a nursery in Cuernavaca, Morelos (Calderón, 1979 and personal observations).

Struthanthus quercicola (Schl. & Cham.) Blume (fig. 4), is the second documented case of an adventitious mistletoe in the Valley of Mexico (Cházaro and Acosta, 1992), growing on *Ligustrum* trees in Ciudad Universitaria, National University Autonoma de Mexico, Mexico City. In 1993 it was also observed in a public park in the city of Tlaxcala on privet trees, and in 1994 it was found in the central park of Pachuca, Hidalgo, also growing on *Ligustrum* trees (Acosta and Cházaro, 1994). In nature this species is distributed from the Gulf of Mexico, Hidalgo, Queretaro, Puebla, Veracruz, Oaxaca, Tabasco to Chiapas, extending from Central America to Panama (Burger and Kuijt, 1983).

Struthanthus interruptus (HBK) Blume (fig. 5) is the third case of an adventitious mistletoe in Mexico, accidentally introduced on privet trees from a nursery outside the region corresponding to the Guadalajara metropolitan area (ZMG). *Struthanthus interruptus* is distributed naturally from Nayarit, Jalisco, Colima, Michoacan, Guerrero and Oaxaca, and Morelos (Bonilla and Villaseñor, 2003). In Jalisco it grows from near sea level on *Rhizophora mangle*, to 1350 m, near Tecolotlán on mesquite, *Prosopis laevigata*. In



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Fig. 2. Map of the geographical distribution of *Cladocolea oligantha* in the Republic of Mexico.

1987 it was observed in the municipality of Zapopan, behind the Basilica of Zapopan, in front of the post office (at the intersection of Vicente Guerrero and Gomez Farias), with cream flowers, growing on a *Ligustrum* tree, *M. Cházaro B. No. 5210* (IBUG), erroneously identified as *Struthanthus* aff. *quercicola* by Cházaro. We assume that this mistletoe came to the ZMG in 1985, on a privet tree from a nursery in Ciudad Guzmán, Jalisco or from Uruapan, Michoacan, where *S. interruptus* is very common and abundant on urban trees. By 1996 it was already established on 15 tree species (Vázquez, 1996), 20 species by 1997, by 2003 [the number] had risen to 47 native or exotic tree species (Ruvalcava et al. 2003) and by 2004, López and Guerrero (2004) reported 58 species of trees as hosts for this mistletoe, thus becoming a major plant for the ZMG. This hypothesis has little support as *C. oligantha* has not been observed on *Ligustrum* trees or other urban forest species.

IC. Species dispersed long distances by ornithochory? There is abundant evidence of ecto- and endozoochory of mistletoes by frugivorous birds (Bray, 1910; Alvarez, 1979; Davidar, 1983; Restrepo, 1985; Hernández, 1991). Even without having reliable data, Cházaro and Oliva (1991) attributed to migratory birds long distance dispersal of *Dendrophthora costaricensis*, a mistletoe that "jumps" from the north of Guatemala to the center of the state of Veracruz, a disjunction of more than 1500 km. On the other hand, Johnston (1992) also refers to birds as seed dispersers of *Bursera* spp. Importantly, bird droppings containing large numbers of *Phoradendron bolleanum* seeds that stuck on the trunk and branches of a cypress (*Cupressus benthamii*) have been documented near Guadalupe Sarabia, Township Tepeyahualco, Puebla (Cházaro and Oliva, 1988c). The same authors, in a coffee plantation in Las Animas, municipality of Xalapa, Veracruz, found that the excreta of birds containing seeds *Struthanthus quercicola* attached to the top of the leaf of coffee plants (*Coffea arabica*). Sutton (1951) documented with *in situ* observations in the states of

Tamaulipas, Hidalgo and Michoacan, birds of the family Thraupidae (tanagers) eating mature berries of *Phoradendron* spp. Morphological data for *C. oligantha*, fleshy fruits, of considerable size and glossy black, allow us to infer dispersal of the ornithochory type. However, this is without data obtained on the dispersers of *Cladocolea* seeds in general and *Cladocolea oligantha* in particular.

Cladocolea cupulata Kuijt, a species disjunct by over 400 km, south and west Jalisco and central Durango and Sinaloa (Gonzalez et al. 1991), by this disjunct pattern, it could have an explanation similar to *C. oligantha* via ornithochory dispersal over long distances. It was recently collected west of Revolcaderos, 4 km before the Palmetto, Sinaloa, on *Pinus*. *M. Cházaro B., P. D. Sorensen and S. E. González 6563* (IBUG, IEB, XAL, WIS).

Since many cases are known of long distance dispersal of mistletoe seeds to more than 1000 km to remote oceanic islands (Kuijt, 2003; Schoedde Barlow, 1993) then it is likely that the distance of ca. 500 km that exists between populations of *C. oligantha*, from the west to the east of Mexico, could well be covered by any bird with a constipated bowel, perhaps attracted by the fruits of *Bursera* that are also eaten and dispersed by frugivorous birds. Furthermore *Cladocolea* morphology and the current distribution of *C. oligantha* in natural forests, points towards the ornithochory long distance dispersal hypothesis. On this question, is it a recent arrival or did it pass unnoticed by botanical collectors? We favor a recent arrival of the species, based on: a) The center of the state of Veracruz is, after the Valley of Mexico, the region of the country best explored botanically, since 1968 Dr. Arturo Gómez-Pompa worked the Flora of Veracruz project and was visited by European botanists from 1800 onwards (Cházaro, 1989a); b) M. Cházaro B. and H. R. Oliva, passed through in 1981 and 1982 (and sporadically in subsequent years) by collecting mistletoe throughout the central portion of the state of Veracruz, a couple of times walking



Fig. 3. *Cladocolea loniceroides* (Van Tieghem) Kuijt. A) Branch with fruits. M. Cházaro et al., 4543; B) Flower. R. Ornelas et al., 929 (XAL).

paths of the two sites (between Barrios and Col. Pachuquilla, and about Ojuelos) where in 1992 we found this species; c) Medina (1988) conducted a floristic inventory of the Barranca de Acazónica, passing several times through the listed localities, without finding nor reporting *C. oligantha*, being right there where H. Oliva R. and F. Ramón F. found it in October 1992, the first record of this taxon for Veracruz. On the other hand, when the host (*Bursera* spp.) presents foliage in the rainy season, *C. oligantha* is difficult to distinguish as the stems of mistletoe are similar in color and texture to those of the host. Based on the foregoing, it seems unlikely (though not impossible) that *C. oligantha* had gone unnoticed by botanical collectors. This leads us to suppose that the species arrived in Veracruz recently, since in both cases there was only one infected tree, and this is the "palo mulato" (*Bursera simaruba* (L.) Sarg.), planted as living fence, the only host available.

ACKNOWLEDGEMENTS

Patiño A Rosa María Beltrán (RIP), Faculty of Medicine, Central South University, University of Guadalajara, Ciudad Guzmán, Jalisco, for the illustrations. A Theodore S. Cochrane, Department of Botany, University of Wisconsin, Madison, USA, for sending copies of literature that was not available in the country. To Dr. Burl L. Mostul, Dr. Clyde L. Calvin, and Victor Marquardt Portland State University, Oregon, USA, with whom we have made several botanical collecting trips to different states, who provided their own financing. To José Antonio Machuca Núñez, Arturo García Guerrero, Agustín Flores Macías, Raúl Acevedo Rosas, Socorro González Elizondo, Francisco Maradiaga C., Rudy Miguel and Alejandro Paskynnell Cházaro Hernández, for their help in field work. M. Cházaro B expresses his sincere appreciation to Dr. Juan Manuel Durán Juárez, rector of the Central University for Social Sciences and Humanities of the University of Guadalajara, and for his continued financial support of academic research projects. To M. C. Hirineo Martínez Barragán and to M. C. Armando Chávez Hernández, leader and career

coordinator, respectively, of the Department of Geography and Regional Planning, CUCSH, University of Guadalajara, for his academic support. The curators of the herbaria: CAS, CORU, CHAP, CHAPA, EBUM, ENCB, F, GUADA, IBUG, IEB, INIF, MEXU, MICH, MO, SLPM, UC, WIS, XAL, and XALU for their help in reviewing their collections.

LITERATURE CITED

- Acosta, P. R. y M. Cházaro B., 1994. *Struthanthus quercicola* (Schlechten. & Cham.) Blume (Loranthaceae), una adición a la flora fanerogámica del valle de México y Tlaxcala. *Biotam*, **6**(1): 47-50.
- Álvarez, S. J. 1979. *Diccionario Rioduero de Botánica*, Ediciones Rioduero. Madrid, España. 249 pp.
- Anónimo, 1992. *Diccionario de especies de la flora de Veracruz*. Instituto de Ecología A. C. y University of California-Riverside, USA. Barlow, B. A. & R. Schoedde 1993. Bird dispersal of Loranthaceous mistletoes to remote pacific islands: symbiosis in default. *Beaufortia*, **43**(8): 124-129.
- Bonilla, B. J. R. y J. L. Villaseñor R., 2003. *Catálogo de la flora del estado de Morelos*. Centro de Investigaciones Biológicas, Universidad Autónoma del Estado de Morelos, Cuernavaca, Mor., 129 pp.
- Bray, L. W., 1910. The mistletoe pest in the southwest. United States Department of Agriculture (USDA) *Bulletin* No. 166, Washington, D. C.
- Breedlove, D. E., 1986. *Listados Florísticos de México IV. Flora de Chiapas*. Instituto de Biología, UNAM, México, DF. pp. 127-128.

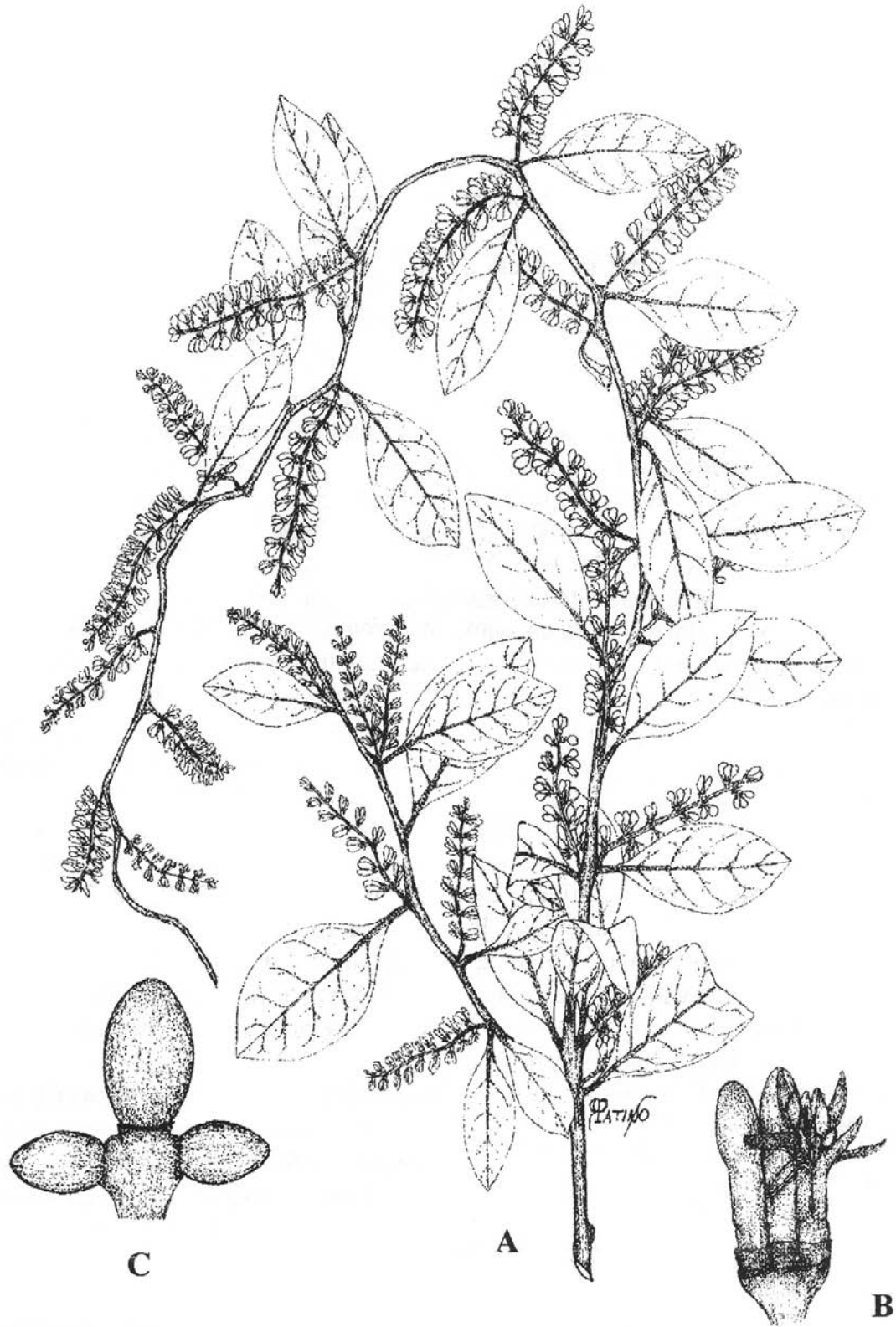


Fig. 4. *Struthanthus interruptus* (HBK) Bunme. A) Plant with flowers (Cházaro *et al.*, 4773); B) Flower detail (Cházaro *et al.*, 4773) (XAL); C) Fruit (Cházaro *et al.*, 5898) (IEB).

- Burger, W. y J. Kuijt, 1983. Loranthaceae. En: W. Burger (editor). *Flora of Costa Rica. Fieldiana Botany*, 13: 29-59.
- Calderón de R., G., 1979. Loranthaceae. En: J. Rzedowski y G. Calderón de Rzedowski (Eds.). *Flora fanerogámica del valle de México*. vol. 1: 119-124. Ed. CECSA, México DF.
- Cházaro, B. M., 1989a. *Miscellaneous papers on the flora of Veracruz*, Mexico. Master Sciences Thesis, Department of Botany, University of Wisconsin- Madison, USA. 80 pp.
- Cházaro, B. M., 1989b. *Los Muérdagos (Loranthaceae) del centro y sur del estado de Veracruz, México*. Memorias de IV Simposio Nacional sobre Parasitología Forestal. Durango, Dgo. Tomo II, pp. 604- 612.
- Cházaro, B. M. y H. Oliva R., 1987a. Loranthaceae del centro de Veracruz y zona limítrofe de Puebla I. *Cact. Suc. Mex.* **32**(3): 55-60.
- _____ 1987b. Loranthaceae del centro de Veracruz y zona limítrofe de Puebla II. *Cact. Suc. Mex.* **32**(4): 78-86.
- _____ 1988a. Loranthaceae del centro de Veracruz y zona limítrofe de Puebla III. *Cact. Suc. Mex.* **33**(1): 14-19.
- _____ 1988b. Loranthaceae del centro de Veracruz y zona limítrofe de Puebla IV. *Cact. Suc. Mex.* **33**(2): 42-48.
- _____ 1988c. Loranthaceae del centro de Veracruz y zona limítrofe de Puebla V. *Cact. Suc. Mex.* **33**(3): 75-77.
- _____ 1991. *Dendrophthora costaricensis* Urban (Loranthaceae), un nuevo registro para la Flora de México, *Acta Botánica Mexicana*, **13**: 31-39.
- Davidar, P., 1983. Similarity between flowers and fruits in some flowers pecker pollinated mistletoe. *Biotropica*, **13**(1): 32-37.
- González , E. M., S. González E. y Y. Herrera A., 1991. *Listados florísticos de México IX. Flora de Durango*. Instituto de Biología, UNAM, México D F, 165 pp.
- Guerrero N., J. J. y G. A. López C., 2004. Los muérdagos, plantas parásitas de los árboles: su diversidad y hospederos en Guadalajara y su zona conurbana. En: G. A. López C. y J. J. Guerrero N. *Ecología urbana en la zona metropolitana de Guadalajara*. Editorial Agata, Guadalajara, Jal. pp. 161-195.
- Hawksworth F.G., R. F. Scharpf y M. Maorsy, 1991. European mistletoe continues to spread in Sonoma county. *California Agriculture*, **45**(6): 39-40.
- Hernández, C. L., 1991. Los Muérdagos (Loranthaceae) de la región central de estado de Tlaxcala. Publicación No. 4 Jardín Botánico de Tizatlán, Tlaxcala, Tlax. 38 pp.
- Johnston, B. M., 1992. The genus *Bursera* (Burseraceae) in Sonora, Mex. and Arizona USA. *Desert Plants*, **10**(3): 123-143.
- Kuijt, J., 1975. The genus *Cladocolea* (Loranthaceae). *J. Arn. Arb.*, **56**: 265-335.
- _____ 1978. Comentary on the mistletoes of Panama. *Ann. Missouri Bot. Garden*, **65**: 736-763.
- _____ 1991. Two new species of *Ixocactus* (Loranthaceae) and a reformulation of the genus. *Systematic Botany*, **16**(2): 292 - 298.

- _____ 1992. Two new species of *Cladocolea* (Loranthaceae) from Mexico and Surinam. *Novon*, (2): 351-354.
- Kuijt, 2003. Monograph of *Phoradendron* (Viscaeeae). *Systematic Botany Monographs*. vol. 66: 1-628. The American Society of Plant Taxonomists.
- Mabberley, D. J. 1987. *The Plant-Book, a portable dictionary of the vascular plants*. Cambridge University Press, Cambridge, Inglaterra, 858 pp.
- Medina, M. E., 1988. *Estudio de la Vegetación de la Barranca de Acazónica en el centro del estado de Veracruz, Méx.* Tesis Profesional. Facultad de Biología, Universidad Veracruzana, Xalapa, Ver.
- Miranda, F. y E. Hernandez X., 1963. Los tipos de vegetación en México y su clasificación. *Bol. Soc. Bot. Mex.*, **28**: 29-179. Oliva, R. H., 1983. *Contribución al conocimiento de las Loranthaceae del centro de Veracruz y zona limítrofe con el estado de Puebla*. Tesis Prof. Fac. de Biología, Universidad Veracruzana, Xalapa, Veracruz, México.
- Restrepo, C., 1985. Aspectos ecológicos de la diseminación de cinco especies de muérdagos. Tesis Lic. Universidad del Valle, Calli, Colombia.
- Rodríguez, J. L. S. y J. Espinoza, G., 1996. Listado florístico del estado de Michoacán. Sección III (Angiospermae) Fascículo complementario X. *Flora del Bajío y regiones adyacentes*. Instituto de Ecología, Pátzcuaro, Michoacán, 296 pp.
- Ruvalcaba, S.J.G., C.A. Álvarez S. y M. Cházaro B., 2003. *Nota sobre la presencia del muérdago: *Struthanthus interruptus* (HBK) Blume, Loranthaceae, en el arbolado urbano de la zona metropolitana de Guadalajara, Jalisco, México*. Memorias III Congreso Iberoamericano de Parques y Jardines, Guadalajara, Jal. pp.120-127.
- Rzedowski, J., 1978. *Vegetación de México*, Editorial Limusa, México, DF.
- Rzedowski, J. & R. McVaugh., 1966. La Vegetación de la Nueva Galicia. *Contr. Univ. of Michigan Herbarium*, **9**(1): 1-123.
- Sosa V. & A. Gómez-Pompa, 1994. *Lista florística. Flora de Veracruz*. Fascículo 82. Instituto de Ecología A. C., Xalapa, Ver. y University of California-Riverside, USA, 245 pp.
- Standley, C. P. & J. Steyermark., 1944. Studies of Central American Plants. IV Publ. *Field. Mus. Nat. Hist. Bot. Ser.*, **23**(4): 62-86.
- _____ 1946. Loranthaceae. Flora of Guatemala. *Fieldiana Botany*, **24**: 62-86.
- Sutton, G. M., 1951. Dispersal of mistletoes by birds. *Wilson Bull.* **63**: 235-237.
- Téllez, V. O., 1994. *Flora, vegetación y fitogeografía de Nayarit, México*. Tesis de Maestría, Facultad de Ciencias, Universidad Nacional Autónoma de México, México D. F. 166 pp.
- Vázquez, O. G., 1996. Plantas parásitas: un problema para los árboles de la ciudad de Guadalajara. Periódico *Ocho Columnas*, pág. 4D, 3 de diciembre.

Translated from Spanish to English by Liliana María Jaramillo Atehortúa and Daniel L. Nickrent

Table 1. List of the species of Loranthaceae and Viscaceae known from the State of Veracruz

1. *Arceuthobium gilli* Hawks. & Wiens
2. *A. globosum* Hawks. & Wiens
3. *A. pendens* Hawks. & Wiens
4. *A. vaginatum* (Willd.) Presl.
5. *Cladocolea oligantha* (Standl. & Steyerl.) Kuijt
6. *Dendrophthora costaricensis* Urban
7. *Phoradendron annulatum* Oliver
8. *P. bolleanum* (Seem.) Eichler
9. *P. brachystachyum* (DC) Nutt.
10. *P. calyculatum* Trel.
11. *P. dipterum* Eichler
12. *P. falcatum* (Schlecht. & Cham.) Trel.
13. *P. galeottii* Trel.
14. *P. minutifolium* Urban
15. *P. mucronatum* (DC) Krug & Urban
16. *P. nervosum* Oliver
17. *P. oliverianum* Trel.
18. *P. pedicellatum* (Tiegh.) Kuijt = *P. wawrae* Trel.
19. *P. piperoides* (HBK) Trel.
20. *P. purpusii* Trel.
21. *P. quadrangulare* (HBK) Krug & Urban = *P. tamaulipense* Trel.
22. *P. robinsonii* Urban
23. *P. robustissimum* Eichler
24. *P. schumannii* Trel.
25. *P. teretifolium* Kuijt
26. *P. tetrapterum* Krug & Urban
27. *P. velutinum* (DC) Nutt.
28. *P. villosum* Nutt.
29. *Psittacanthus americanus* (Jacq.) Mart.
30. *P. calyculatus* (DC) Don.
31. *P. ramiflorus* (DC) G. Don
32. *P. schiedeanus* (Schlecht. & Cham.) Blume
33. *Struthanthus cassythoides* Millsp. ex Standl.
34. *S. densiflorus* (Benth.) Standl.
35. *S. deppeanus* (Schlecht. & Cham.) Blume
36. *S. quercicola* (Schlecht. & Cham.) Blume