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The Palms of a Tropical Rain Forest in Veracruz, Mexico

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The Palmae is a medium-sized family in México with 21 genera and some 150 species (Aguilar 1986, Quero 1986). Of these, 15 genera and about 40 species can be found in the phytogeographically interesting Sierra de Los Tuxtlas area in the southern state of Veracruz where Caribbean, Central American, and Mexican mainland floristic elements meet. In this zone the Instituto de Biología of the National Autonomous University of México maintains a field station (Estación de Biología Tropical "Los Tuxtlas"), located between 95°04'/95°09'W and 18°34'/18°36'N, for research and study. The station contains large pockets of virgin tropical rain forest in its 700 hectares. The number of vascular plant species in this reserve is about 818 (Ibarra-Manríquez and Sinaca 1987), and of these 289 are trees and 223 herbs. As part of a comprehensive floristic project, initiated in 1982 (Ibarra-Manríquez 1985), this report presents descriptions of the palm species found in the preserve, a key to their identification, phenological data, and their common names and uses. The collections on which this study is based are located mainly in MEXU and the reference herbarium maintained in the station.

Ten species in six genera are encountered in the preserve. Most are represented by just one species except *Chamaedorea*, which has 5 species. They are all understory palms and hardly reach 10 m in height. One of the most striking characteristics of this forest is the abundance of the palms, especially *Astrocaryum mexi-*

canum, which has a density of 300-1,230 individuals per hectare (Piñero et al. 1977) and has also been the subject of diverse studies including demography and population genetics. These 10 species in the reserve are easy to spot and the following key is produced as an aid in their identification.

KEY TO THE PALMS OF BIOLOGICAL STATION "LOS TUXTLAS"

1. Palms climbing 2
1. Palms not climbing 3
2. Plants unarmed 4. *Chamaedorea elatior*
2. Plants armed 8. *Desmoncus ferox*
3. Palms armed 4
3. Palms unarmed 5
4. Plants single-stemmed; trunk with verticillate markedly flattened spines; leaf-blades greyish below 1. *Astrocaryum mexicanum*
4. Plants clustered; trunk with aciculiform scattered spines; leaf-blades greenish below 2. *Bactris trichophylla*
5. Leaves entire, bifid; flowers orange 5. *Chamaedorea ernesti-augusti*
5. Leaves pinnate; flowers green or yellowish-green 6
6. Pinnae with windows between the secondary veins, cuneate, outer margins coarsely dentate 10. *Reinhardtia gracilis* var. *gracilior*
6. Pinnae without windows, elliptic to obovoid-elliptic, outer margins slightly dentate 7
7. Trunk yellowish-brown; pinnae not damaged and orange when senescent; monoecious 9. *Geonoma oxycarpa*
7. Trunk green pale or dark; pinnae with longitudinal or circular ruptures throughout the lamina when senescent, never orange; dioecious 8
8. Pinnae symmetrical; leaves 1-1.5 m long; inflorescences (1-)4-8(-11) per plant; fruit ellipsoid; plants frequently multistemmed 7. *Chamaedorea tepejilote*

8. Pinnae strongly asymmetrical; leaves 0.5–1 m long; inflorescences 1–3 per plant; fruit spherical or falciform; plants single-stemmed 9
9. Pinnae dark green above, the middle 5.5–11.5 cm wide; inflorescence infrafoliar; fruits ovoid-ellipsoidal, frequently falciform, black 6. *Chamaedorea oblongata*
9. Pinnae pale green above, the middle 2.5–5 (–6) cm wide; inflorescence interfoliar; fruits spherical, orange to black at maturity 3. *Chamaedorea concolor*

1. ***Astrocaryum mexicanum*** Liebm. ex Mart., Hist. Nat. Palm. 3: 323. 1853.

Armed, monoecious treelets (1.5–)2.5–6(–8) m tall, 4–8 cm d.b.h., trunk clothed with numerous flattened, blackish spines 15–50 mm long, arranged in whorls. Leaves pinnate, 1.5–2 m long, rachis clothed with spines and sheath open; leaf segments 15–32 on each side, 40–60 cm × 2–3.5 cm, elliptic-lanceolate, greyish beneath. Inflorescence 15–25(–35) cm × 11–20(–28) cm, interfoliar, branched, with basal flowers pistillate and staminate flowers densely congested at the upper part of the rachillae; peduncular bract 20–45 × 11–35, boat-shaped, brown, spiny and persistent. Staminate calyx 3–4 mm long, woolly; corolla 4–5 mm long, yellowish-white, glabrous; stamens 6, 2–3 mm long; pistillode absent. Pistillate calyx and corolla 2–3 mm long, scarcely woolly, yellowish-white; staminodes absent; pistil 6–7.5 mm long. Fruits 4–6 × 4–6 cm, turbinate, brown, clothed with slender spines 1–3 mm long. Germination adjacent-ligular.

Flowering March–June; fruiting September–December; nevertheless, there are individuals reproductive in forest gaps throughout the year (Fig. 1A).

Representative Specimens: *Ibarra 159, 475, 792, 1448, 2074.*

Astrocaryum mexicanum, commonly known as “chocho,” is immediately recognized by its tree-like habit, flattened spines that cloth the trunk, leaf segments greyish beneath, and spiny fruits. The palm is definitely the species with most numbers of individuals per hectare. Demographic

studies and their use in understanding community dynamics have been discussed by Piñero et al. (1986). The plants are protogynous and the time of anthesis is early morning (A. Búrquez, pers. comm.). The fallen fruits are actively removed by mice. As yet, it is not known whether most removed fruits are eaten or secondarily dispersed (R. Dirzo, pers. comm.). Squirrels (*Sciurus deppei* and *S. aureogaster*) take fruits directly from the plant and disperse some of them; several seeds may germinate and establish on trunks or branches visited by them. Moles (*Orthogeomys hispidus*) eat the roots, frequently felling the plants. *A. mexicanum* plays a useful role in the local economy; the young inflorescence and endosperm are eaten; the leaves form excellent material for thatching; and the trunks are used for handles or tools. The species ranges from México (Veracruz, Tabasco, Oaxaca, and Chiapas) to Guatemala.

2. ***Bactris trichophylla*** Burret, Repert. Spec. Nov. Regni Veg. 32: 113. 1933.

Armed, monoecious palm, 2–4 m tall, 1.5–4 cm d.b.h.; plants caespitose, forming clumps of (1–)3–10 stems per individual, numerous acicular, blackish spines, 3–60 mm long scattered on stems. Leaves pinnate, 1–2 m long; rachis clothed with spines and sheath open; leaf segments (5–)12–18(–25) on each side, 20–35 × 2–5 cm, elliptic-lanceolate. Inflorescence 10–15 cm long, 7–12 cm wide, infrafoliar, branched, with staminate flowers scattered among the pistillate; peduncular bract 12–25 × 6–13 cm, boat-shaped, brown or blackish-brown, spiny and persistent. Staminate calyx 0.8–1 × 2.5–3 mm, yellowish; corolla 2.5–3.5 × 2.5–3.5 mm., yellowish; stamens 6, 1.8–2.5 mm long; pistillode absent. Pistillate calyx 0.8–1 × 0.8–1 mm, yellowish; corolla 4.5–5 × 2.8–3.2 mm, yellowish, perianth strongly obovoid; staminodes present; pistil 5–6 mm long. Fruits 10–20 × 12–21 mm, sub-spherical, red. Germination adjacent ligular.



1. A) *Astrocaryum mexicanum*; B) *Bactris trichophylla*; C) *Chamaedorea concolor*.

Flowering March–June; fruiting (August–) September–January(–February) (Fig. 1B).

Representative Specimens: Ibarra 170, 228, 867, 1967, 2433, 3088, S. Sinaca C. 1222.

Bactris trichophylla, commonly known as “chischi,” is recognized by its clumping habit and acicular spines that clothe the trunk. The plants are protogynous and the time of anthesis is in the evening (A. Búr-

quez, pers. comm.). The floral cycle is completed in about 24 hrs. The fruits are severely damaged by insects. The species ranges from Mexico (Veracruz, Tabasco, Quintana Roo) to Guatemala.

3. **Chamaedorea concolor** Mart., Hist. Nat. Palm. 3: 160. 1838.

Unarmed, dioecious palm 1.5–2(–3) m tall; 1–4 cm d.b.h.; trunk green, ringed with leaf scars. Leaves pinnate, 0.5–0.7 m long, sheath tubular; leaf segments 4–7 on each side, (11–)18–27 × (2–)5–9 cm wide, elliptic, strongly sigmoid. Inflorescence 30–40 cm long, interfoliar, branched; bracts 2(–3), 2.5–9 × 0.4–0.6 cm, tubular, brown, persistent. Staminate calyx 0.6–1.2 × 1.8–2.2 mm, pale green; corolla 2.7–3.2 × 1.5–2.1 mm, cup-shaped, green, greenish-yellow at the base; stamens 6, 1.8–2 mm long, pistillode 2–2.2 mm long. Pistillate calyx 0.5–0.8 × 1.5–1.7 mm, green; corolla 1.3–1.5 mm × 1.8–2 mm, yellowish-green; staminodes absent; pistil 0.9–1.2 mm long. Fruits 6–7 mm × 6–7 mm, spherical, orange to black. Germination adjacent ligular.

Flowering May–July (–August); fruiting November–February (Fig. 1C).

Representative Specimens: *Ibarra* 237, 344, 448, 992, 1774, 1790, 2103, 2485.

Chamaedorea concolor is recognized by its typical circular ruptures (rarely longitudinal) in the lamina (present almost as in *C. oblongata*), interfoliar inflorescence, and spherical fruits. The palm is shade-tolerant. The pollination is probably by wind. The fruits are dispersed by birds (D. Van Dorp, pers. comm.). The leaves of this plant are used in ornaments. Its distribution ranges from México (Hidalgo, Puebla, Veracruz, Tabasco, Oaxaca, and Chiapas) to Guatemala and Honduras.

4. **Chamaedorea elatior** Mart., Linnaea 5: 205. 1830.

Unarmed, dioecious climbing palm, 0.8–2.5 cm d.b.h.; trunk green, rarely with

ringed leaf scars. Leaves pinnate 0.7–1.5 (–2) m long, sheath open tubular; leaf segments 9–19 on each side, 13–35 × 1.5–6 cm, elliptic. Inflorescence 20–30 cm long, interfoliar, branched; bracts 3–5, 6–13 × 0.6–1 cm, tubular, brown, persistent. Staminate calyx 0.5–0.8 × 2–2.2 mm, pale green; corolla 2.8–3 × 1.8–2 mm, white, cup-shaped; stamens 6, 2.2–2.6 mm long; pistillode 2–2.2 mm long. Pistillate calyx 1–1.2 × 2.2–2.8 mm, green; corolla 2.6–2.8 × 3–3.2 mm, white; staminodes absent; pistil 2–2.2 mm long. Fruit 9–11 × 11–13 mm, spherical, black. Germination adjacent ligular.

Flowering April–June; fruiting December–January (Fig. 2B).

Representative Specimens: *Ibarra* 922, 1176, 2876, *S. Sinaca* C. 642, 643, 716, 1212, 1213.

Chamaedorea elatior, commonly known as “Junco blanco,” is immediately recognized by its unarmed climbing habit. The pollination is probably by wind and the fruits are dispersed by birds. Its leaves are used in the construction of traps for shrimps and rarely for ornament. The species ranges from Mexico (Veracruz, Oaxaca, and Chiapas) to Guatemala and Honduras.

5. **Chamaedorea ernesti-augusti**

H. A. Wendl. in Otto & Dietr., Allg. Gartenzeitung 20: 73. 1852.

Unarmed, dioecious palm, 1.5–2 m tall, 1–1.5 cm d.b.h., trunk green, ringed with leaf scars. Leaves simple, 0.5–1.2 m long, sheath open, lamina 40–60(–90) × 20–35 cm, cuneate-ovate, deeply cleft at the apex. Staminate inflorescence 20–30 cm long, branched, interfoliar; pistillate inflorescence 70–110 cm long, unbranched, interfoliar; bracts 5–7, 11–50 × 0.4–0.6 cm, tubular. Staminate calyx 0.8–1.2 × 1.5–2 mm, green; corolla 2.5–2.8 × 2–2.7 mm, orange; stamens 6, 1.3–1.5 mm long; pistillode 1.2–1.5 mm long. Pistillate perianth similar to those of staminate flowers; staminodes 6, 1.5–2 mm long; pistil 1.8–2 mm long. Fruit 12–14 × (6–)8–10 mm, subspherical or



2. A) *Chamaedorea ernesti-augusti*; B) *C. elatior*; C) *C. oblongata*.

ellipsoidal, black. Germination adjacent ligular.

Flowering January–March(–April); fruiting February–September(–December) (Fig. 2A).

Representative Specimens: *Ibarra* 273, 430, 1177, 1390, 1391, 2073, 2263, 2264, *S. Sinaca* C. 597.

Chamaedorea ernesti-augusti, locally known as “cola de pescado,” is immedi-

ately recognized by its simple leaves, orange flowers, and unbranched pistillate inflorescence. The plants are shade-tolerant and the seeds are dispersed by birds. There is little differentiation between the sexes in nitrogen, phosphorus, potassium, and total non-structural carbohydrates, among leaves and stems. The ratio of vegetative to reproductive biomass is 3.5 for males but only 1.2 for females on a per module basis (Bullock 1984). The species ranges from México (Veracruz, Tabasco, and Chiapas) to Honduras.

6. ***Chamaedorea oblongata*** Mart.,
Hist. Nat. Palm. 31: 160. 1838.

Unarmed, dioecious palm, 1–3 m tall, 1–2 cm d.b.h.; trunk green, ringed with leaf scars. Leaves pinnate, 0.6–1 m long, sheath tubular, sometimes slightly open; leaf segments 5–9 on each side, 12–29 × 2–8 cm (–13 cm at the leaf apex), rhombic-lanceolate, strongly sigmoid. Inflorescences 1–3 per plant, 30–50 cm long, infrafoliar, branched; bracts 4–6, 3–27 × 0.6–0.8 cm, tubular, green, persistent. Staminate calyx 3–3.2 × 0.5–1 mm, green; corolla 3.8–4 × 2.2–2.5 mm, greenish; stamens 6, 1.8–2 mm long; pistillode 2–2.2 mm long. Pistillate calyx 0.8–1 × 2.5–2.8 mm, green, cup-shaped; corolla 2.3–2.6 × 1.8–2.2 mm, greenish; staminodes absent; pistil 1.8–2.2 mm long. Fruits 12–15 mm × 6–8 mm, turbinate to ellipsoidal, reniform, black. Germination adjacent ligular.

Flowering April–June; fruiting November–January (–March) (Fig. 2C).

Representative Specimens: *Ibarra* 343, 1790, 2149, 2444, *S. Sinaca* C. 234, 877, 1214, 1215.

Chamaedorea oblongata is recognized by the circular ruptures in the lamina (as in *C. concolor*), inflorescence infrafoliar, and reniform fruit. The palm is shade-tolerant. Pollination is probably effected by wind. The fruits are dispersed by birds (D. Van Dorp, pers. comm.). Leaves are

used in ornaments. The species range from México (Puebla, Veracruz, Oaxaca, and Chiapas) to Nicaragua.

7. ***Chamaedorea tepejilote*** Liebm. in
Mart., Hist. Nat. Palm. 3: 308. 1849.

Unarmed, dioecious palm, 2–4.5(–6) m tall, 2–4(–6) cm d.b.h., frequently forming clumps, 1–3(–8) stems per plant; trunk green, ringed with prominent leaf scars. Leaves pinnate, 1–1.5 m long, sheath open; leaf segments 10–20 on each side, (10–)30–50(–70) × 2–7(–9) cm, elliptic. Inflorescence 1–3(–6) at each node, 2–8(–11) per plant, 15–50 cm long, 12–20 cm wide, infrafoliar, branched; staminate bracts 14–20 × 2–4 cm, boat-shaped, green, deciduous, pistillate bracts 4–5, 2–15 cm × 0.6–1.5 cm, tubular, yellowish-brown, deciduous. Staminate calyx 0.4–0.6 × 1–1.5 mm, green; corolla 2–3 × 2–3 mm, yellowish; stamens 6, 1.8–2 mm long; pistillode 1.5–1.8 mm long. Pistillate calyx 0.3–0.4 × 2.8–3.2 mm, yellowish; staminodes absent; pistil 2–2.2 mm long. Fruits 10–15 × 6–8 mm, ellipsoidal, black. Germination adjacent-ligular.

Flowering September–January and March–July; fruiting July–January (Fig. 3A).

Representative specimens: *Ibarra* 361, 362, 1014, 1434, 2023, 2027, 2104, 3078, 3079.

Chamaedorea tepejilote, commonly known as “tepejilote,” is recognized by the typical longitudinal ruptures along the veins of the leaves, frequently multistemmed habit, and 2–8(–11) inflorescences per plant. It is a common palm forming dense patches in the forest in places where slight disturbance has occurred. In some particular areas, its local density can be even higher than that of *Astrocaryum mexicanum* (Oyama 1984). The spatial pattern of distribution is aggregated and association between sexes is independent; the sex ratio is around 1:1 (Oyama 1984). The longitudinal ruptures are produced by the adults of the beetle, *Calyptocephala mar-*



3. A) *Chamaedorea tepejilote*; B) *Desmoncus ferox*; C) *Geonoma oxycarpa*; D) *Reinhardtia gracilis* var. *gracilior*.

ginipennis (Chrysomelidae). The size and number of flowers per inflorescence in the males is smaller than in the females and it has been suggested that pollination is by wind (L. Eguiarte, pers. comm.). The fruits are dispersed by birds (D. Van Dorp, pers. comm.). The young inflorescences are eaten and the leaves are much valued as ornaments. The species ranges from México (Jalisco, Veracruz, Tabasco, Oaxaca, and Chiapas) to Panama.

8. **Desmoncus ferox** Bartlett, Journ. Wash. Acad. Sci. 25: 87. 1935.

Armed, monoecious, climbing plants, 1.5–2.5 cm d.b.h., sheaths clothed with numerous scattered acicular, blackish spines, 1–4 cm long. Leaves pinnate 0.25–2(–2.5) m long, sheath tubular, rachis spiny; leaf segments 6–12 on each side, (7–)10–35 × 2–7 cm, elliptic or obovoid-elliptic, with spines 2–5 mm long on upper surface and along midvein. Inflorescence 30–40 cm long, with staminate flowers scattered among the pistillate, branched; peduncular bract 35–60 cm long, boat-shaped, brown, spiny, persistent. Staminate calyx 0.8–1.5 × 2.5–3 mm, yellowish; corolla 5.5–9 × 2–3.5 mm, yellowish, falcate; stamens 8–11, 1.5–2 mm long, subsessile; pistillode absent. Pistillate calyx 0.8–1.5 × 2.8–3.2 mm, yellowish; corolla 2–2.2 × 3–3.5 mm, yellowish; staminodes absent; pistil 2–2.3 mm long, spherical. Fruits 11–12 × 10–11 mm, subspherical to ellipsoidal, black.

Flowering May–June (Fig. 3B).

Representative Specimens: *Ibarra* 2535. *S. Sinaca* C. 1227, 1230.

Desmoncus ferox is commonly known as “junco negro.” This species is easily recognized by its climbing habit, trunk with spines, and naked leaf tips, armed with reflexed spines. The species forms clumps, with numerous stems that are a constant obstacle to anyone walking through the forest. The plant is much favored locally since its leaves are used in trap construction. The flowers are predated by insects;

in the flowers males eat the corolla and stamens and the females oviposite, killing the pistil. The species occurs from México (Veracruz and Tabasco) to Guatemala.

9. **Geonoma oxycarpa** Mart., Palmet. Orb. 30. 1843.

Unarmed, monoecious palm, (1–)4–5 (–7) m tall, 4–7 cm d.b.h., trunk yellowish-brown, ringed with leaf scars. Leaves pinnate, (0.5–)1.5–2.5 m long, sheath open; leaf segments (3–)8–13 on each side, 35–60 × 2–7.5 cm (–15 cm at the leaf apex) elliptic-lanceolate. Inflorescence 45–80 cm long, interfoliar, with staminate flowers scattered among the pistillate, branched; bracts 2, 25–35 cm long, boat-shaped, green. Staminate calyx 2–2.5 × 0.8–1 mm; corolla 2.5–3.5 × 1 mm wide, greenish; stamens 6, 2–4 mm long; pistillode 1.5 mm long. Pistillate perianth similar to those in staminate flowers; staminodes absent; pistil 2–2.5 mm long. Fruit 5–6.5 × 3.5–4.5 mm wide, ellipsoidal to spherical, black. Germination adjacent-ligular.

Flowering (September–)November–January; fruiting February–March(–July) (Fig. 3C).

Representative Specimens: *Ibarra* 997, 1247, 2021, 2144, 3137.

Geonoma oxycarpa is commonly known as “chocho blanco” and is recognized by its unarmed solitary trunk; its yellowish-brown leaf segments are coriaceous and orange when senescent (almost as in *Astrocaryum mexicanum*). The plants are confined to primary forest and in the preserve this is one of the rarer species. The fruits are dispersed by birds. The trunk is used for handles of tools. Its distribution is from México (Veracruz, Oaxaca, and Chiapas) to Nicaragua.

10. **Reinhardtia gracilis** (H. A. Wendl.) Burret, var. **gracilior** (Burret) H. E. Moore. *Principes* 1(4). 1957. *Malortia gracilis* H. A. Wendl. in Otto & Dietr., *Allg. Gartenzeitung* 21: 26, 146. 1853.

Unarmed, monoecious palm, 0.5–1.5 tall, 0.5–2 cm d.b.h., trunk brown. Leaves pinnate, rarely simple, 20–35(–50) cm long, sheath open, brown; leaf segments (1–)2(–3) on each side, 7–14 × 1.5–3.5 cm wide, cuneate with holes (windows) at the base between the folds. Inflorescence 30–40 cm long, interfoliar, with staminate flowers scattered among pistillate, branched; bracts 2, 55–75 cm long, tubular, brown, persistent. Staminate calyx 0.5–1.5 × 0.5–1.5 mm, green; corolla 3–3.5 × 0.8–1 mm, yellowish-white; stamens 10, 2.7–3 mm long; pistillode absent. Pistillate perianth similar to those in staminate flowers; staminodes 9–10, 1.8–2 mm long; pistil 1.8–2.3 mm long. Fruits 8–15 × 7–10 mm wide, ellipsoidal, black. Germination adjacent-ligular.

Flowering (May–)July–September; fruiting June–September (Fig. 3D).

Representative Specimens: *Ibarra 229, 1975, 3077, Ramamoorthy 3705.*

Reinhardtia gracilis var. *gracilior*, commonly known as “coquillo” is recognized by its small size, leaf segments cuneate with holes at the base and outer margins coarsely dentate. The spatial pattern of distribution is clumped; vegetative reproduction (clonal) in this plant is very common. The species is shade-tolerant and fruits are dispersed by birds (V. Souza, pers. comm.). The young fruits (seeds) are eaten by people. Its distribution ranges from México (Veracruz, Tabasco, Oaxaca, and Chiapas) to Honduras.

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