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Notes on the flora of the Yucatan Peninsula (Mexico) X: restoration of Casearia subsessiliflora Lundell (Salicaceae), an endemic species of the Yucatan Peninsula

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Abstract

CARNEVALI FERNÁNDEZ-CONCHA, G., R. DUNO DE STEFANO, J. L. TAPIA, G. ROMERO & I. RAMÍREZ MORILLO (2008). Notes on the flora of the Yucatan Peninsula (Mexico) X: restoration of Casearia subsessiliflora Lundell (Salicaceae), an endemic species of the Yucatan Peninsula. *Candollea* 63: 85-91. In English, English and French abstracts.

Casearia subsessiliflora Lundell *(Salicaceae),* endemic to Mexican portion of the Yucatan Peninsula Biotic Province, had hitherto been placed in the synonymy of *Casearia sylvestris* Sw. Herbarium material of *Casearia subsessiliflora,* however, differs morphologically from specimens of *Casearia sylvestris* collected elsewhere in Mexico, Central America, and the Antilles. We herein provide evidence to treat *Casearia subsessiliflora* as a distinct taxon different from *Casearia sylvestris.*

Key-words

SALICACEAE – *Casearia* – Mexico – Taxonomy – Flora

Résumé

CARNEVALI FERNÁNDEZ-CONCHA, G., R. DUNO DE STEFANO, J. L. TAPIA, G. ROMERO & I. RAMÍREZ MORILLO (2008). Notes sur la flore de la péninsule du Yucatan (Mexique) X: restauration de Casearia subsessiliflora Lundell (Salicaceae), une espèce endémique de la péninsule du Yucatan. *Candollea* 63: 85-91. En anglais, résumés anglais et français.

Casearia subsessiliflora Lundell *(Salicaceae),* plante endémique de la portion mexicaine de la province Biotique de la Péninsule du Yucatan, a été jusqu'ici placée sous la synonymie de *Casearia sylvestris* Sw. Néanmoins, le matériel d'herbier de *Casearia subsessiliflora* montre des différences morphologiques marquées avec des spécimens de *Casearia sylvestris* collectés dans d'autres populations du Mexique, de l'Amérique Centrale et des Antilles. Nous apportons ici des évidences pour considérer *Casearia subsessiliflora* comme un taxon différent de *Casearia sylvestris.*

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Introduction

Casearia Jacq., encompassing about 180 species worldwide, and ca. 75 in the New World, along with some other genera of the family *Flacourtiaceae* (Sleumer, 1980), are currently referred to the family *Salicaceae* (APG, 2003). *Casearia subsessiliflora* Lundell was based on one of the collections made by C. L. and A. A. Lundell in the archeological zone of Coba, along the border of Mexico's states of Quintana Roo and Yucatan in the Yucatan Peninsula. The protologue of this species includes an adequate description but provides no clues on how to differentiate it from the other three species currently referred to *Casearia* section *Crateria* Benth. (fide Sleumer, 1980: *Casearia selloana* Eichler, *C. obliqua* Spreng., and *C. sylvestris* Sw.). The author did point out that *C. subsessiliflora* was part of the *C. sylvestris* complex and placed it next to *C. formosa* Urb. (Lundell, 1941).

Sleumer (1980), in his treatment of *Flacourtiaceae* for *Flora Neotropica,* referred *C. formosa* and *C. subsessiliflora* to the synonymy of *C. sylvestris* without discussing this taxonomical decision. As circumscribed by Sleumer (1980), *C. sylvestris* is a polymorphic species with an extensive geographical and ecological distribution (Mexico to Argentina and the Antilles, collected in a variety of habitats). An evaluation of botanical material from several herbaria, however, suggests that the entity found in the Yucatan Peninsula differs from Sleumer's concept of *C. sylvestris.*

Up to six species of *Casearia* are included in published checklists of the Mexican Yucatan Peninsula: *C. aculeata* Jacq., *C. corymbosa* Kunth, *C. emarginata* Griseb., *C. guianensis* (Aubl.) Urb., *C. nitida* Jacq., and *C. sylvestris* Sw. (e.g. Standley, 1930; Sousa & Cabrera, 1983; Sosa & al., 1985; Téllez Valdes & Cabrera Cano, 1987; Durán & al., 2000; Arellano Rodríguez & al., 2003; Gutiérrez Báez, 2003). All of these compilations have either ignored or overlooked *C. subsessiliflora,* which is not even mentioned in the synonymy of *C. sylvestris*. During our attempt to treat the *Salicaceae* for the upcoming "Illustrated Flora of the Yucatan Peninsula" we studied botanical and bibliographical material related to the *C. sylvestris* complex, particularly the status of the populations referred to *C. sylvestris* in the Yucatan Peninsula Biotic Province (YPBP). We aimed to assess whether these populations were conspecific with *C. sylvestris* or distinct, the latter situation requiring the restoration of *C. subsessiliflora.*

Methodology

We studied selected herborized material of *C. sylvestris* from Mexico, Central America and the Antilles from the following herbaria: A, CICY, F, GH, LL, UADY, UCAM, US and XAL), following standard herbarium methodology to investigate the morphology of the specimens (Leenhouts, 1968). Using this methodology, differences in general discontinuous, both vegetative and floral characters, were evaluated. In addition, we examined *in vivo* native populations from YPBP referable to this complex (hereafter referred to "YPBP-*C. sylvestris*"). We performed a morphometric study to test the hypothesis that YPBP-*C. sylvestris* displayed patterns of morphological discontinuity in relevant continuous characters with respect to other populations of *C. sylvestris* from other localities in Mexico, Central America, and the Antilles. For the study of continuous characters we chose seventeen specimens of *C. sylvestris* from throughout Mexico and Central America but outside the YPBP and twelve specimens of YPBP-*C. sylvestris* representing at least eight populations. Five variables were selected, namely: length and width of the leaf blade, petiole length, distance between internodes at branches, and number of marginal teeth per unit length (this measure taken below the widest portion of leaf blade). For both set of populations four to six mature leaves were measured. To ensure developmental maturity, no data were taken from the four distal-most leaves in any given branch. The statistical analyses (*t*-test independent sample by group) were performed with the STATISTICA software package (ver. 6.0; Statsoft).

Results

The YPBP-*C. sylvestris* specimens are clearly referable to *Casearia* sect. *Crateria* (their flowers bear 10 subequal stamens, free disc lobes, which are set in the same verticil and alternate with the stamens, a 3-fid style, and the fruits are 1-to many-seeded capsules; Sleumer, 1980). They showed both discrete and continuous differences in vegetative and reproductive characters when compared to specimens collected outside the Yucatan Peninsula. The YPBP-*C. sylvestris* featured smaller leaves that are ovate to ovate-elliptic, with rounded, slightly asymmetric bases, the inflorescences are fasciculate, with the pedicel almost absent, flowers are subtended by many conspicuous, scarious, closely imbricating bracts at the base. However, the most striking difference between both sets of populations is the morphology of stamens and staminodes, which together form a corona-like structure (Fig. 1D). In YPBP-*C. sylvestris* specimens, the bases of stamens and staminodes are flat, forming a well-developed corona, which is up to 1 mm high; this structure is conspicuously pubescent on the inner surface, while the apex of the staminodes are

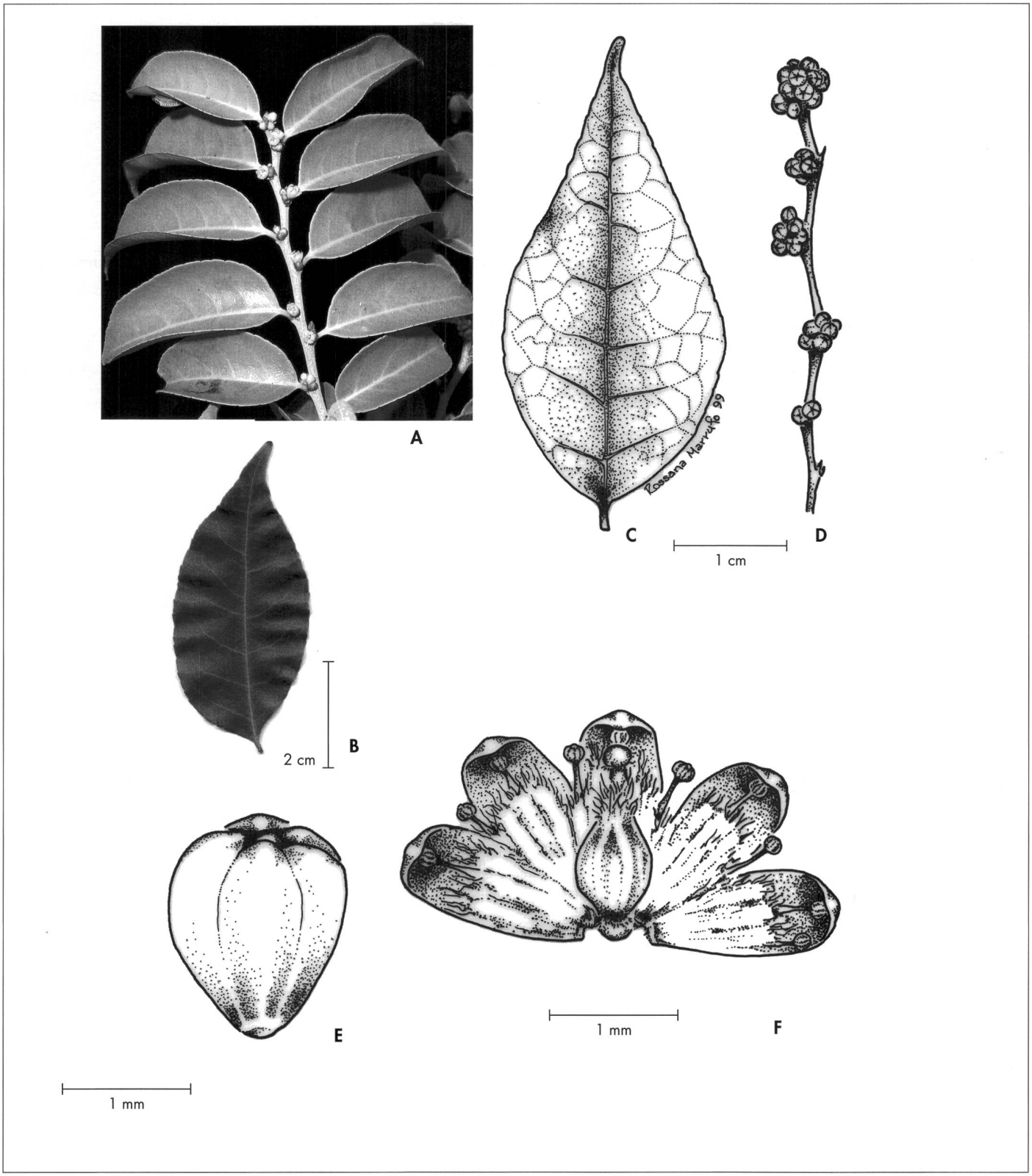

Fig. 1. – *Casearia subsessiliflora* Lundell. **A.** Branch with inflorescences; **B, C.** Leaves (adaxial surface), two different shapes; **D.** Detail of a flowering, leafless branch; **E.** Flower bud detail; **F.** Mature flower, longitudinal view showing ovary, and staminal corona.

[**A-B:** *G. Carnevali 6410*, CICY; **C, E, F, D:** *E. Cabrera 996*, CICY]

Table 1. – Relevant morphological differences in *Casearia sylvestris* between YPBP-*C. sylvestris* and *C. sylvestris* from outside YPBP.

	YPBP-*C. sylvestris* (*C. subsessiliflora*)	**Extra YPBP-*C. sylvestris***
Leaf shape	ovate to narrowly ovate	ovate-oblong to elliptic and oblong-elliptic
Leaf base	rounded, slightly asymmetric,	cuneate or obtuse, asymmetric
Margin	crenulated to fine serrate	subcrenate-serrate to entire
Leaf margin length [cm]	(2.3-)3.5-6.0(-8) × (1)2-2.7(-3.2)	(3-)6-14 × (2-)3-5(-7)
Number of secondary nerves	7-10	5-7
Petiole length [mm]	4-6	4-8
Floral bract	scarious, 2 or 3 per flower, 2 mm long, ovate, slightly indumented in the abaxial surface, covering the base of the flower up to mid-height of its longitude	coriaceous, one per flower, 1 mm long, narrowly triangular up to triangular, slightly indumented in the abaxial surface, covering only the pedicel
Pedicel length [mm]	absent or less than 0.5, not articulate	2- 5, articulate in the middle or the base
Sepal aestivavation and length [mm]	valvate, about 1.5	imbricate, about 2
Corona-like structure	stamens and staminodes fused to each other for ¾ of their length, ca. 0.5 mm long	stamens and staminodes fused near the base, ca. 2 mm long
Ovary shape	ovate-spheroid	obovate angular
Style length [mm]	0.3	0.5-1

truncate and fimbriate. Furthermore, the filaments are joined to the corona for 2/3 of their length. In contrast, staminodes are more or less fleshy, not flat; the corona-like structure is only 0.2 to 0.3 mm high, and the apex of the staminodes are acute and not fimbriate. Moreover, the filaments are joined to the corona for 1/3 of the length of the corona-like structure in specimens of *C. sylvestris* collected outside YPBP. Table 1 shows the main morphological (continuous and discrete characters of both vegetative and floral structures) differences between both sets of populations.

All five continuous characters chosen for the statistical assessment of differences between both groups of specimens showed normal distributions and we did not detect any significant differences between the variances of the variables (Brown & Forsythe test). Table 2 shows the statistical values for selected continuous characters for YPBP-*C. sylvestris* and *C. sylvestris* collected outside YPBP. Variables leaf blade length and leaf blade width, petiole length, and internode distance all show a similar pattern. *Casearia sylvestris* collected outside YPBP has a longer and wider leaf blade, longer petiole, and longer distance between the internodes thant YPBP-*C. sylvestris*. All the differences are statistically significant. On the other hand, there are significantly more number of marginal teeth per unit of length in YPBP-*C. sylvestris* than *C. sylvestris* collected outside YPBP.

Since all the collection of YPBP-*C. sylvestris* are unambiguously conspecific with the type of *C. subsessiliflora,* we propose to restore Lundell's species as a distinct taxon from *C. sylvestris*. It grows in much drier environments than true *C. sylvestris* and it is restricted to a belt of medium height (10-20 m) subcaducifolious forests toward central and southern Yucatan State and northeastern Quintana Roo State in the Mexican portion of the YPBP (Fig. 2). Thus, as here circumscribed, the populations of *Casearia* sect. *Crateria* from the northern portion of the Yucatan and Quintana Roo belong to a taxon that is restricted to the YPBP, while true *C. sylvestris* occurs in Belize, the Guatemalan Peten, and neighboring States of Tabasco and Chiapas, and then southwards into South America and the West Indies.

An apparently related species from Cuba, *Casearia formosa* Urb., only known from the type collection, is housed at the Stockholm herbarium (S) with a fragment at A and NY. Digital images of these collections were studied for our analysis. These specimens lack well-developed inflorescences, a situation which precludes us from the observation of floral pedicels and bracts, structures which are necessary to assess conspecificity with either *C. subsessiliflora* or *C. sylvestris*. Thus, with the evidence at hand, we have chosen to follow Gutiérrez Amaro (2000), who referred *C. formosa* to the synonymy of *C. sylvestris* var. *mirycoides* (Griseb.) J. E. Gut.

In the following section, an amplified description of *C. subsessiliflora* is offered and iconography depicting the species is presented for the first time. Furthermore, we provide a key to the five species of *Casearia* known from the Mexican portion of the YPBP.

Casearia subsessiliflora Lundell in Contr. Univ. Michigan Herb. 6: 50. 1941 (Fig. 1).

Typus: Mexico: Quintana Roo, Coba, in advanced forest east of the ruins, 5 July 1938, *Lundell, C. L. & A. A. Lundell 7824* (holo-: MICH; iso-: A!, F, LL, NY!, US!).

Tree or shrub up to 8 m high; stem densely ramified, terete, young branches fragrant, densely and diminutely velutine-tomentulose, lenticels present; leaves membranaceous, pellucid-punctuate, simple, alternate, exestipulate; petiole up to 6 mm long, sulcate in the middle and occasionally finely and densely tomentulose; blade (2.3-)3.5-6(-8) cm long, (1-)2-2.7 (-3.2) cm wide, ovate to narrowly ovate, apex narrowly acute, with abundant translucid dots, 0.5-2 mm long, base rounded, slightly asymmetric, margins crenulated to finally serrulate, glabrous in the lower surface, glabrous and lustrous in the adaxial surface, mid-nerve prominent in the abaxial surface, often finely and densely tomentulose at the base, 7-10 pairs of secondary nerves, these perpendicular to the midnerve, but curving in the distal portion near the margin of the blade, more conspicuously raised in the abaxial surface, tertiary venation inconspicuous on the abaxial surface. *Inflorescences* axillar, densely fasciculate, multiflowered, 3-5 mm diameter. *Flowers* minute, sessile or subsessile, totally covered by the bracts, which are 2 or 3 per flower, these scarious, ovate, puberulent, 2 × 1 mm; calyx deeply 5-partite, lobes oblong to obovate-oblong, apex rounded to obtuse, puberulent on the outer surface; petals absent; androecium with 10 stamens and 10 staminodes, arranged as a 1 mm tall corona-like structure with alternate stamens and staminodes that are fused to each other for 3/4 of their length and to the inner surface of the calyx below their midlength; stamens included, 5 opposite and 5 alternate to the calyx lobes, filaments pilose, the distal 1/4 projecting beyond the corona; anthers globose, with 2 tecae, basifixed, longitudinally dehiscent; apex of the staminodes conspicuously fimbriate; ovary ovate-spheroid, glabrous, style 0.3 mm long, conspicuously pubescent, stigma 3-fid, each lobe capitate; fruit an ovoid-globose capsule, 3-5 mm diameter.

Distribution. – Only known from the Yucatan Peninsula, toward central and southern Yucatan State and northeastern Quintana Roo in Mexico. It grows in medium height (10-20 m) subcaducifolious forests between 20 and 50 m elevation (Fig. 2).

Additional material examined. – **Mexico. Quintana Roo:** Zona Arqueológica de Cobá, 20°29'30"N 87°43'45"W, 22.VIII.2001, *G. Carnevali 6410* (CICY); Rancho El Eden, 21°12'N 87°11'W, 20 m, 17.II.1999, *G. O. Schultz & R. Palestina 1083* (CICY); Cobá, 20°29'15"N 87°44"W, 22.III. 1994, *R. R. Sears & al. 76* (CICY). **Yucatán:** alrededores de la zona arqueológica de Sayil, 20°10'41"N 89°39'07"W, 19.VII.1985, *E. Cabrera & H. de Cabrera 9021* (XAL); a 5 km al O de Chemax, 20°39'55"N 87°59'20"W, 19.XII.1985, *E. Cabrera & H. de Cabrera 9996* (CICY, GH); Zona Arqueológica Sayil, 20°10'37"N 89°39'90"W, ca. 150 m, 21.XI. 2006, *G. Carnevali & al. 7186* (CICY, FLAS, HUH, MEXU, MO, NY, TEX, UAMIZ, UCAM, XAL); alrededores Hacienda Santa Ana, 10.VIII.1956, (fl.), *O. G. Enríquez 728* (US); Tinum, 20°38'40"N 88°20'28"W, 11.IX. 2001, *F. May & S. Peraza* 1983 (CICY, MO); al O de Ticul, 16.IX.1954, *F. Miranda 8068* (US); Sayil, 20°10'37"N 89°39'07"W, 9.VII.1981, *A. Puch & M. Narváez 515* (CICY); Sayil, 20°10'37"N 89°39'07"W, 8.XI.1981, *A. Puch & M. Narváez 695* (CICY, XAL); Valladolid, 22.VI.1988, *P. Simá 756* (CICY); camino blanco de Dzitnup, 20°40'25"N 88°14' 35"W, 22 m, 2.II.1982, *E. Ucan 1919* (XAL); San José, 20°40'00"N 88°18'00"W, 22 m, 2.II.1982, *E. Ucán 1912* (XAL); carretera Uayma hacia Pixoy, 20°43'01"N 88°19' 01"W, 22 m, 15.VI.1983, *E. Ucán 2520* (CICY); 1 km al W de la desviación, km 20 de la carretera El Cuyo a Colonia Yucatán, 21°21'20"N 87°45'30"W, 10.VII.1992, *P. Simá & al. 1418* (CICY).

Notes. – Plants referable to *C. subsessiliflora* have been collected in flower and/or fruit in June and November to December. It is locally known as "Ak a tzup che" (Maya), and "Balsamillo" (Spanish). *Casearia subsessiliflora* (as *C. sylvestris)* is reported as medicinal in herbarium specimen labels.

Key to the species of *Casearia* from the Yucatan Peninsula

1. Inflorescences corymbiform panicles, conspicuously pedunculate 2

1a. Inflorescences fascicles, non pedunculate 3

2. Leaves membranaceous to chartaceous, pellucid-punctate and lineate, apex short-to rarely long-acuminate, or obtuse to even rounded ..... ***C. corymbosa***

2a. Leaves subcoriaceous to coriaceous provided with pellucid dots, apex shortly and bluntly subacuminate, rarely attenuate or obtuse ..... ***C. nitida***

3. Leaves deciduous, obovate or obovate-spathulate, apex rounded, truncate, or emarginate, (5-)1-2(-2.5) cm long upon maturity, with 2-3 secondary nerves subparallel to the mid-nerve borne just above the basal 1/3 of the leaf, but leaves not clearly 3-nerved; flowers solitary or in 2-3-flowered fascicles, emerging when the new leaves are flushing ..... ***C. emarginata***

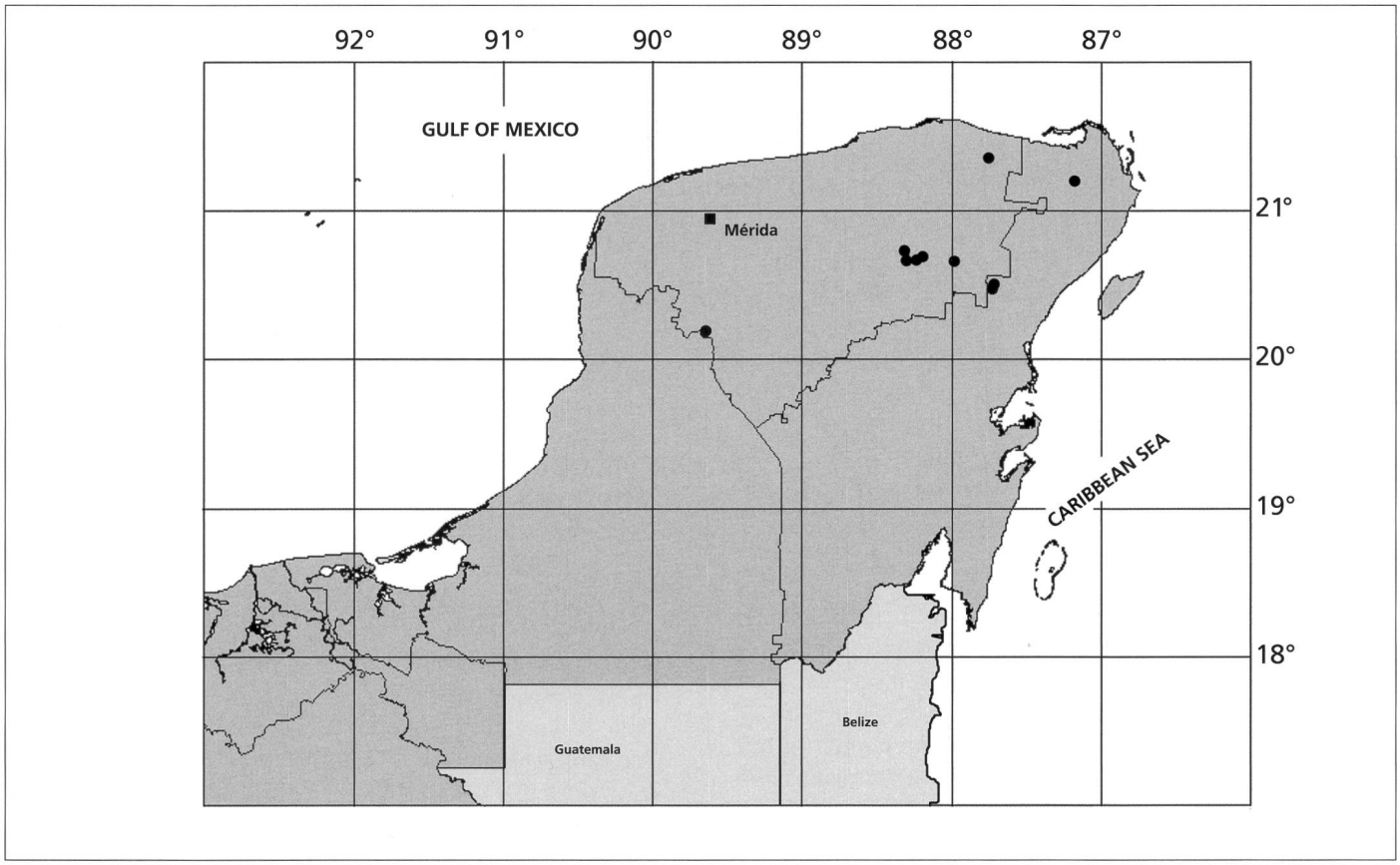

Fig. 2. – Mexican portion of the Yucatan Peninsula. Distribution of *Casearia subsessiliflora* Lundell (•).

3a. Leaves perennial or, if deciduous, persisting until well-entered the dry season (up to at least December), elliptic, ovate-elliptic to oblong-elliptic, apex acute or acuminate, rarely obtuse, (2.3-)4-6(-8) cm long upon maturity, totally penninerved; flowers in few- to many-flowered fascicles, borne when leaves are fully mature 4

4. Leaves membranous, drying dull olive-green, ovate to narrowly ovate, abruptly or gradually acuminate, the primary nerves first perpendicular to mid-nerve, then arching distally toward the leaf margin; inflorescences 2-6 mm diameter; flowers essentially sessile with pedicels <1 mm long; fruits 2-3 mm long when dry ..... ***C. subsessiliflora***

4a. Leaves coriaceous, drying dull greenish yellow, elliptical or oblong elliptic, acute or short acuminate, the primary nerves in a 45° angle to the mid-nerve; inflorescences ca. 10 mm diameter; flowers sharply pedicelled with 2-3 mm long pedicels; fruits 4-6 mm long when dry. ***C. aculeata***

Acknowledgments

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Table 2. – Statistical analysis of some continues characters in *Casearia sylvestris* of the vegetative morphology of YPBP-*C. sylvestris* (*C. subsessiliflora*) and *C. sylvestris* from outside YPBP.

	Normal distribution value [1] *C. subsessiliflora*	Normal distribution value [1] *C. sylvestris*	Mean and standard deviation *C. subsessiliflora*	Mean and standard deviation *C. sylvestris*	T-Test for Independent sample by group [3]
Leaf blade length [cm]	*K-S* d = 0.11, $p > 0.20$ (n = 55)	*K-S* d = 0.12, $p > 0.20$ (n = 72)	5.78 ± 0.7	8.81 ± 2.06	$F_{(1,126)} = 23.60$, $p = 0$
Leaf blade width [cm]	*K-S* d = 0.14, $p > 0.20$ (n = 55)	*K-S* d = 0.12, $p > 0.20$ (n = 72)	2.37 ± 0.3	3.01 ± 0.76	$F_{(2,126)} = 39.35$, $p = 0$
Distance between internodes [cm]	*K-S* d = 0.20, $p > 0.05$ (n = 55)	*K-S* d = 0.09, $p > 0.20$ (n = 72)	1.13 ± 0.29	1.59 ± 0.55	$F_{(3,126)} = 26.32$, $p = 0$
Number of teeth [per cm]	*K-S* d = 0.23, $p < 0.01$ (n = 55)	*K-S* d = 0.22, $p < 0.01$ (n = 72)	3.98 ± 0.73	3.65 ± 0.9	$F_{(4,126)} = 4.07$, $p = 0.04$
Petiole length [cm]	*K-S* d = 0.29, $p < 0.01$ (n = 55)	*K-S* d = 0.20, $p < 0.01$ (n = 72)	0.28 ± 0.06	0.45 ± 0.11	$F_{(5,126)} = 10.39$, $p = 0$

(1) Normal distribution: Kolmogorov-Smirnov test
(2) Brown & Forsythe test
(3) Statiscal difference between means

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