cupular, deeply lobed, sepals connate in basal 1/4-1/2, broadly rounded apically, +/- thin, +/membranous and transparent especially along margins, unnerved, olive-green with light-colored margins when dry; petals 1.5-2 x 1.5-2 mm, broadly ovate to triangular, valvate nearly to base, acute, +/- thin, olive-green with light margins and very faintly nerved adaxially when dry; receptacle 0.5 mm high; stamens 1-1.25 mm long, in a tight circle around pistillode and curving inward toward its tip; filaments nearly lacking or to 0.5 mm long, anthers 1 mm long, ellipsoidal, dorsifixed near base; pistillode 1-1.25 mm long, slightly exceeding stamens, shorter than petals, columnar, slightly fluted, truncate apically. Pistillate flowers in 2 spiraling rows, flowers 1-2 mm distant within row, rows 2-5 mm distant as they spiral vertically, leaving slightly raised oval scars 1.5-1.75 mm long; flowers at anthesis, 2 x 3 mm, globular or +/-domeshaped, greenish; calyx 0.75 x 2-3 mm, cupular, deeply lobed, sepals connate and/or slightly imbricate in basal 1/4-1/2, broadly rounded above, +/- thin, +/- transparent, prominently nerved adaxially and keeled abaxially when dry; petals 2.5 x 2-2.25 mm, imbricate in basal 3/4, cupped or bowllike, broadly ovate or triangular, roundedacute to slightly mucronate, nerved and thickened toward middle but margins thin and transparent when dry, greenish when fresh or dried; pistil 2.25 x 2.25 mm, globular to globose, styles lacking, stigma lobes 3, just exceeding petals, not much differentiated, short, blunt. Fruits 12 x 8 mm, oblong-ellipsoid, black; seeds 9-10 x 6 mm; fruiting perianth 2-2.5 mm high, orange, when dry very faintly nerved abaxially, more prominently nerved adaxially.

Distribution: COSTA RICA. Wet forest, 1200 m elev.

Additional Specimens Examined: COSTA RICA. Herrera et al. 8787, 8788 (BH,CR), 8797 (CR), Hammel 20408 (INB), Hodel et al. 1539 (BH,CR), Sanchez 797 (CR).

The epithet is from the Latin *pisc*, meaning fish, and *folius*, meaning leaf, and is used here in reference to the unusual leaf blade which is fish-shaped. By the nature of its solitary staminate inflorescences and flowers with free and spreading petals, we place *Chamaedorea piscifolia* in subgenus *Chamaedoropsis*.

Discovered by Herrera, Cascante, and Joaquín Sanchez in 1994, Chamaedorea piscifolia is one

of the most remarkable species in the genus, and ranks with C. tuerckheimii (Dammer) Burret in the exceptional nature of the leaves. Indeed, leaf blades of C. piscifolia are somewhat similar to those of C. tuerckheimii, but these of the latter lack the long, distinctive, drawn out, bifid, caudate tips. Also, inflorescences of C. tuerckheimii are interfoliar, with the staminate ones bearing many rachillae. Leaves of C. palmeriana Hodel & Uhl are somewhat similar in color and texture to those of C. piscifolia although they, too, lack the distinctive, caudate tips; C. palmeriana also differs significantly in details of the inflorescences and flowers. C. piscifolia is probably closest florally to C. correae Hodel & Uhl, C. guntheriana Hodel & Uhl, and C. subjectifolia Hodel, all from Panama and known from only one or a few isolated, localized populations. Like C. piscifolia, these latter three species have spicate or fewbranched inflorescences borne well below the leaves on bare stem, but their leaf blades lack the distinctive, caudate tips. Staminate flowers of C. piscifolia are similar to those of C. dammeriana Burret but, again, the latter species lacks the distinctive leaves. In fact, the extraordinary leaves alone easily and readily set C. piscifolia off from all other species in the genus.

The inflorescences of *Chamaedorea piscifolia* are usually at such a distance below or behind the leaves on the creeping, prostrate, buried stem that they are often difficult to associate with any given plant. Indeed, in such instances, they arise from the bare ground or leaf litter in an isolated manner, and are often overlooked or escape attention as palm inflorescences. Only after carefully tracing a buried stem, sometimes for a meter or more, does one find the leafy crown of this species.

In its only known locality, *Chamaedorea piscifolia* is distributed in a rather narrow band about 100 meters wide over an altitudinal range of 30 meters. Due to this localized distribution, its proximity to human activity, and its highly ornamental nature, *C. piscifolia* should tentatively be designated as endangered.

Chamaedorea rossteniorum Hodel, G. Herrera & Casc. sp. nov. Figs. 3-6, and outside of back cover.

Subgeneris Chamaedoreae floribus masculis petalis connatis apicaliter corollis aperturis

lateralibus. *C. strictae* Standl. & Steyerm. affinis sed petalis et sepalis et perianthiis fructificantibus valde nervatis ubi siccis, petalis masculis connatis apicaliter differt; *C. macrospadici* Oerst. affinis sed foliis simplicibus bifidis differt. Typus: Costa Rica, *Hodel, Cascante, Chacón et Herrera* 1525 (holotypus BH; isotypi CR,MO,USJ).

Solitary, +/- acaulescent, understory palm to 1.75 m tall. Stem short-creeping to briefly erect, infrequently to 50 cm tall, usually buried in leaf litter, to 3 cm diam., internodes congested, 0.5-5 cm long. Leaves 4-8, simple, bifid, ascending to spreading, +/- thick and coriaceous, infrequently thin-papery and then drying nearly transparent with back light; sheath to 28 cm long, long-open, tubular only in basal 2-5 cm, coriaceous, pinkish basally, prominently longitudinally striate when dry; petiole (excluding sheath) to 36 cm long, rounded abaxially, flattened or slightly grooved adaxially; rachis to 70 cm long, rounded abaxially, slightly raised adaxially when fresh but prominently raised and knifelike when dry; blade to 110 x 25 cm, distal lobes to 40 cm long, longacuminate, with up to 20 primary nerves per side, these +/- prominent adaxially when fresh, conspicuously raised and knifelike when dry, 2-4(-6) not too prominent secondary nerves between each pair of primaries, tertiaries numerous, faint, all nerves less prominent abaxially but conspicuously yellowish on thin blades. Inflorescences 3-4, inter- or infrafoliar, ascending to spreading; peduncle to 1.8 m long, shorter than to exceeding leaves, 1 cm wide at attachment of prophyll and +/- flattened, 2-3 mm diam and rounded at apex, greenish in flower and red-orange in fruit distally where exposed with up to 14 bracts, these tightly sheathing, green to brown? in flower becoming tattered in fruit, faintly longitudinally nerved when dry, prophyll and proximal peduncular bracts acute, bifid, short-open, those concealed in leaf sheath or leaf litter pinkish, distal bracts long-acuminate and obliquely open, prophyll to 2 cm long, 2nd bract to 4.5 cm long. 3rd to 9 cm long, 4th to 19 cm long, 5th to 24 cm long, 6th and 7th to 29 cm long, 8th to 32 cm long, 9th to 34 cm long, 10th to 32 cm long, 11th to 30 cm long, 12th to 20 cm long and +/- equally peduncle and concealing small 13th (to 5 cm long) and 14th (to 3 mm long) bracts. Staminate inflorescence with rachis to 6 cm long; bearing up to 7 rachillae, to 22 cm long, 1 mm diam., drooping, greenish vellow in flower. Pistillate inflorescence with rachis to 3.5 cm long; bearing up to 6 rachillae, to 21 cm long, 1.5-2 mm diam, greenish yellow and erect to ascending in flower, red-orange and drooping or slightly spreading in mature fruit,. Staminate flowers in 2 spiraling rows, flowers 1-2 mm distant within a row, rows 3-5 mm distant as they spiral around vertically; leaving superficial elliptic scars 1.5 x 0.5 mm; flowers 3.5-4 x 2.5-3.5 mm, obovoid-globose, greenish yellow when fresh, black when dry; calyx 0.6-1 x 1.5-2 mm, cupular, elliptic, sepals connate in basal 1/2, acuterounded apically, prominently nerved when dry; petals connate apically and there adnate to pistillode, corolla opening by lateral and basal apertures to 1.75 mm long, prominently nerved when dry; receptacle 0.75 x 1 mm; stamens 1.75 mm long, filaments 1 mm long, leaning outward, when fully open anthers 1-1.75 x 0.75-1.25 mm, opening longitudinally and laterally, roundedelliptic, bilobed, dorsifixed slightly above base, leaning inward and touching pistillode just below tip: pistillode 2.5 mm long, columnar, longitudinally fluted, conspicuously truncate and expanded distally. Pistillate flowers in 1-2 spiraling rows, flowers 1.75-5 mm distant within a row, rows 6-12 mm distant as they spiral vertically; flowers slightly sunken but leaving superficial to slightly raised elliptic scars 2 x 0.5-0.8 mm, becoming in fruit slightly sunken and rounded-elliptic, 2 x 1-1.5 mm; flowers 2.75-3 x 2.5-3 mm, bullet- to dome-shaped, greenish yellow when fresh, black when dry; calyx 1 x 2.5 mm, cupular, moderately to deeply lobed, prominently nerved when dry, sepals connate and/or imbricate in basal 1/2 -3/4, broadly rounded-acute apically; petals 2.75 x 2.5 mm, broadly ovate, keeled, tightly imbricate nearly to apex, erect, slightly mucronate, exceeding stigma lobes, prominently nerved when dry; pistil 2.5-3 x 1.25-2 mm, +/- ovoid, flared basally, truncate apically, styles lacking, stigma lobes inconspicuous and blunt-rounded to erect and triangular or +/- conspicuous, 0.25 mm long, erect, obtuse. Fruits to 14 x 9 mm, globose-oblong, black; seeds to 12 x 8 mm, obovoid; fruiting perianth to 3-3.5 x 7 mm, orangish, prominently nerved when dry.

Distribution: COSTA RICA. PANAMA. Veraguas. Moist or wet forest, 1000-1600 m elevation.

Additional Specimens Examined: COSTA



Fig. 3 Chamaedorea rossteniorum, staminate plant with long inflorescences, Hodel et al. 1525 (holotype), Costa Rica.



Fig. 4 Chamaedorea rossteniorum, pistillate plant, Hodel et al. 1526, Costa Rica.



Fig. 5 Chamaedorea rossteniorum, fruiting plant, Hodel et al. 1541, Atlantic lowlands, Costa Rica.



Fig. 6 Chamaedorea rossteniorum, Hodel et al. 1189, Panamá.

RICA. Chavarria 109 (CR); Hammel 19904, 20160, 20163 (INB); Herrera 8746 (BH,CR); Hodel et al. 1526 (BH,CR,K,MO,USJ), 1538 (BH,CR), 1541(BH,CR,K,MO,NY,USJ), 1551 (BH,CR,MO,USJ), 1555 (BH,CR,MO); Zamora 1428 (CR,MO). PANAMA. Veraguas, Antonio 1861 (MO); Hamilton et al. 4020 (MO); Hammel 4615 (MO); Hodel et al. 1189 (BH,CAS,MO,NY,PMA).

Vernacular Names: cola de gallo, mata de caña.

The specific epithet honors Lois and Kurt Rossten of Huntington Beach, California, who have labored and toiled selflessly in the International Palm Society and its Southern California Chapter as well as other plant societies for over 30 years, their volunteer efforts helping these societies to grow and flourish.

Hodel (1992a) referred material of Chamaedorea rossteniorum from Costa Rica and Panamá to C. stricta, a species similar in habit, leaves, and inflorescences from México and Guatemala. Unfortunately, staminate flowers of the Costa Rican and Panamanian material, the best diagnostic character for distinguishing the two taxa, were not available until recently. In October, 1996, a collection from Panamá produced staminate flowers in the research collection in Los Angeles (Hodel et al. 1189 bis), and in December, 1996, we were able to collect excellent staminate flowers of this species in Costa Rica. Staminate flowers of the Costa Rican and Panamanian material have petals connate apically and there adnate to the pistillode, the corolla opening by lateral, basal apertures, and prominently nerved sepals and petals when dry, all characters which place C. rossteniorum in subgenus Chamaedorea. Also, pistillate flowers and the fruiting perianth are nerved when dry. In contrast, petals of staminate flowers of C. stricta are free and spreading apically and not prominently nerved when dry, characters which place it in subgenus Chamaedoropsis.

Chamaedorea rossteniorum is closest to C. macrospadix, a species widespread in Costa Rica and also found sparingly in adjacent regions of Panamá. C. macrospadix differs in its usually well developed, above-ground stem; pinnate leaves; shorter inflorescences with fewer bracts and more rachillae (up to three times as many staminate, two times as many pistillate); and much smaller, greenish, ovoid, staminate flowers. Other species related to *C. rossteniorum* and *C. macrospadix* include *C. matae* Hodel and *C. warscewiczii* H. Wendl. These four species have mostly thick and leathery leaf blades or pinnae, and leaf sheaths pinkish adaxially, especially near the base. When dry, the leaf sheaths are conspicuously rosy pink to reddish.

Material from the Atlantic slope of Costa Rica is only tentatively included here, especially since staminate and pistillate flowers for these collections are unknown. These collections differ in their thinpapery leaf blades more deeply bifid apically (sometimes slightly more than half way), thicker pistillate rachillae, and fruiting perianth much less conspicuously nerved and with thickened sepal and petal margins. Leaf-blade thickness and texture are variable, though; the material from Panamá has the thickest, most coriaceous leaf blades, those from the Pacific slope of Costa Rica are slightly less thick and coriaceous, while those from the Atlantic slope are thin-papery. Leaf blades from the Atlantic slope of Costa Rica dry shiny and glossy dark green and are more or less transparent with back lighting, while those from Panamá and the Pacific slope of Costa Rica dry gravish and thick, and are not transparent.

Chamaedorea rossteniorum is a handsome species and would make a striking ornamental with its rosette of dark green, spreading, thick and leathery simple leaves and long inflorescences, which hold flowers and attractive black fruits on red-orange rachillae conspicuously above the foliage where they can be viewed to best advantage. Unfortunately, as with other highly ornamental chamaedoreas in the past, unscrupulous hobbyists and collectors, this time from Southern California, have recently raided populations of *C. rossteniorum*, among other species in Panamá, illegally stripping numerous plants from a protected reserve, and selling and distributing them in the United States as *C. stricta*.

Although a highly ornamental species and at times occurring in proximity to human activity, *Chamaedorea rossteniorum* appears to be sufficiently abundant across its diverse and somewhat wide range to warrant designating it as vulnerable rather than endangered. However, the only known population in Panamá is confined to a single ridge and, although it occurs in a government forest reserve, its narrow distribution and accessibility to collectors suggest the species is endangered at the local level in Panamá.

Chamaedorea incrustata Hodel, G. Herrera & Casc. sp. nov. Figs. 7-9, and inside back cover.

Subgeneris *Chamaedoropsi* Oerst. inflorescentiis masculis solitariis, floribus masculis solitariis petalis patentibus apicaliter pertinens. Species insignis rhachidi et rachillis fructificantibus valde dense incrustatis trichomatibus minimis stellatis albidis et pinnis valde navicularibus, a ceteris speciebus bene distincta. Typus: Costa Rica, *Hodel, Cascante, Chacón & Herrera 1532* (holotypus BH; isotypi CR,MO).

Solitary, erect, understory palm to 6 m tall. Stem 2-3 cm diam., smooth, ringed, internodes to 20 cm long, light green, large adventitious prop roots to 7-8 mm diam, below leaf litter, apical portion of stem with old, brownish, often tattered or shredded, persistent leaf sheaths. Leaves 3-5, ascending to spreading; sheath to 35 cm long, tubular, obliquely open in distal 6 cm, thick, coriaceous, gravish lime-green distally when fresh, drying prominently striate with a conspicuous slightly raised central costa; petiole (excluding sheath) to 17 cm long, 7-9 mm diam., rounded abaxially, flattened or grooved adaxially, grayish lime-green with dense minute spots when fresh, minutely rough-pebbled when dry; rachis to 85 cm long, rounded abaxially, angled adaxially, color and surface texture (especially proximally) similar to that of petiole; up to 11 pinnae per side, proximal pair to 32 x 5 cm, acuminate, middle pinnae to 37 x 10 cm, long-acuminate, caudate, distal pinnae to 15 x 3.5 cm, pinnae opposite proximally and to 6 cm distant to alternate medially and to 13 cm distant to subopposite distally and to 3 cm distant, straight, conspicuously falcate, thick, iridescent gravish blue-green and strongly cupped downward when fresh resulting in drying prominently wrinkled and plicate, nerves not too conspicuous when fresh, when dry a conspicuous midrib adaxially, middle pinnae with 4-5 primary nerves on each side, 2-3 faint secondaries between each pair of primaries, tertiaries numerous, faint, all nerves lighter colored and more prominent abaxially. Staminate inflorescences 1-2, infrafoliar, breaking through old persistent sheaths, branching to 2 orders; peduncle to 60 cm long (ca. 5 cm basal portion of peduncle missing), 2 cm wide and

prophyll and perhaps 1-2 additional bracts missing, 7 bracts present, 2 proximal ones 9 cm long, acuminate, +/- flattened and with a small wing on each side longitudinally, (5 distal bracts with proximal portions only, distal portions missing) 3rd bract 26 cm long, 4th 19 cm long, 5th 18 cm long, 6th 23 cm long, 7th 9 cm long, all bracts thick-papery, longitudinally striate when dry; rachis 24 cm long, longitudinally ridged, the ridges crusty or roughly crinkled, proximal 10 cm of rachis with 10 branches each with 2-4 rachillae, branches to 3 cm long, distal 14 cm of rachis with only simple rachillae; up to 58 rachillae total, to 16 cm long. Pistillate inflorescence in young or old fruit only, peduncle to 55 cm long, 1 cm wide at prophyll attachment and flattened, arcuate, green in young fruit and red-orange and scabrous where exposed distally in old fruit; bracts as in staminate inflorescence; rachis 14 cm long, green in young fruit, red-orange in old fruit, longitudinally ridged, the ridges conspicuously encrusted with thin, long, irregular, sometimes wavy, platelike, corallike protuberances resulting in a conspicuously crusty or roughly crinkled appearance and feel, the protuberances to 1-1.5 mm high and bearing on their margins and apices concrescent clusters of slender, stellate, white, simple hairs to 0.05-0.1(-0.5) mm long, proximal portion of rachis with 2 branches, each with 4 and 2 rachillae each respectively, each branch 2.5 cm long, 5 mm wide and flattened proximally, 1 mm diam. at apex, remaining distal portion of rachis with simple rachillae; up to 23 rachillae total, to 13 cm long, 1-3 mm diam., ascending, scabrous and rough as in rachis, green in young fruit, red-orange in old fruit. Staminate and pistillate flowers not seen. Fruits immature, 9 x 5 mm, oblong, green, arranged in 2 spiraling rows, fruits 3 mm distant within a row, rows 5 mm distant as they spiral vertically; fruiting perianth 3 x 4 mm, sepals 1-1.25 x 1-1.5 mm, connate and/or imbricate in basal 1/2, broadly rounded apically, +/- thin, faintly nerved, petals 3-4 x 3-4 mm, broadly ovate, imbricate in basal 1/2-2/4, thin, transparent, lightcolored, with a central costa, margins and area near central costa thickened.

flattened at base, 1 cm diam. and rounded at apex;

Distribution: COSTA RICA. Moist or wet forest and cloud forest, to 1600 m elevation.

Additional Specimens Examined: COSTA RICA. Hodel et al. 1531 (BH,CR); Herrera 7425