

The Genus *Synechanthus* (Palmae)

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Synechanthus is a distinctive genus of small undergrowth palms encountered with some frequency in the wet forests of southern Mexico, Central America, and northwestern South America. It is related to several other genera (*Gaussia*, *Opsiandra*, *Wendlandiella*, *Hyophorbe*, *Chamaedorea*) that together form an alliance to be considered in detail elsewhere. As in several of these genera, the flowers are borne in an unusual arrangement termed an acervulus in which the lowest flower is usually female with two to several male flowers borne above it in a line (Fig. 1a).

The genus was described over a century ago, has been cultivated intermittently ever since, and seven species have been described largely from differences in foliage and in fruit. The problem of differentiating among these species in the field and herbarium has intrigued me since 1949 when I first became acquainted with the genus. Twenty years of experience have demonstrated, at least to me, that the division of the leaf, and size and shape of fruit and seed are very variable and do not correlate well with other morphological characters nor with geography or elevation. When leaves with undivided blades, with irregularly divided blades, and with regularly divided blades occur on sometimes adjacent plants in a limited area of a small island in the bay off Buenaventura, Colombia, characteristics of leaf division are clearly seen to be unreliable in distinguishing species. Equally, when ellipsoid and globose fruits are encountered together, the shape of the fruit and seed becomes less convincing as a specific criterion.

The nature of the inflorescence and of the staminate flower, however, is constant, though dimensions may vary. When reliance is placed on these more stable characteristics, two clear-cut groups emerge as contrasted in the synoptic key. Leaf and fruit vary within each group and it is conceivable that intensive field study may reveal some infraspecific correlation between, for example, color of nerves on the leaves with elevation. Present materials and experience do not permit this but they do permit the following treatment of *Synechanthus* as a genus of two species.*

Synechanthus H. Wendland, *Botanische Zeitung* 16: 145. 21 Mai. 1858.

Lectotype: *S. fibrosus* (H. Wendland) H. Wendland (vide Moore, *Gentes Herbarum* 9: 273. 1963).

Reineckea H. Karsten, *Wochenschrift für Gärtnerei und Pflanzenkunde* 1: 349. 4 Nov. 1858 ('*Reineckia*') corr. *op. cit.* 377. 2 Dec. 1858 non *Reineckea* Kunth (1844).

Type: *Reineckea triandra* H. Karsten.

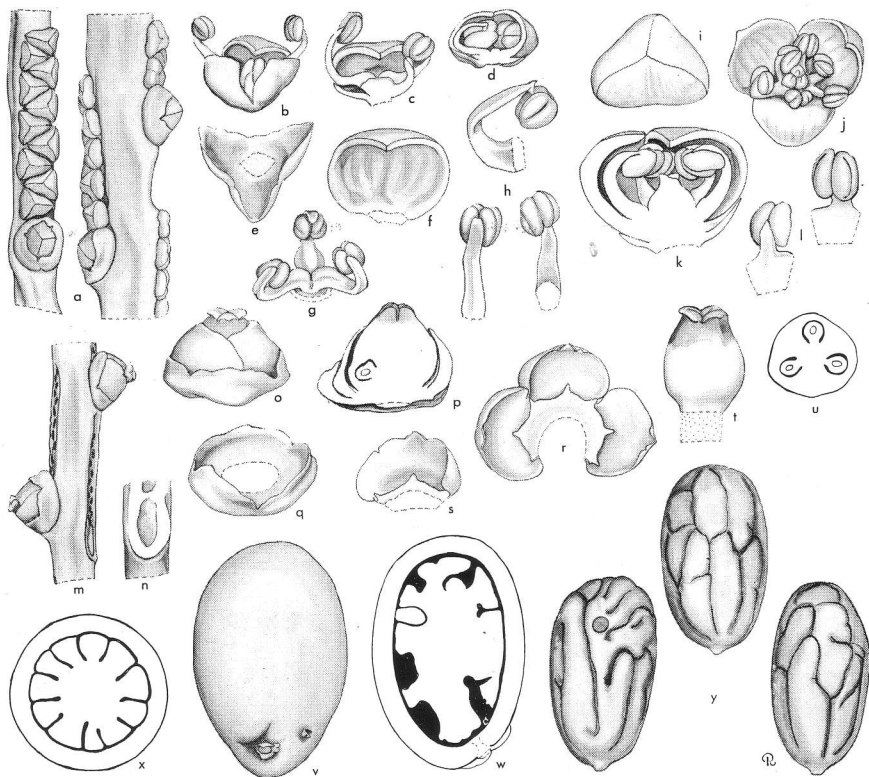
Rathea H. Karsten, *Wochenschrift für Gärtnerei und Pflanzenkunde* 1: 377. 2 Dec. 1858 *nom. illeg.*

Type: *R. fibrosa* (H. Wendland) H. Karsten.

Solitary or cespitose, unarmed, slender, monoecious palms.

Leaves pinnate; sheath elongate on new leaves but soon splitting opposite the petiole and differentiated from it

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1. *Synechanthus Warszewiczianus* (a-h, m-y) and *S. fibrosus* (i-l). a, portion of rachilla with acervuli in two views $\times 4$; b, staminate flower $\times 8$; c, staminate flower in vertical section $\times 8$; d, staminate bud in vertical section $\times 8$; e, staminate calyx, interior view $\times 16$; f, staminate petal, interior view $\times 16$; g, androecium $\times 16$; h, stamens in three views $\times 16$; i, staminate bud $\times 8$; j, staminate flower $\times 8$; k, staminate bud in vertical section $\times 16$; l, stamens $\times 16$; m, portion of rachilla at pistillate anthesis $\times 4$; n, portion of rachilla with scar of pistillate flower $\times 4$; o, pistillate flower $\times 8$; p, pistillate flower in vertical section $\times 8$; q, pistillate calyx $\times 8$; r, pistillate petals and staminodes, interior view, expanded $\times 8$; s, pistillate petal and staminodes, interior view $\times 8$; t, pistil $\times 8$; u, pistil in cross-section $\times 8$; v, fruit $\times 1$; w, fruit in vertical section $\times 1$; x, fruit in cross-section $\times 1$; y, seed in three views $\times 1$. a-h from material of Moore & Parthasarathy 9486 preserved in liquid; i-l from dried material of Hernandez X. & Sharp X-1287 (BH); m-u, w from material of Moore & Parthasarathy 9466 preserved in liquid; v, x, y from material of Moore & Parthasarathy 9409 preserved in liquid.

only by a narrow, usually fibrous, dry strip along each margin; petiole convex below, concave above; rachis convex below, angled above; pinnae broadly reduplicate at insertion, acute to acuminate, slightly to markedly sigmoid or, when broad-based, the apex falcate, with 1 to

several principal nerves, these elevated above, or the blade sometimes undivided except at the bifid apex.

Inflorescence interfoliar or becoming infrafoliar, once- or twice-branched, erect at anthesis, arcuate or pendulous in fruit, solitary in the leaf-axil, long-

pedunculate; bracts (5-) 6, tubular-sheathing, ultimately disintegrating into fibers, the prophyll short, open apically, successive bracts longer and inserted at increasingly greater distances, the uppermost usually somewhat exceeding the peduncle; rachis usually elongate; branches all simple or the lower branches again once-branched; rachillae slender, nearly quadrate to markedly flattened and more or less flexuous, the tips usually slender and appearing spinose.

Flowers borne in mostly distichously arranged cincinni (acervuli) of a proximal pistillate and 5-13 distal biseriate staminate, the distal flower opening first and flowering basipetal in the acervulus; staminate flowers green in bud, golden-yellow at anthesis, depressed-triangular in bud, sepals connate in a low, acutely 3-lobed cupule, petals 3, valvate, very prominently nerved in bud *when dry*, spreading at anthesis, stamens 6 with short filaments incurved in bud, erect at anthesis or 3 with long filaments markedly incurved and inflexed at the apex in bud, horizontally exerted at anthesis, anthers basifixed, shallowly bifid at apex and base, dehiscent by lateral slits, pistillode small, deltoid-ovoid, apically 3-lobed or lacking; pistillate flowers yellowish

at anthesis, sepals 3, connate in a 3-lobed cupule, petals 3, imbricate, twice as long as the sepals or more, staminodes apparently lacking, or perhaps sometimes 3 and minute, or evident and connate in a 6-lobed ring and partially adnate to the petals, pistil ovoid, drying 3-angled, with 3 short recurved stigmas, trilobular, triovulate, ovules laterally attached, anacampylotropous, integuments 2.

Fruit red at maturity, with basal stigmatic residue; exocarp smooth; mesocarp fleshy, with few slender, loosely anastomosed flat fibers against the membranous endocarp, this non-operculate; seed not adherent to endocarp, with inconspicuous basal hilum, raphe-branches ascending adaxially from the base, little anastomosed, curving laterally and descending abaxially to the lateral embryo, this above the middle to subapical; endosperm homogeneous or minutely ruminate marginally to markedly ruminate.

Chromosome complement: $n = 16$ for *S. fibrosus* (as *S. mexicanus*), fide Read, *Principes* 10: 59. 1966.

Distribution: southern Mexico, Central America, and northwestern South America, most frequently at low elevations but up to 1200 m. in the mountains.

Key to Species

1. Stems solitary: pinnae, except the usually broader terminal pair, all with 1 principal nerve and 2 lateral secondary nerves, these elevated above, dull yellow-brown below, usually borne in disjunct groups, rarely regularly arranged along the rachis: lower branches of the inflorescence usually divided into several rachillae, rarely unbranched but rachillae always minutely scaberulous when dry, branches and rachillae with a prominent pulvinus basally, this enlarged in fruit: staminate flowers with 6 stamens, the filaments incurved but not inflexed at the apex in bud, erect at anthesis, the anthers about as long as the filaments, not exerted: staminodes lacking, or if present then minute and perhaps only 3: seed with homogeneous or minutely and marginally ruminate endosperm. Southern Mexico, British Honduras, Guatemala, Honduras, Costa Rica. -----
----- *S. fibrosus*
1. Stems cespitose or very rarely solitary and then probably with suppressed basal shoots: pinnae variously arranged and with 1 or often more principal nerves

or the blades sometimes undivided, the nerves elevated above, often bright straw-colored below when dry: inflorescence once-branched, the rachillae always simple, not minutely scaberulous when dry, the pulvinus less prominent and scarcely enlarged in fruit: staminate flowers with 3 stamens, the filaments markedly incurved and inflexed at the apex in bud, horizontally exerted and bearing the anthers erect at anthesis: staminodes apparently usually present in pistillate flowers, connate in a 6-lobed ring partially adnate to the petals: seed with prominently ruminant endosperm. Costa Rica, Panamá, Pacific coast of Colombia and Ecuador. ----- *S. Warscewiczianus*

Synechanthus fibrosus (H. Wendland) H. Wendland, *Botanische Zeitung* 16: 145. 1858.

?*Chamaedorea fibrosa* H. Wendland, *Index Palmarum* 57. 1854.

Type: cultivated Hort. Herrenhausen (destroyed) (photos Field Museum negs. 20759, 20759a, BH, F)

Rathea fibrosa (H. Wendland) H. Karsten, *Wochenschrift für Gärtnerei und Pflanzenkunde* 1: 377. 1858.

Synechanthus mexicanus L. H. Bailey ex H. E. Moore, *Gentes Herbarum* 8: 199. 1949.

Type: *E. Hernandez X.* & *A. J. Sharp X-1287* (BH)

Stems solitary, slender, smooth, green, prominently ringed, rarely as much as a 5-6 m. high, 2-3 cm. in diam., usually much lower and often commencing to flower before an emergent stem develops or the stem sometimes decumbent.

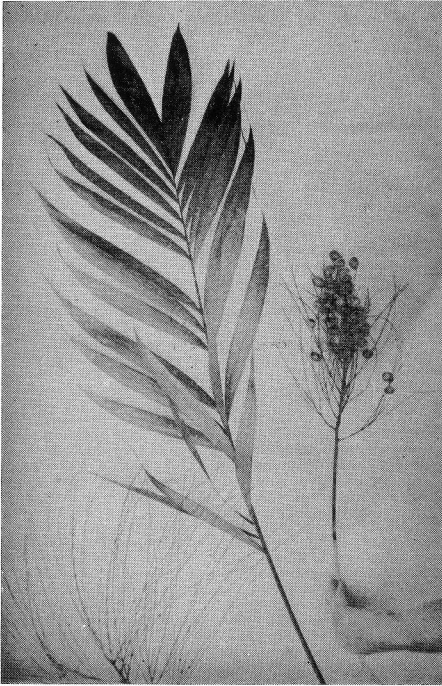
Leaves few, glossy deep-green; sheath and petiole together to 1.1 m. long or more, the sheath tubular and the petiole short on new leaves (fide O. F. Cook) but the sheath soon splitting opposite the



2. *Synechanthus fibrosus* grown from seed in the garden of A. C. and M. Langlois, The Retreat, Nassau, Bahamas, 1952.



3. Closer view of plant in Fig. 2 to show leaf-bases and inflorescences. Mr. A. C. Langlois provides scale.



4. A leaf and inflorescences of *Synechanthus fibrosus* from British Honduras. Photo Langlois, 1941.

petiole, functioning as and differentiated from the petiole only by the deeply channelled upper surface and a narrow, usually fibrous strip along the margin; petiole convex below, concave above; rachis convex below, angled above, ca. 7.4–12.5 dm. long; pinnae 10–23 on each side of the rachis, rarely regularly arranged but usually in 2 or more separated groups of 2–4 or more, basal pinnae 13–31 cm. long, 0.3–2.2 cm. wide, median pinnae 29–50 cm. long, 2.5–4.4 cm. wide, apical pinnae 19–30 cm. long, 4.2–8 cm. wide and with 3–7 principal elevated nerves, all pinnae slightly to markedly sigmoid, acute to acuminate, all but the several-nerved apical ones with 1 midnerve and 2 lateral nerves prominent and elevated on the upper surface, dull yellow-brown on the lower surface.

Inflorescence to ca. 1 m. long; peduncle to 7.2 dm. long; rachis to 22 cm. long; branches and/or rachillae to 30 cm. long, subtended by a low, often acute bract, with a pulvinus much thickened and calloused in fruit between branch or rachilla and axis, lower branches divided into several (to 6) rachillae, all rachillae very slender, ca. 1 mm. in diam., minutely scaberulous.

Acervuli of a pistillate and usually 5–9 staminate flowers; staminate flowers ca. 0.6–0.8 mm. high in bud, lobes of the calyx acute, about half as high as the petals, petals very prominently nerved when dry, at anthesis horizontally spreading and slightly recurved at the margins, forming a triangle basally about the apex of the pistillode, stamens 6, filaments short, incurved in bud but not inflexed at the apex, erect, about as long as the anthers and the petals at anthesis, pistillode shorter than the stamens, deltoid-ovoid, conic and shallowly 3-lobed apically; pistillate flowers ca. 1 mm. high, lobes of the calyx about half as high as the petals or somewhat more, petals strongly nerved when dry, staminodes lacking, pistil as high as the petals, stigmas recurved.

Fruit globose to ellipsoid, very fleshy and slippery when bruised, changing from yellowish-green to yellow, orange, and finally scarlet, 14–21 mm. long, 10–14 mm. in diam. when dry (obovoid and ca. 1.5 cm. long, 1.0 cm. in diam. when fresh fide Steyermark); seed ellipsoid to globose, 12–14 mm. long, 7–12 mm. in diam.; endosperm nearly homogeneous or minutely ruminant marginally.

Distribution: wet forests of the Atlantic slope from near sea-level to ca. 1200 m. alt., southern Mexico to Costa Rica.

Specimens examined: MEXICO. EDO. OAXACA: from Finca "La Gloria" (on río Negro watershed) back over the sierra to río Grande (n. Niltepec), 3

April 1946, *E. Hernandez Xolocotzi & A. J. Sharp X-1287* (BH, holotype of *S. mexicanus*). BRITISH HONDURAS. Roaring Creek—Stann Creek Rd., 15 mi. S. of Sibun River bridge (30 mi. S. of Roaring Creek), 1957, *J. E. Smith 5* (BH); TOLEDO DISTR.: Esperanza Trail, 1500 ft. alt., May 1960, *J. Turner 64* (BH). GUATEMALA. DEPT. ALTA VERAPAZ: near the Finca Sepacuite, Mar. 15, 1902, *Cook & Griggs 11* (US); Mar. 21, 1902, *Cook & Griggs 88* (US); road between Panzos and Sepacuite, Apr. 17, 1904, *Cook & Doyle 38* (US); Sepacuite, May 6, 1904, *Cook & Doyle 129* (US); mountain forest above Trece Aguas, 2700 ft. alt., April. 29, 1914, *Cook & Doyle 2* (US); dense wet limestone forest near Chirriacté on the Péten highway, alt. ca. 900 m., Apr. 9, 1941, *P. C. Standley 91641* (F); DEPT. IZABAL: wooded rocky slopes between Piciu and road to Senahi, about 20 miles from Puerto Barrios on road to Guatemala, alt. 100 m., 8 Nov. 1959, *H. E. Moore & M. Cetto 8218* (BH); between Virginia and Lago Isabal, Montaña de Mico, 50–500 m. alt., Apr. 5, 1940, *J. A. Steyermark 38834* (F); Cerro San Gil, along río Frio, 50–75 m. alt., Dec. 19, 1941, *J. A. Steyermark 41599* (F, US). HONDURAS. YORO: rain forest, Sierra de Sulaco, 4100 ft. alt., July 1937, *C. & W. von Hagen 1025* (F). COSTA RICA. PROV. CARTAGO: forêts de Tuis, 650 m. alt., *A. Tonduz 11373* (US); PROV. LIMON: wooded slopes about 5 km. beyond Central of Hacienda Moravia, 1000–1200 m. alt., 13 Apr. 1953, *H. E. Moore 6696* (BH). CULTIVATED. The Retreat, Nassau, New Providence, Bahama Islands (probably from British Honduras), 16 Feb. 1952, *H. E. Moore 6046* (BH); Fairchild Tropical Garden, Coral Gables, Florida, as FG 58-159 in plot 119A, 30 Apr. 1965, *R. W. Read 1421* (BH, voucher for chromosome count), as FG 58-159A from

seed collected by MacDougal west of Isthmus of Tehuantepec, Mexico, 18 Apr. 1966, *H. E. Moore 9369* (BH).

Synechanthus fibrosus was originally described in 1854 as a species of *Chamaedorea* from plants cultivated at the Royal Gardens in Herrenhausen, Hannover, Germany. The native country was noted as eastern Guatemala and the collector was apparently von Warscewicz, Garteninspektor at Krakow, Poland, who visited Central America in 1847. Wendland later removed the species from *Chamaedorea* and erected a distinct genus for it and *S. Warscewiczianus* only months before two other generic names—*Reineckea* and *Rathea*—were proposed independently.

The species appears to have been grown in a number of European gardens and a specimen sent to Kew by Wendland was figured in *Curtis's Botanical Magazine* 107: pl. 6572, 1881. More recently, *S. fibrosus* has been grown in the Western Hemisphere in the Bahama Islands, Florida, and perhaps elsewhere.

Foliage of *S. fibrosus* is variable. The pinnae, except for the apical pair, are always slender with one principal nerve and most often are borne in groups of two or more in varying patterns, although they are rarely regularly arranged along the rachis. The fruit and seed also appear to vary in size and shape—the subglobose fruit and seed of acaulescent plants from Mexico at one time seemed sufficiently distinctive to call for description of a new species, but similar fruits are now known from plants of British Honduras which otherwise are good *S. fibrosus* and a similar pattern of variation occurs in *S. Warscewiczianus*.

There has been some question about the presence or absence of staminodes in the pistillate flowers of *S. fibrosus*. Karsten noted six staminodes in his material at Berlin while Wendland found none or only three very minute stami-

nodes in his material (Wochenschrift für Gärtnerei und Pflanzenkunde 2: 15, 1859). I have not been able to discern staminodes clearly in the dried material at my disposal; certainly, if present, they are not prominent as they are in *S. Warscewiczianus*.

An apparently constant feature of this species is the solitary stem. Nowhere has there been any indication that stems cluster as in *S. Warscewiczianus*, though plants have been said to be "gregarious." My own field notes clearly indicate solitary stems only for plants in Guatemala and Costa Rica, and Hooker described the plant at Kew as single-stemmed.

Synechanthus fibrosus has been less frequently collected than *S. Warscewiczianus* and certainly appears to be rare in Costa Rica where the ranges of the two species overlap.

***Synechanthus Warscewiczianus* H.**

Wendland, Botanische Zeitung 16: 145. 1858.

Type: cultivated Hort. Herrenhausen (destroyed) (photos Field Museum negs. 20760, 20760a, F, BH).

Reineckea triandra H. Karsten, Wochenschrift für Gärtnerei und Pflanzenkunde 1: 349. 1848.

Type: cultivated Hort. Decker (probably destroyed).

Synechanthus angustifolius H. Wendland, Wochenschrift für Gärtnerei und Pflanzenkunde 2: 15. 1859.

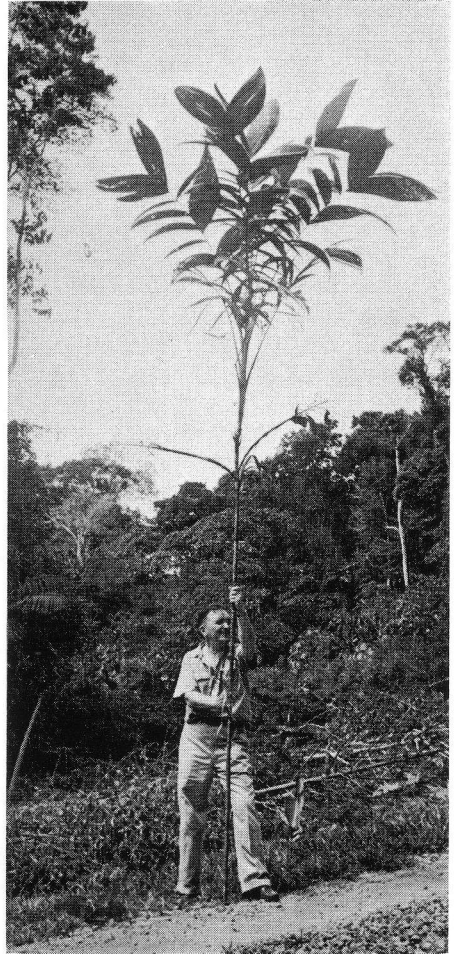
Type: cultivated Hort. Herrenhausen (destroyed) (photo Field Museum neg. 20761, BH, F).

S. ecuadorensis Burret, Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem 13: 339. 1936.

Type: *H. Schultze-Rhnhof 1890* (B, destroyed).

S. panamensis H. E. Moore, Gentes Herbarum 8: 201. 1949.

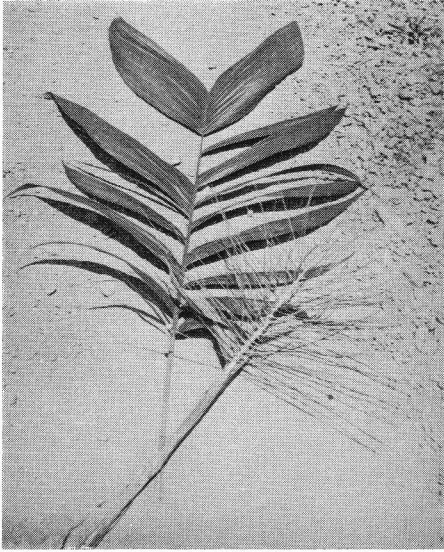
Type: *P. H. Allen 4376* (MO).



5. A stem of *Synechanthus Warscewiczianus* collected at Caimito, Panama, 1949. Photo by M. Langlois.

Stems slender, erect, rarely solitary with short adventitious prop roots, most often cespitose with one principal stem and several subordinate stems or several stems, sometimes with short vegetative branches at the nodes, to 6 m. high, 5 cm. in diam., dark olive-green except for light-green new growth, internodes elongate, 6–8 cm. long.

Leaves to ca. 10, spreading; sheath and petiole to 9.2 dm. long; rachis to 17



6. A leaf and inflorescence of *Synechanthus Warscewiczianus* collected at Caimito, Panama, 1949. Photo Langlois.

dm. long with blade undivided and about 18-nerved on each side or with 2-31 pinnae on each side, these dark green above, slightly paler below, all or nearly all with one principal nerve except the apical and regularly arranged, or variously 1- to 17-nerved and variously disjunct along the rachis, the basal pinnae to 45 cm. long, 1.8 cm. wide or more, median pinnae to ca. 57 cm. long, 2.3 cm. wide or more, apical pinnae ca. 22 cm. long or more, 3.2 cm. wide or more, the principal nerve and secondary nerves elevated above, bright straw-colored and conspicuous below when dry.

Inflorescence to ca. 1 m. long, interfoliar or often infrafoliar; peduncle to 7.3 dm. long; rachis to 3.5 dm. long; rachillae numerous, always simple, with the basal pulvinus not much enlarged in fruit, not scaberulous, to 30 cm. long.

Acervuli with a basal pistillate and (3-) 6-13 biseriate staminate flowers; staminate flowers ca. 0.6 mm. high, lobes of the calyx usually much less than half

as long as the petals, petals less strongly nerved when dry than in *S. fibrosus*, stamens 3, the filaments elongate, markedly incurved and inflexed at the apex in bud, horizontally exerted at anthesis and bearing the anthers erect, pistillode lacking; pistillate flowers ca. 1 mm. high, lobes of calyx less than half as long as petals, staminodes usually present, minute, connate in a 6-lobed ring and partially adnate to the petals, pistil as high as the petals.

Fruit subglobose to ellipsoid, maturing yellow to orange and finally to bright red, 15-32 mm. long, to 15 (-30) mm. in diam. and very soft when ripe, shrinking to ca. 11-27 mm. long, 5-11 mm. or more in diam. when dry; mesocarp fleshy and ca. 3 mm. thick when fresh but drying very thin; seed depressed-globose to obpyriform to ellipsoid, 11-19 (-25) mm. long, 5-9 (-14) mm. in diam.; endosperm prominently ruminant; embryo above the middle or subapical.

Chromosome complement: not known.

Distribution: wet forests, mostly at low elevations but up to 1200 m., eastern and western Costa Rica, Panamá, Pacific coast of Colombia and Ecuador.

Specimens examined: COSTA RICA. PROV. CARTAGO: vicinity of Pejivalle, alt. about 900 m., 7-8 Feb. 1926, *P. C. Standley & J. Valerio* 47238 (US); virgin forest, Pavones, 25 Apr. 1953, *H. E. Moore* 6756 (BH); PROV. HÉREDIA: Finca La Selva, Puerto Viejo de Sarapiquí, alt. 100 m., 27 June 1959, *L. R. Holdridge* 5114 (BH); five miles from San Miguel towards La Virgen, Sarapiquí Valley, 12 Mar. 1945, *A. C. & M. Langlois* 1 (BH); río Cuatro, Mar. 1945, *A. C. & M. Langlois* 1a (BH); Finca La Selva, on río Puerto Viejo above junction with río Sarapiquí, 110 m. alt., 28 Jan. 1967, *H. E. Moore & M. V. Parthasarathy* 9409 (BH); Puerto Viejo, hillside tract opposite Miramar Bar, ca. ½ mile north of town, 15 Aug. 1965,

- P. B. Tomlinson s.n.* (BH); PROV. LIMON: wooded slopes about 5 km. beyond Central of Hacienda Moravia, alt. 1000–1200 m., 13 Apr. 1953, *H. E. Moore 6694* (BH); woodlands south of La Lola on the railroad, alt. ca. 120 m., 15 Apr. 1953, *H. E. Moore 6715* (BH); PROV. PUNTARENAS: Esquinas forest preserve between Palmar Sur and Golfito on United Fruit Co. railroad, 9 Mar. 1953, *H. E. Moore 6537* (BH); Finca Las Cruces, slopes on trail to río Java, alt. ca. 3500 ft., 31 Jan. 1967, *H. E. Moore & M. V. Parthasarathy 9427* (BH); Las Cruces, San Vito de Java, 14 Dec. 1961, *R. W. Read 642* (BH), 18 Dec. 1961, *R. W. Read 659* (BH). PANAMÁ. PROV. VERAGUAS: forested slopes of Cerro Tute, 2500 ft., vicinity of Santa Fé, 25 Mar. 1947, *P. H. Allen 4376* (MO, holotype of *S. panamensis*); CANAL ZONE: Barro Colorado Island, 1931, *S. Aviles 27* (F), 82 (F), 11 June 1931, *L. H. & E. Z. Bailey 141* (BH), July, 1931, *Bailey & Bailey 523* (BH), 10 Aug. 1940, *H. H. Bartlett 16742* (BH), 28 June 1960, *J. E. Ebinger 207* (MO), Aug. 1927, *L. A. Kenoyer 172* (US), 13 Mar. 1958, *H. F. Loomis s.n.* (BH), 6 June 1923, *W. R. Maxon, A. D. Harvey & A. T. Valentine 6826* (US), 6831 (US), 6 Aug. 1934, *O. Shattuck 1143* (F), 18–24 Nov. 1925, *P. C. Standley 41092* (US); Frijoles, 13 July 1923, *O. F. Cook & R. D. Martin 60* (US); northwestern part of Canal Zone (area west of Limon Bay, Gatun Locks and Gatun Lake), near Maru Towers, 10 Nov. 1955, *I. M. Johnston 1644* (BH); forest along the río Indio de Gatun, near sea-level, 17 Feb. 1911, *W. R. Maxon 4847* (US); railroad relocation between Gorgona and Gatun, 10–50 m., 7 Jan. 1911, *H. Pittier 2292* (US); wet forest, hills north of Frijoles, 19 Dec. 1923, *P. C. Standley 27468* (US); PROV. DARIEN: Cerro Pirre, 11 Apr. 1967, *N. Bristan 550* (BH); between upper río Membrillo and Camp 7 on the Construction Road to San Blas, 100–800 m., 26–28 Apr. 1967, *J. A. Duke 10859* (BH); Cerro Pirre, cloud forest and/or mossy forest, 2500–4500 ft., Aug. 9–10, 1967, *J. A. Duke & T. S. Elias El 3712* (MO); PROV. PANAMÁ: beyond Goofy Lake along road to Cerro Jefe, 16 Nov. 1967, *M. D. Correa A. & R. L. Dressler 479* (MO); E. slope Cerro Jefe, 2700 ft., 8 Feb. 1966, *E. L. Tyson 3406* (MO); Cerro Jefe, 2700–3000 ft., 27 Jan. 1966, *E. L. Tyson, J. Dwyer & K. Blum 3240* (MO); PROV. SAN BLAS: between río Diablo and río Acuati, near Nargana, 11 Mar. 1967, *J. A. Duke 14902* (BH). COLOMBIA. DEPT. CHOCÓ: rain forest on hill north of Alto Curiche, ca. 300 m. alt., 19 May 1967, *J. A. Duke 11227* (BH); dense forest near junction of río Condoto and río San Juan, 100–150 m. alt., 20 April 1939, *E. P. Killip 35097* (US); DEPT. CAUCA: Costa del Pacifico, río Micay, brazo Noanamito, orilla derecha, El Chachajo, 2–5 m. alt., 27 Feb. 1943, *J. Cuatrecasas 14248* (COL); DEPT. DEL VALLE: Buenaventura, 3 May 1926, *O. F. Cook 77* (US), 26 May 1926, *O. F. Cook 156* (US); río Calima, La Trojita, 5–50 m. alt., 19 Feb.–10 Mar. 1944, *J. Cuatrecasas 16764* (F; COL); Costa del Pacifico, río Cajambre, 5–80 m. alt., 15 Mai 1944, *J. Cuatrecasas 17653* (COL); Bocana Island in bay off Buenaventura, Apr. 1959, *N. J. De Leon 123* (BH); near Buenaventura, 1960, *N. J. De Leon 243* (BH); dense forest, Cordoba, 50–100 m., 17 Feb. 1939, *E. P. Killip & H. Garcia 33426* (US); slopes and ravines of Agua Dulce, an island in Buenaventura Bay, 12 Feb. 1967, *H. E. Moore, M. V. Parthasarathy & P. Orjuela 9466* (BH). ECUADOR. Junction of the Provinces of Guayas, Cañar, Chimborazo and Bolivar, foothills of the western cordillera near the village of Bucay, 1000–1200 ft. alt., 8–15 June 1945, *W. H. Camp E-3671* (BH); woodlands and fields at entrance to Comune Chilhuilpe, Santo Do-

mingo de los Colorados, alt. ca. 600 m., 21 Feb. 1967, *H. E. Moore & M. V. Parthasarathy* 9486 (BH).

Synechanthus Warscewiczianus is a variable species of substantial range sharply differentiated from *S. fibrosus* though occurring with it at least in one

region of Costa Rica near the Hacienda Moravia in Limon Province (see *Moore 6694, 6696*). Species relegated to synonymy have been based on variable characters that, as noted earlier, do not prove reliable in the light of field experience.

PALM LITERATURE

LEVER, R. J. A. W. Pests of the Coconut Palm. 190 pp., 106 figs., 1 table. FAO Agricultural Studies No. 77. Food and Agriculture Organization of the United Nations, Rome, 1969. Distributed in the United States by Unipub, Inc., P. O. Box 433, New York, N. Y. 10016. Price \$3.50.

An accounting of the most important of very many invertebrate pests of the coconut palm, chiefly insects, and the fewer vertebrate pests occupies two of the four chapters in this paperbound book. Insect pests of copra and practical aspects of pesticidal application are the subjects of two additional chapters. An extensive list of references follows the text and precedes an index.

The book is copiously illustrated with photographs and line drawings printed on glossy paper. Economic aspect, geographic distribution, description, biology, and control are considered for each pest with considerable attention to biological control.

Although the book is centered on the coconut, notes are included when pests are known to attack other palms.

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GLASSMAN, S. F. A conspectus of the palm genus *Butia* Becc. Fieldiana:

Botany 32 (10): 127-172, fig. 1-31. 1970.

———. A synopsis of the palm genus *Syagrus* Mart. *op. cit.* 32(15): 215-240, fig. 1. 1970.

———. A new hybrid in the palm genus *Syagrus* Mart. *op. cit.* 32(16): 241-257, fig. 1-14. 1970.

These three papers are parts of a series that has dealt with the genus *Syagrus* for which Dr. Glassman adopts a circumscription far broader than that accepted of late. Earlier papers were noted in *Principes* 13: 66. 1969.

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TIDWELL, W. E., RUSHFORTH, S. R., REVEAL, J. L. & BEHUNIN, H. *Palmoxylon simperi* and *Palmoxylon pristina*: two pre-Cretaceous angiosperms from Utah. *Science* 168: 835-840. 1970.

TIDWELL, W. E., RUSHFORTH, S. R. & SIMPER, A. D. Pre-Cretaceous flowering plants: further evidence from Utah. *Science* 170: 547-548. 1970.

The authors of these articles suggest that palms, hence flowering plants, were present in Jurassic times.

H. E. MOORE, JR.