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The Palms of Belize: Species Richness and a Key Based on Vegetative Characters

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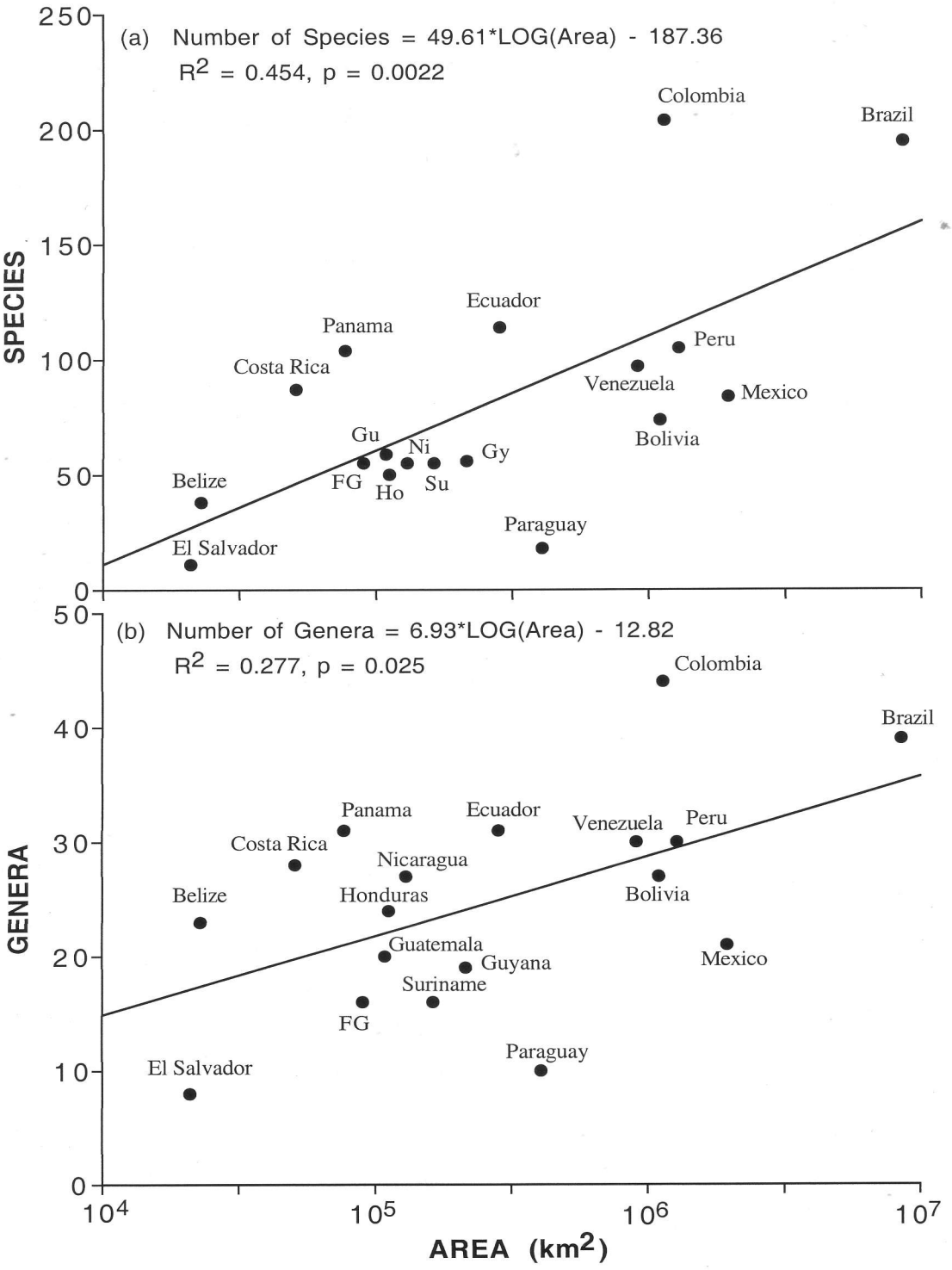
Belize (formerly British Honduras) lies between 15°53′ and 18°30′ N latitude and is the second smallest country in mainland America. When its small area is taken into account, Belize is above average for number of palm species and well above average for number of genera among tropical American countries (Figure 1a and b respectively). Six of Belize's 38 palm species are restricted in their range to one or two neighboring countries. One of these species (*Schippia concolor*) is endemic, and *Pseudophoenix sargentii* is considered endangered in the Yucatan peninsula (Durán 1995). *Colpothrinax cookii* has a very patchy distribution among Guatemala, Costa Rica, and Panama.

Perhaps the relatively high species richness of Belize is due to a great variety of vegetation types packed into a small area, from savanna and drought-deciduous scrub to evergreen wet forests. Annual rainfall and topography is also highly variable in Belize, ranging from approximately 1350 mm in the lowland north to well over 4000 mm in the mountainous south.

Furthermore, Belize is politically stable, is sympathetic to conservation and scientific research, and gives a large proportion of its land some degree of protected status. Consequently, this sparsely populated country has experienced a great increase in biological research and ecotourism. Unfortunately, an increase in the resources available for identification of woody plants in Belize using vegetative characters has not accompanied the growth of biological research and visitor interest. A notable exception is Balick and Johnson's (1994) vegetative key to the palmate-leaved palms of Belize.

The following key is a result of my work on a vegetative key to the trees of Belize. Nomenclature follows Henderson et al. (1995), and this key is meant to complement that comprehensive work. The key was developed from field observations, plus data and descriptions from Standley and Record (1936), Standley and Steyermark (1958), Balick and Johnson (1994), and Henderson et al. (1995). Those species reported by Henderson et al. (1995) for Belize (37 plus *Colpothrinax cookii*, reported by Meerman and Williams 1995 and reported as possibly in Belize by Henderson et al. 1995) are included in the key. Those species with reasonable potential to be found in Belize (8) are also included. Potential species are marked with an asterisk.

Although this key emphasizes vegetative characters, fruit characters (and occasionally inflorescence characters) are included in cases where persistent fruits (or inflorescences/infructescences, on the palm or ground beneath) are likely to enhance identification to species. Flower characters are included when useful vegetative characters may be weak or few. All identifications using this key should be confirmed with herbarium specimens, especially for the difficult genera *Chamaedorea* and *Geonoma*. It is strongly encouraged that suggestions for improvements to the key, new species records for Belize, and more consistent and/or easily observed vegetative characters for separating species in the field be sent to the author. Updated versions of the key based on such suggestions will be posted on the World Wide Web.



1. A regression of the number of (a) species and (b) genera on the area (in log scale) for the mainland neotropical countries. FG = French Guiana, Gu = Guatemala, Gy = Guyana, Ho = Honduras, Ni = Nicaragua, Su = Suriname.

A Key to the Palms of Belize

* denotes potential species

1. Leaves palmate (or "costapalmate"), i.e. fan-shaped 2
1. Leaves pinnate, i.e. feather-shaped, or pinnately veined (in simple-leaved taxa) 9
2. Stem armed with slender, often branched spines ... . *Cryosophila stauracantha*
2. Stem unarmed 3
3. Petioles armed with thorns or spines 4
3. Petioles unarmed 5
4. Stems clumped in groups of 2–15+, covered with persistent leaf bases; savannas and pine forests, of low elevation in wet soils; leaves bright green above ..... *Acoelorraphe wrightii*
4. Stems solitary (rarely clumped), only apically covered with persistent leaf bases; on hill sides; leaves dull green (to glaucous) above ..... *Brahea dulcis*
5. Leaves with a long rachis on which the segments attach (costapalmate); leaf sheaths and petioles conspicuously split lengthwise at the base; ripe fruits black 6
5. Leaf blades with a very short rachis, or rachis absent; leaf sheath split or not at the base; ripe fruits black or not 7
6. Segments joined for almost their entire length in groups of 2–3, the groups joined for about one-third their length; stem swollen at the base; inflorescence branched to 4 orders; widespread, south of Corozal ..... *Sabal mauritiiformis*
6. Segments joined for one-half their length in groups of 2 (rarely 3), the groups joined for about one-sixth their length; stem not swollen at the base; inflorescence branched to 3 orders; northern Belize (Corozal district) ..... *Sabal yapa*
7. Stem 20–35 cm diameter, often conspicuously swollen near the middle; leaf sheaths not split; ripe fruits brown or black ..... *Colpothrinax cookii*
7. Stem smaller, usually 5–13 cm diameter, not swollen near the middle; ripe fruits white 8
8. Leaf sheath and petiole conspicuously split lengthwise; blade not bilobed; bark not corky .... *Thrinax radiata*
8. Leaf sheath and petiole inconspicuously split lengthwise at the very base; blade divided to the base into 2 lobes; bark often corky ..... *Schippia concolor*
9. Stems and/or leaves spiny 10
9. Stems and leaves without spines 15
10. Climbing palms; leaves with a whip-like extension of the rachis (cirrus) containing barb-like hooks .... *Desmoncus orthacanthos*
10. Arborescent palms to 4 m tall (or taller in the cultivated *Bactris gasipaes*), cirrus absent 11
11. Stems clumped, rarely solitary, mostly 6 cm diameter (10–25 cm in *Bactris gasipaes*) 12
11. Stems solitary 14
12. Found only in cultivation; stems >6 cm diameter ..... **Bactris gasipaes*
12. Wild palms; stems >6 cm diameter 13
13. Leaflets glabrous beneath, regularly arranged and spreading in the same plane; spines on sheath, petiole, and rachis <9 cm long; found in relatively dry, open habitats near groundwater; fruits purple-black ..... *Bactris major* var. *major*
13. Leaflets often pubescent beneath, clustered and spreading in different planes; spines on sheath, petiole, and rachis to 15 cm long; in wet forest; fruits orange to red ..... *Bactris mexicana*
14. Stems to 8 cm diameter, with whorls of flattened, black spines; fruits bristly; in lowland moist to wet forests ..... *Astrocaryum mexicanum*
14. Stems ≥10 cm diameter, spines not flattened; fruits smooth; in open and/or disturbed areas of seasonal rainfall ..... *Acrocomia aculeata*
15. Stems tall and stout, often much >15 cm diameter, never cane-like (i.e. stem more or less uniform in color and leaf scars not prominent), solitary 16
15. Stems slender (<15 cm diameter) and usually cane-like (i.e. with conspicuous, and contrasting or prominent leaf scars), solitary or clumped 25
16. Cultivated, or naturally-occurring and most often found along beaches; stems often markedly curved; woody "coconuts" >20 cm diameter .... *Cocos nucifera*
16. Naturally-occurring in a variety of habitats, rarely along beaches; stems usually straight; fleshy or woody fruits <6 cm diameter 17
17. Crownshaft, of closed (or partially closed) leaf sheaths, present; leaflets spreading in different planes (appearing plumose) or not 18
17. Crownshaft never present; leaflets not spreading in different planes 23
18. Leaves plumose, with leaflets spreading in different planes 19
18. Leaves not plumose, leaflets in 1 row per side, not spreading in different planes (the tips may be pendulous, but not plumose) 22
19. Stems generally >30 cm (to 60 cm) diameter; crownshaft conspicuous, of closed leaf sheaths; inflorescences born below the leaves 20
19. Stems usually smaller; crownshaft open, short; inflorescences born among the leaves 21
20. Peduncular bract shorter than the crown-shaft; on wet soil in forest or open savanna, disturbed areas, also cultivated ..... *Roystonea regia*
20. Peduncular bract ≥ the crown-shaft; found on flooded soils in coastal swamps and estuaries .... **Roystonea dunlapiana*
21. Palms of the coastal plain, usually near the sea; leaflets somewhat glaucous, with brown scales beneath; inflorescence branched to 5 orders .... *Pseudophoenix sargentii* subsp. *sargentii*
21. Widespread palms; leaflets not glaucous, without brown scales; inflorescence branched 1–2 orders ..... *Gaussia maya*
22. Montane palms with a partially closed (for 1/3 to 1/2 the length of the leaf sheaths), purplish or purple-green crownshaft; stem brownish .... **Prestoea acuminata*
22. Montane or lowland palms with conspicuously closed, green or yellowish crownshaft; stem gray ... . *Euterpe precatoria* var. *longevaginata*
23. Leaves irregularly divided into wide leaflets with serrated apical margins; stems to 20 cm diameter; fruits covered with pyramidal protrusions .... *Manicaria saccifera*
23. Leaves regularly divided into many narrow, entire leaflets; stems usually >30 cm diameter; fruits smooth 24
24. Margins of leaf sheath and petiole naked; male flow-

ering branches short, ≥15 cm; endocarp fibers in clusters ..... *Attalea cohune*
24. Margins of leaf sheath and petiole with stout fibers; male flowering branches long, 30–50 cm; endocarp fibers scattered ..... **Attalea butyracea*
25. Leaves simple 26
25. Leaves compound 33
26. Stems <1 cm diameter, clumped via rhizomes..... **Chamaedorea brachypoda*
26. Stems solitary, often >1 cm diameter 27
27. Stems 3–5 cm diameter or acaulescent adults; leaves 8–15 or more, usually bifid, leaf sheaths brownish.. 28
27. Stems ≤2 cm (to 3 cm in *Chamaedorea pinnatifrons*) diameter; leaves mostly-8, bifid or not; leaf sheaths green..... 29
28. Apparently acaulescent (stems short, underground); leaves usually not simple; inflorescences spicate and with a deciduous bract (leaving a conspicuous scar) near the apex of the peduncle; fruits obovoid to 2 cmdiameter, green to black ..... *Calyptrogyne ghiesbreghtiana*
28. Stems not underground (as adults), 3–5 cm diameter; leaves bifid; inflorescences branched, fruits reddish ..... *Asterogyne martiana*
29. Leaf blades bifid, leathery, rigid, with a velvety aspect, blue-gray-green; female infl. spicate, male infl. with 2–10 branches ..... *Chamaedorea adscendens*
29. Leaf blades bifid or not, thin, not blue-gray-green .. 30
30. Leaves bifid for 1/3 of their length, but usually some leaves pinnate; stem ≤0.75 m tall, often apparently stemless; female infl. spicate or bifurcate, male infl. with 10–25 branches ..... **Chamaedorea pygmaea*
30. Leaves bifid for ≥1/3 of their length; stem conspicuous, potentially ≥0.75 m 31
31. Leaf blade obscurely nerved above, more or less oblong; female infl. usually with up to 3 flowering branches, male infl. with 1–6 branches ..... *Chamaedorea geonomiformis*
31. Leaf blade prominently nerved above, more or less obovate; female infl. with >3 flowering branches or spicate 32
32. Blades thick, simple, with ≥12 major veins per side; female infl. usually spicate, rarely with up to 4 branches, male infl. with 13–25 branches..... *Chamaedorea ernesti-augusti*
32. Blades thin, rarely all simple, with ≤10 major veins per side; female infl. usually with up to 20 flowering branches, rarely spicate, male infl. with 2–45 branches ..... *Chamaedorea pinnatifrons*
33. Stems solitary..... 34
33. Stems clumped..... 54
34. Apparently acaulescent (stem short, underground); with 8–21 leaves inflorescences spicate ..... *Calyptrogyne ghiesbreghtiana*
34. Stems evident in mature palms; leaves usually ≤8 (to 12 in *Synechanthus*) inflorescences branched (except in *Chamaedorea nationsiana*) 35
35. Stems green; leaves clustered at stem apex, often ≤7 36
35. Stems not green, and/or leaves spread loosely along the stem; leaves often >7 45
36. Leaflets many (>10) per side and arranged in groups of 2–6; sub-apical leaflets with one principal vein; monoecious; flowers arranged in rows along the flowering axes ..... *Synechanthus fibrosus*
36. Leaflets few or many per side, not arranged in groups of 2–6, sub-apical leaflets without one principal vein; dioecious; flowers solitary or in groups 37
37. Leaves leathery and leaflets ≤3.5 cm wide, leaflets 2–6 per side, rigid and with a velvety aspect, blue-gray-green; female infl. spicate, male infl. with 2–10 branches ..... *Chamaedorea adscendens*
37. Leaves thin and/or leaflets wider, rigid or not, green in color 38
38. Leaflets mostly ≤10 per side; stems usually <2 cm diameter 39
38. Leaflets ≥10 per side, stems variable..... 42
39. Leaflets thick, leathery, lanceolate to oblong; leaflets with a dominant midrib and 2 submarginal, obscure, unkeeled 10 nerves; apex of leaf sheath whitish; infl. with 6–25 branches ..... *Chamaedorea oblongata*
39. Leaflets thin, sigmoid or lanceolate, 10 nerves conspicuous and/or keeled; leaf sheath apex green 40
40. Leaflets sigmoid, with ≤7 10 nerves; inflorescences branched 41
40. Leaflets lanceolate with 8–9 prominent 10 nerves; female, male inflorescences spicate; flowers greenish ..... **Chamaedorea nationsiana*
41. Leaflets 4–8/side with 2–7 angular 10 nerves; stem to 3 cm diameter; female flowers greenish; female, male infl. mostly with 5–20 branches..... *Chamaedorea pinnatifrons*
41. Leaflets to 11/side with 2 marginal, rounded 10 nerves; stem to 1.6 cm diameter; female flowers orange; female infl. with 4–8 branches, male infl. to 20 branches ..... **Chamaedorea sartori*
42. Small, slender palms <2 cm diameter and >2 m tall; leaf sheaths tubular near base; leaflets 11–21/side, linear to lanceolate, contracted at base; female, male infl. with 5–35 branches ..... *Chamaedorea elegans*
42. Small to medium-sized palms, 2–10 cm diameter, 2–12 m tall; leaf sheaths tubular for ± entire length; leaflets not contracted at base 43
43. Leaflets linear-lanceolate or lanceolate; female infl. with c. 50 branches, or spicate..... 44
43. Leaflets sigmoid, to 25 per side; female infl. with 5–20 flowering branches, male infl. with 7–50 branches ..... *Chamaedorea tepejilote*
44. Leaf sheaths ≥30 cm long, smooth, green to thinly brown-edged; leaflets linear-lanceolate, to 36 per side; female infl. with c. 50 flowering branches..... *Chamaedorea woodsoniana*
44. Leaf sheath to 30 cm long, rough, conspicuously brown-edged; leaflets lanceolate, to 11 per side; inflorescences spicate ..... **Chamaedorea nationsiana*
45. Leaves 7–18, loosely spread apart along the stem; stems brown or green, usually clumped, 0.5–3 cm diameter ..... *Geonoma deversa*
45. Leaves 6+, clustered at stem apex; stems not green, usually solitary and >3 cm diameter (except *Reinhardtia*) 46
46. Leaflets 4-ranked, spreading in 4 different planes and giving leaves a plumose appearance; stem to 15 cm diameter; leaves 6–8; crown open; fruits red; palm of rocky places over limestone at low elevations ..... *Gaussia maya*
46. Leaflets generally spreading in 1–2 planes; stems large or small; leaves often <8; crown usually dense; fruits red or not; on limestone soils or not 47
47. Leaves with brown scales on lower surface; salt-tolerant, found near the sea; stem to 30 cm diameter;

fruits red .... *Pseudophoenix sargentii* subsp. *sargentii*
47. Leaves without brown scales beneath; most commonly found in wet or moist forest; fruits brown or blackish 48
48. Leaves very large (2–8 m long), erect and irregularly divided into wide leaflets with serrated apical margins, persistent and forming a skirt around the stem; stems 15–20 cm diameter; fruits large (4–6 cm diameter), brown, covered in pyramidal protrusions; on wet, lowland soils ..... *Manicaria saccifera*
48. Leaves smaller, generally <3 m long, arching or erect, regularly divided, persistent or not, but never forming a skirt around the stem; leaflets not serrated (but apically toothed in *Reinhardtia gracilis*); stem diameter large or small; fruits small, <2 cm diameter, black or purple-black, fleshy 49
49. Leaflets few, usually 2 per side; slender palm <2 cm diameter, leaf sheaths closed but not forming a crownshaft (forming interwoven fibers instead) 50
49. Leaflets many, often >10/side; stem much larger; crownshaft present in *Euterpe* 51
50. Leaves large: leaf rachis 11–23 cm long, with 14–22 nerves on each side; the lower pinnae 14.5–25 cm long ..... *Reinhardtia gracilis* var. *gracilis*
50. Leaves small: leaf rachis 3.5–6 cm long, with 8–11 nerves on each side; the lower pinnae 8.5–12 cm long ..... *Reinhardtia gracilis* var. *gracilior*
51. Stem gray, with a green crownshaft formed by closed leaf sheaths; tall (to 20 m), to 23 cm diameter; leaves 5–10; leaflets linear; fruits 1 cm diameter, purple-black ..... *Euterpe precatoria* var. *longevaginata*
51. Stem brown, with a (purplish) crown shaft only in *Prestoea*, ≤10 m tall, to 20 cm; leaves 6–20; fruits <7 mm, black 52
52. Crownshaft open, purplish or purple-green; stem to 20 cm diameter ..... **Prestoea acuminata*
52. Crownshaft absent; stem to 15 cm diameter 53
53. Montane rainforest palm; rare; leaflets ± linear; pits in flowering branches with a lower and upper lip ... . *Geonoma undata*
53. Most common in lowland and pre-montane forests as well as on mountain slopes, sometimes in disturbed areas; leaflets sickle-shaped; pits in flowering branches without a distinct upper lip..... .....*Geonoma interrupta* var. *interrupta*
54. Stems green and leaves tightly clustered at stem apex 55
54. Stems not green or leaves loosely clustered at stem apex 57
55. Stems, sheath, petiole, and rachis often glaucous; leaflets 22–42 per side; stems 2–3 cm diameter; female, male infl. with 10–35 branches ....*Chamaedorea graminifolia*
55. Not glaucous; leaflets usually >22 per side..... 56
56. Stems sometimes clumped, 2–10 cm diameter, to 7 m tall; leaflets wide (3.5–10 cm) and long (16–70 cm), 6–25 per side, with several prominent 10 nerves above; female infl. with up to 20 branches, male infl. with up to 50 branches ..... *Chamaedorea tepejilote*
56. Stems always clumped, 1–2 cm diameter, to 3 m tall; leaflets narrow (≤3 cm) and short (20–35 cm), 5–18 per side, with one 10 nerve; female, male infl. with 4–12 branches ..... *Chamaedorea seifrizii*
57. Leaflets numerous (usually >20/side, at least >3/side), without "windows" between the folds and the rachis 58
57. Leaflets usually >4 per side, or 2–3 compound leaflets with small windows between the folds on either side of the rachis 60
58. Crownshaft formed by closed, or partially closed leaf sheaths present, stem to 20+ cm diameter; leaflets ± uniform in size, linear 59
58. Crownshaft absent; leaflets sickle-shaped, broad ones intermixed with narrow ones; stems 2–12 cm diameter ..... *Geonoma interrupta* var. *interrupta*
59. Montane palms with a partially closed (for 1/3 to 1/2 the length of the leaf sheaths), purplish or purple-green crownshaft; stem brownish .... **Prestoea acuminata*
59. Montane or lowland palms with conspicuously closed, green or yellowish crownshaft; stem gray ... .*Euterpe precatoria* var. *longevaginata*
60. Leaves clustered at the apex, with compound leaflets having small windows between the folds on either side of the rachis 61
60. Leaves loosely spread apart along the stem, without windows; stem ≤3 cm diameter ..... *Geonoma deversa*
61. Stems thick, c. 6–7 cm diameter; leaf blades ≥1 m long ..... *Reinhardtia latisecta*
61. Stems c. 1.5 cm diameter; leaf blades ≥1 m. (usually <0.5 m) 62
62. Leaves large: leaf rachis 11–23 cm long, with 14–22 nerves on each side; the lower pinnae 14.5–25 cm long ..... *Reinhardtia gracilis* var. *gracilis*
62. Leaves small: leaf rachis 3.5–6 cm long, with 8–11 nerves on each side; the lower pinnae 8.5–12 cm long ..... *Reinhardtia gracilis* var. *gracilior*

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Literature Cited

Balick, M. and D. Johnson. 1994. The conservation status of *Schippia concolor* Burret in Belize. Principes 38(3): 124–128

Durán, R. 1995. *Pseudophoenix sargentii:* an Endangered Palm Species. Principes 39(4): 219–224.

Henderson, A., Galeano, G., and R. Bernal. 1995. Field Guide to the Palms of the Americas. Princeton University Press, Princeton, New Jersey, USA.

Meerman, J.C. and G. Williams. 1995. Maya mountain traverse expedition, January 16–February 4, 1995. Belize Tropical Forest Studies Publication # 3. Belize Tropical Forest Studies, Belmopan, Belize.

Standley, P.C. and S.J. Record. 1936. The forests and flora of British Honduras. Field Museum of Natural History, Botany Series 12: 1–432.

Standley, P.C. and J. A. Steyermark. 1958. Flora of Guatemala. Fieldiana: Botany 24(1): 196–299.