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A Revision of *Kentiopsis*, a Genus Endemic to New Caledonia

JEAN-CHRISTOPHE PINTAUD¹

Laboratoire de Botanique, ORSTOM, BP A5, 98848, Nouméa Cedex, New Caledonia

DONALD R. HODEL

University of California, Cooperative Extension, 2 Coral Circle, Monterey Park, CA 91755

The definitive and unparalleled work of Harold E. Moore, Jr. and Natalie W. Uhl (1984) on the palms of New Caledonia has proven to be unusually successful. It unraveled the intriguing but perplexing mysteries of the extraordinary assemblage of palms on the island and has ably served as a stable foundation for future palm studies there. Essentially, Moore and Uhl completed nearly all the most difficult work when they made order out of the chaos of the numerous and interesting genera on the island. Their contribution to palm taxonomy in New Caledonia cannot be overstated. The little they did leave for future palm taxonomists mainly involved naming and describing the additional new species that were sure to be discovered when the large, geographically, and ecologically diverse island of New Caledonia was more thoroughly explored. Indeed, Moore and Uhl's work inspired local palm enthusiasts to search the mountains and forests of New Caledonia for additional treasures in the palm family. This work was rewarded with the discovery of the two new species of *Kentiopsis* that we name and describe here in anticipation of publishing a fully illustrated book, now in preparation, on the palms of New Caledonia.

After extensive field work in New Caledonia spanning several years, we had, at one time, considered erecting two new genera for the two new species of *Kentiopsis*. However, the two new species prove to be intermediate between the existing genera *Kentiopsis* and *Mackeeea* and serve as a bridge or continuum to tie the two extremes together. Thus, we decided to include the two

new species and *Mackeeea* in the older *Kentiopsis*. We feel this arrangement best reflects the natural variation and diversity of palms at the generic level in New Caledonia.

Kentiopsis Brongn., *Compt. Rend. Hebd. Séances Acad. Sci.* 77: 398. 1873; Moore & Uhl, *Allertonia* 3(5): 324–325. 1984; Uhl & Dransfield, *Genera Palmarum*, 374–375. 1987. Type species: *K. oliviformis* (Brongn. & Gris) Brongn., (lectotype) vide Beccari, *Palmae Nuova Caled.* 18. 1920. ('*olivaeformis*').

Mackeeea H. E. Moore, *Gentes Herb.* 11: 304. 1978. Type species: *M. magnifica* H. E. Moore. **Syn. nov.**

Solitary, tall, erect, unarmed, pleoanthic, monoecious palms. Trunk aging gray, often expanded proximally with exposed adventitious roots, ringed with not too prominent leaf scars, internodes nearly smooth but with superficial longitudinal fissures. Leaves regularly pinnate, spreading to arching, neatly abscising; sheaths tubular, forming a prominent cylindrical crownshaft, fibrous and \pm woody, waxy and punctulate to tomentose; petiole channelled adaxially, rounded abaxially, glabrescent to variously tomentose; rachis adaxially ridged proximally and angled distally, flattened to slightly rounded abaxially, glabrescent to variously tomentose; pinnae \pm flat and arranged in one plane to stiffly erect, lanceolate, acute to acuminate, single-fold, midrib elevated adaxially and prominent abaxially, numerous secondary ribs very conspicuous abaxially, marginal ribs prominent and second in size to midrib, waxy glabrescent adaxially sometimes with remnant tomentum on midrib, abaxially punctulate with tiny scales, midrib and secondary ribs with numerous, con-

¹Present address: Laboratoire d'Ecologie Terrestre, 13, Avenue du Colonel Roche, B.P. 4403, 31405 Toulouse Cedex, France.





spicuous, membranous, medifixed ramta. Inflorescences infrafoliar, protandrous, stiffly and paniculately branched to (2-)3-4 orders; peduncle short, stout, variously tomentose; prophyll and first peduncular bract caducous, chartaceous, sparsely scaly to tomentose, prophyll markedly two-keeled, flattened, encircling peduncle at insertion and enclosing first peduncular bract, this one similar to prophyll but not keeled, rostrate, 2-4 subsequent small, triangular, peduncular bracts present; rachis longer than peduncle, waxy-glabrescent to minutely scaly, main branches rounded or angled, with same indument as rachis; bracts subtending branches and rachillae acute to acuminate proximally and reduced to low ridges distally; rachillae slender to rather stout, straight or curved, mostly glabrous. Flowers in spirally arranged triads of two earlier-opening distal-lateral or rarely median-lateral staminate flowers flanking a central later-opening pistillate flower, sunken in a prominent cleft subtended proximally by a conspicuous liplike or sharp-edged, rounded bract; triads at least in proximal 2/3 of rachillae, distally with only paired or solitary staminate flowers; outermost bracteole low, small to inconspicuous, bracteoles surrounding pistillate flower markedly unequal or rarely subequal, inner one often sepal-like. Staminate flowers symmetrical to asymmetrical; sepals 3, distinct, variable in shape, imbricate basally, \pm keeled or costate abaxially; petals 3, \pm connate basally, valvate apically, acute or rounded; stamens 11-38, shorter or equal to or exceeding petals, filaments shorter or equal to or longer than anthers, mostly straight apically, free or connate basally and there variously adnate to a variable receptacle, anthers elongate, latrorse or introrse, emarginate to bifid distally, bifid to bilobed proximally, dorsifixed about 1/3 from base, connective narrow to wide, tanniferous or not; pollen elliptic to triangular, monosulcate or trichomosulcate with finely pitted to reticulate tectate exine; pistilode much shorter than to equalling filaments, conical to columnar. Pistillate flowers symmetrical; sepals 3, broadly imbricate basally; petals 3, broadly imbricate basally, valvate only briefly apically, acute; staminodes mostly 3, toothlike and borne within 1 petal or 6 and connate in a ring with triangular lobes; gynoeceum unilocular, uniovulate, with 3 prominent, recurved stigmatic lobes, ovule pendulous or rarely lateral. Fruits ellipsoid, red or purplish, stigmatic remains api-

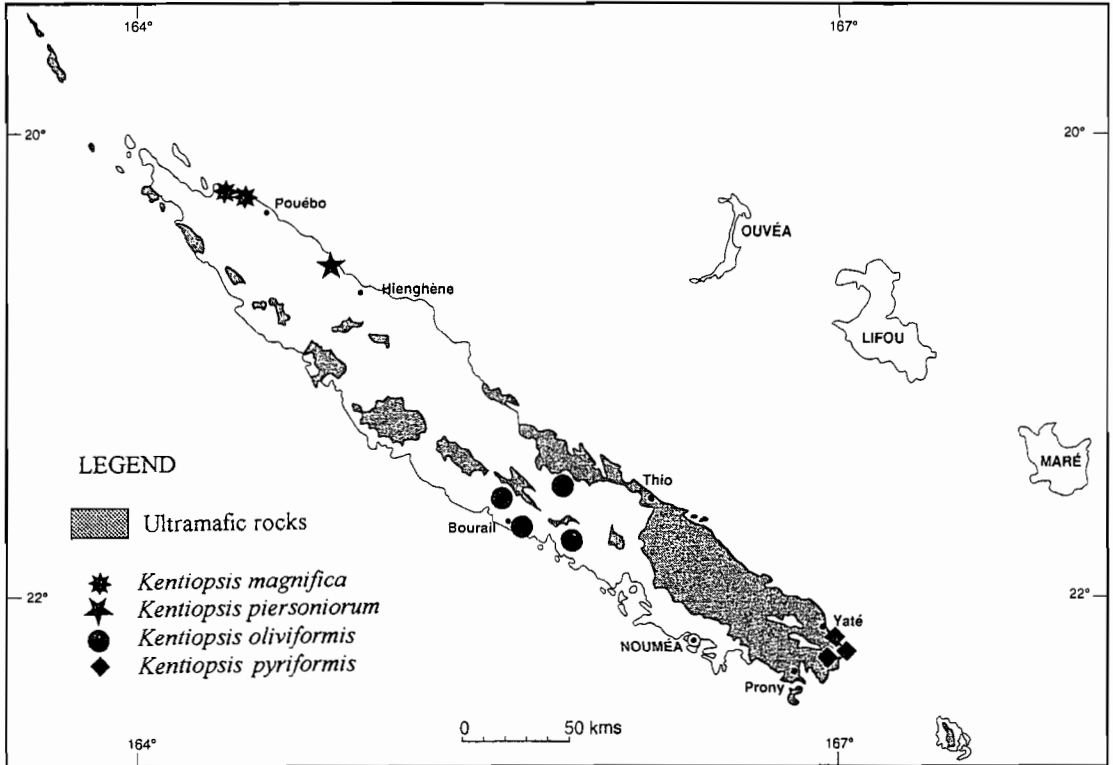
cal or rarely subapical, perianth remains prominent; epicarp smooth, thin, drying minutely pebbled; mesocarp containing short sclereids, longitudinal fibers anastomosing or not and variously adherent to the endocarp and a thick layer of tannin cells over the endocarp; endocarp thin, fragile, not operculate, not adherent to seed. Seeds ellipsoid to rarely pyriform, hilum elongate, raphe branches various, numerous, anastomosing, slightly embedded, endosperm homogeneous; embryo basal. Germination adjacent-ligular; eophyll bifid, 4-6 subsequent deeply bifid leaves with narrowly lanceolate lobes, before first pinnate leaf. Leaves of juvenile individuals spirally or distichously arranged, "saxophone" type establishment growth present or lacking.

Distribution. NEW CALEDONIA. Four species endemic to the main island "Grande Terre," two in the northeast of the island, one in the center, and one in the extreme southeast (Fig. 1). All have a very limited distribution at low to medium elevations.

Ecology. The four species are clearly gregarious and often develop pure stands. They are found mostly in lowland rain forest where they grow up to 30 m tall as emergent or canopy trees; however, *K. oliviformis* is restricted to transitional semihumid forest and *K. piersoniorum* is frequently exposed in wet, shrubby montane vegetation. *Kentiopsis pyriformis* grows on ultramafic rocks, often on unstable steep slopes; the other three species occur on schists, or rarely basalt, sometimes mixed with serpentine colluvium.

Taxonomic history. In 1873, A. Brongniart established *Kentiopsis* and included three species, *K. macrocarpa*, *K. divaricata*, and *K. oliviformis*. Earlier, Vieillard had invalidly named the former two while Brongniart and Gris (1864) had named the last, all in *Kentia* Blume, a name accepted at the time but now included in *Gronophyllum* Scheffer. According to Brongniart (1873), *Kentiopsis* differed in the staminate flowers bearing numerous stamens (20-50) adnate to a prominent receptacle, instead of the 6-12 stamens in *Kentia*. Dammer (1906) transferred *K. divaricata* to *Actinokentia*, and, although Vieillard (1873) had transferred *K. macrocarpa* to *Chambeyronia*, he had done so invalidly, leaving Beccari (1920) to validate the transfer; thus *Kentiopsis* has been a monotypic genus until the present.

(Continued from p. 33)

1. Distribution of *Kentiopsis* species.

Kentiopsis includes the stateliest palms of New Caledonia; they often attain or exceed 20 m in height and grow in impressive colonies. There is great floral variation among the species, especially regarding the size and symmetry of the flowers, insertion of the stamens, shape of the receptacle and pistillode and also in the bracteoles. The manner in which the leaves are held is also very diverse; *K. piersoniorum*, with leaves sharply recurved and stiff pinnae held in a narrow V, and *K. magnifica*, with pinnae flat in one plane and initially held vertically by the twist of the rachis, are the extremes. On the other hand, pinna morphology is strikingly similar in all species. Pinnae have an elevated midrib adaxially, this one also prominent abaxially and bearing numerous ramenta, many prominent secondary nerves, prominent marginal ribs and abaxial pinna surface minutely and regularly dotted with scale-like trichomes. Fruits with a thick and very conspicuous layer of tannin cells in the inner part of the mesocarp are also distinctive. Each species has at least one important di-

agnostic character: *K. pyriformis* has fruits with subapical stigmatic remains and mostly pyriform seeds; *K. magnifica* has staminate flowers with stamens connate basally in a ring; *K. oliviformis* has strongly asymmetrical staminate flowers with deltoid sepals and lacks sepal-like bracteoles; and *K. piersoniorum* has pistillate flowers with six staminodes connate in a crownlike ring. Groups of two or three species have several shared characters. For example, distichously arranged leaves in the juvenile stage and a short conical pistillode occur in *K. pyriformis* and *K. magnifica*; "saxophone" type establishment growth and persistent indument of inflorescence are exhibited in *K. pyriformis* and *K. oliviformis*; recurved leaves and waxy punctulate sheaths are found in *K. pyriformis* and *K. piersoniorum*, glaucous-waxy inflorescences and truncate-depressed seeds in *K. magnifica* and *K. piersoniorum*. The northeastern species *K. magnifica* and *K. piersoniorum* seem to be less specialized than the central and southern species, *K. oliviformis* and *K. pyriformis*. The last share the "saxo-

phone” type establishment growth, and they produce simultaneously several complex, much branched inflorescences with small flowers followed by numerous, rapidly maturing (three months), small fruits in great quantity with readily germinating seeds. These features promote and enhance their gregarious nature.

**Keys to the Species of *Kentiopsis*
Key Based on Vegetative Characters**

Leaf sheath densely dotted with scales to tomentose, rachis not recurved, pinnae flat to drooping.

Sheath initially densely covered with appressed white tomentum, rachis initially white-tomentose also, new expanding leaf light green 2. *K. oliviformis*

Sheath initially covered with prominent, blackish-centered, white-margined scales, aging densely dotted with blackish scales, rachis persistently brown-tomentose, new expanding leaf chocolate-brown to bright red 1. *K. magnifica*

Leaf sheath waxy, almost glabrous but minutely punctulate with sunken, lacerate, dark brown, barely visible scales, rachis ± recurved

Leaf sheath conspicuously wine-colored to purple or copper-colored, glaucous wax layer thin to thick, leaves slightly to moderately recurved, pinnae held in an open V or flat to slightly pendulous, dark green 4. *K. pyriformis*

Leaf sheath purplish obscured by a thick layer of bright glaucous wax, leaves strongly recurved, pinnae stiffly erect in a narrow V, glaucous 3. *K. piersoniorum*

Key Based on Floral Characters

Branches of inflorescence ± swollen basally, rounded to angled, branching to (2)-3 orders, staminate flowers with 30 or more stamens and distal-lateral to the pistillate flower in the triad

Inflorescence erect, branches pale green and bearing white scales, inner bracteole not sepal-like, staminate flowers strongly asymmetrical, pointed in bud, with deltoid sepals 2. *K. oliviformis*

Inflorescence spreading, branches glaucous and spotted with brown scales, inner bracteole large, rounded, ± sepal-like, staminate flowers ± symmetrical, not pointed in bud, with rounded or emarginate sepals

Staminate flowers broadly ovoid to barrel-shaped in bud, stamens connate in a conspicuous basal ring, pistillode short, conical, staminodes 2-3 1. *K. magnifica*

Staminate flowers elongate, bullet-shaped in bud, stamens free or nearly so, pistillode columnar, nearly equalling stamens, staminodes 6 in a crownlike ring 3. *K. piersoniorum*

Branches of inflorescence not swollen basally, sharply angled and dorsiventrally flattened, branching to 3-4 orders, staminate flowers with 20 or fewer stamens and median-lateral to the pistillate flower in the triad 4. *K. pyriformis*

Key Based on Fruits and Seeds

Fruits with apical stigmatic remains

Mesocarp fibers adherent to endocarp throughout, seeds ovoid-elongate to ellipsoid, fruits bright red 2. *K. oliviformis*

Mesocarp fibers not adherent to endocarp throughout, seeds bullet-shaped and truncate to depressed basally

Mesocarp fibers adherent to endocarp only basally, leaving a striate ring on it, fruit red 1. *K. magnifica*

Mesocarp fibers few, not leaving a striate basal ring on endocarp, fruit purplish 3. *K. piersoniorum*

Fruit purplish with subapical stigmatic remains, mesocarp fibers not adherent to endocarp, seed pyriform 4. *K. pyriformis*

Key to the Juveniles

Leaves 50-100 cm long spirally arranged

“Saxophone” type growth, petiole with prominent appressed scales 2. *K. oliviformis*

No “saxophone” growth, petiole glabrous 3. *K. piersoniorum*

Leaves 50-100 cm long distichously arranged

“Saxophone” growth, petiole reddish to purple, glabrous 4. *K. pyriformis*

No “saxophone” growth, petiole densely and shortly brown tomentose 1. *K. magnifica*

1. *Kentiopsis magnifica* (H. E. Moore) Pin-taud & Hodel comb. nov. (Fig. 3)

Mackeea magnifica H. E. Moore, Gentes Herb. 11:304 (1978); Moore & Uhl, Allertonia 3(5): 324-325 (1984). Type: *MacKee 26471* (holotype BH).

Emergent palm. Trunk to 25 m tall, 25 cm dbh. Leaves 8-9, spreading; sheath 0.8-0.9(-1.5) m long, initially covered with blackish-centered, white-margined scales; petiole 20 cm long, minutely covered with brown-centered pale-margined scales of trichomes concrescent toward center; rachis ca. 2.25 m long, densely covered by similar scales; pinnae to 55 on each side, dark green on both surfaces and coriaceous, with numerous veins especially prominent abaxially, median pinnae 74-80 × 2.4-5 cm, the lowermost continuing into lorae to 2 m long, all arranged in one plane, although leaves in upper part of crown often twisted so pinnae oriented vertically (but still in one plane). Inflorescences 45-55 cm long, spreading, branched to three orders; peduncle 6.5-9 cm long, densely covered especially proximally with small brown-centered scales with long diverging white trichomes along margins; prophyll and first peduncular bract 51-55 cm long, densely tomentose-floccose abaxially; rachis 16-17.5 cm long, scarcely scaly, with 15-20 angled branches; rachillae 27-44 cm long, waxy glaucous and glabrous. Flowers in triads nearly to apex of rachillae; bract subtending triad prominent, rounded, liplike; staminate flowers brown in bud, white inside, symmetrical, 12 mm diameter

and 10 mm high at anthesis; stamens 32–38, exceeding petals, connate basally in a conspicuous ring, filaments 5 mm long, equalling petals, subulate, awl-shaped, straight at apex, anthers 3.5 mm long, linear-oblong, introrse, connective large, dark; pistillode less than half as high as filaments, conic, 3-lobed; outer bracteole surrounding pistillate flower ring-like, equalling triad bract, inner one twice as high, partly surrounding flower, both brown.; pistillate flowers 8 × 6 mm at anthesis, gynoecium 5 mm high, ovoid, stigmatic lobes prominent, white; staminodes 2–3. Fruits 2.2 × 1.2 cm, red, perianth brown, stigmatic remains apical; mesocarp with longitudinal fibers adherent to endocarp only basally; endocarp glossy, with longitudinal groove and round basal invagination. Seeds 15–16 × 9 mm, bullet-shaped, truncate basally. Leaves of juvenile individuals distichously arranged; “saxophone” type establishment growth lacking.

Specimens examined, additional to those cited in Moore & Uhl (1984). NEW CALEDONIA. Upper Mayavetch valley, 550 m elev., 20°18'S, 164°23'E, 29 Apr. 1995 (stam. fl.), J.-C. Pintaud & J.-L. Aubé 175 & 176 (K), 177 (NY), 178 & 179 (NOU), 180 (K) (all juv.); Col d'Amos, 550 m elev., 20°18'S, 164°26'E, 13 Jun. 1995 (ster.), J.-C. Pintaud & M. Olivier 215 (K); Upper Mayavetch valley 550 m elev., 18 Sept. 1995 (juv.), J.-C. Pintaud 281 (NOU), 282 (NY); id., 17 Mar. 1996 (stam. fl.), J.-C. Pintaud & D.R. Hodel 339 (K, NY); Col d'Amos 550 m elev., 29 Apr. 1996 (stam. fl.), J.-C. Pintaud & J.-P. Tivollier 346 (NY); Mayavetch, 550 m elev., 6 Jun. 1996 (pist. fl.), J.-C. Pintaud & D. R. Hodel 373 (NOU).

Distribution. *Kentiopsis magnifica* occurs in an area of about 10 × 1–4 km along Col d'Amos and the Pam Peninsula ridge at the north end of New Caledonia where it grows in dense populations at 300–600 m elevation.

Ecology. *Kentiopsis magnifica* is an emergent tree in remnant rain forest on schists in many small, close but mostly separate valleys. Associated palms include *Basselinia gracilis*, *Cypho-phenix elegans*, and *Moratia cerifera*.

Phenology. Anthesis occurs from March through June; fruits mature from December through March (Fig. 2). Flowers are visited by bees that have nests in the forest while the ant *Polyrhachis guerini* feeds on the stigmas of pistillate flowers; also, a very abundant *Tetranych-*

dae mite feeds on the fleshy inflorescence branches and flowers.

Conservation status. Vulnerable (Jaffré et al. in press). Although *K. magnifica* occurs gregariously in numerous populations, its range is quite limited and the remnant forest habitat is fire-prone.

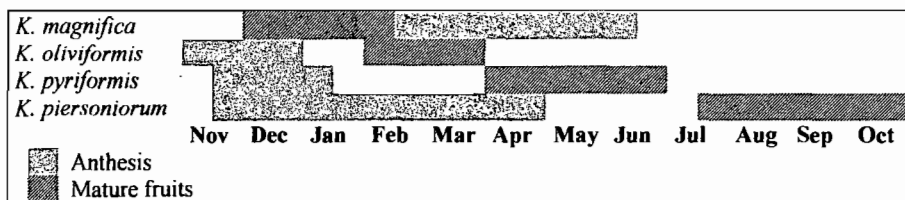
Taxonomic history. H. E. Moore, Jr. (1978) named and described *Mackeeea magnifica* as a monotypic genus, stating that it differed from *Kentiopsis*, also monotypic at the time, by its symmetrical staminate flowers, mesocarp fibers adnate only basally to the endocarp, and short, trifid pistillode. These characters proved to be quite variable from species to species within the New Caledonian Archontophoenicinae with the wider series of specimens now available for study and thus are not sufficiently significant to maintain *Mackeeea* as a distinct genus. Moore also stated that *Mackeeea* was distinctive by the conspicuous layer of tannin cells overlaying the endocarp but *Kentiopsis oliviformis* was ambiguously described as having or lacking a layer of tannin cells in Moore and Uhl (1984). *K. oliviformis* has, in fact, a layer of tannin cells like the three other members of the genus. On the other hand, Moore did not say anything about the conation of stamens in a ring, a unique character.

Derivation of name. Moore (1978) chose the epithet because *K. magnifica* is one of the tallest and stateliest palms of New Caledonia.

Distinguishing features of *Kentiopsis magnifica* include the thick indument of brown scaly-concrescent trichomes on the petiole, rachis, and peduncle; bright red to chocolate-brown expanding leaf with pinnae held in one plane (initially vertically) and stamens connate in a ring in the proximal 1/3. “Saxophone” type establishment growth is not present but eccentric root development does occur. Leaves are distichously arranged in juvenile plants and petioles are covered by a dense brown tomentum. *Kentiopsis magnifica* is very similar to *K. piersoniorum* in inflorescence architecture and morphology but quite different in floral structure.

2. *Kentiopsis oliviformis* (Brongn. & Gris) Brongn., Compt. Rend. Hebd. Séances Acad. Sci. 77: 398. 1873; Beccari, Le Palme della Nuova Caledonia: 18. 1920; Moore & Uhl, Allertonia 3(5): 324–325. 1984. (Fig. 4)

Kentia oliviformis Brongn. & Gris, Bull. Soc. Bot. France 11: 313. 1864; Ann. Sci. Nat. Bot. V.

2. Phenology of *Kentiopsis* species.

2: 161. 1864 ('*olivaeformis*'); Vieillard, Bull. Soc. Linn. Normandie II. 6:229. 1873. Type: Vieillard 1281 (holotype P).

Emergent palm. Trunk to 30 m tall, 25 cm dbh, gray, base thickened. Leaves 8–10, ascending to spreading; sheath to 1.1 m long, initially densely covered with \pm conrescent white-translucent appressed trichomes, becoming grayish with age, glabrescent; petiole to 10 cm long; rachis to 3 m long, initially with same indument as sheath; pinnae 40–55 on each side, median ones 80–105 \times 4–6 cm, basal ones continuing into lorae, all \pm drooping, shining dark green adaxially, paler abaxially. Inflorescences erect to ascending, branched to three orders; peduncle 7–10 cm long; prophyll and first peduncular bract 60–70 \times 20 cm, with deciduous brown-centered white-floccose scales becoming punctulate; rachis to 35 cm long, bearing stellate scales; branches ca. 18, bearing same scales; rachillae to 30 cm long, \pm glabrescent; bracts subtending branches and rachillae low, rounded, \pm ruffled. Flowers in triads nearly to apex of rachillae, bract subtending triad prominent, rounded, liplike; bracteoles surrounding pistillate flowers low, unequal, rounded to pointed, not sepal-like; staminate buds 5.5–6.5 mm high, very asymmetrical, pointed; stamens 34–37, slightly shorter than petals, filaments 2 mm long, straight and not attenuate apically, anthers 2.8–3 mm long, linear, latrorse, emarginate apically, bifid basally, connective elongate, large, black; pistillode nearly as high as stamens, columnar, attenuate to a sometimes briefly trifid apex; pistillate flowers 5.5–7 mm high, staminodes 3, gynoeceium 4.8 \times 3.5 mm, \pm diamond-shaped. Fruits 14–17 \times 8–9 mm, red; stigmatic remains apical; mesocarp with flat fibers adherent to endocarp throughout. Seeds 11–13 \times 6 mm, ellipsoid. Leaves of juvenile individuals spirally arranged; "saxophone" growth present.

Additional specimens examined. NEW CALEDONIA. Boghen Valley, Mecounia, 100 m elev., 21° 37' S, 165° 39' E, 9 Nov. 1995 (stam. fl.), J.-C. Pintaud, S. Blancher, M. Grouzis & T. Jaffré 292 (NOU); id. 7 Mar. 1996 (fr.), J.-C. Pintaud 324 (leg. J.-M. Veillon, S. Blancher & M. Boulet), (BH, BRI, K, NY, P); Houé-Moindou Valley, Tindéa, 150 m elev. 21° 39' S, 165° 43' E, 27 May 1996 (ster.), J.-C. Pintaud, R. Gatefait & N. Natiello 358 (K, NOU, NY); id. 359 (juv.) (P).

Distribution. *Kentiopsis oliviformis* is restricted to central New Caledonia at low elevations (10–300 m), from Farino to Col des Roussettes on the west side and from Canala (not recently seen) to Kouaoua on the east side.

Ecology. A gregarious species, *Kentiopsis oliviformis* is an emergent tree in transitional, semihumid *Aleurites* forest only, where it occurs on schists and basalts often mixed with serpentine colluvium. In valley bottoms in the Tindéa-Boghen area, there are numerous populations, each nearly forming a pure stand of 0.1–1 ha (usually on flat land along a temporary stream), within which there is no regeneration due to continuous leaf fall from tall (25–30 m), mature trees. Regeneration occurs only on the periphery of each stand where mature trees are more widely spaced. Mature trees become even more widely spaced farther out from the center of each population then disappear altogether on adjacent hill-sides and valley slopes. In the Koh region of Kouaoua, under a more humid climate, but also around Farino, *K. oliviformis* escapes from valley bottoms and is scattered on well-drained hill slopes.

Phenology. Anthesis occurs from November through December; fruits mature from February through March (Fig. 2). Seeds germinate immediately after dispersion.

Conservation status. *Kentiopsis oliviformis* is endangered (Jaffré et al. in press). All populations are in areas under agricultural pressure; none have normal regeneration. In the Tendéa-

Boghen area with several populations exceeding 1000 individuals, regeneration is very low due to cattle grazing; dramatic population reduction is expected here. The government of the South Province of New Caledonia has established an experimental, fenced area near Boghen to exclude cattle from one stand of *K. oliviformis*. However, these measures need to be greatly expanded to protect these and other populations adequately. Clearing of forests and harvesting trees for the edible cabbage or palm heart have much reduced populations near Kouaoua, La Foa, and Bourail.

Taxonomic history. A. Brongniart and A. Gris (1864) named and described *Kentia olivaeformis* from an incomplete collection of Vieillard from Canala lacking leaves and male flowers. Brongniart (1873) transferred the species to *Kentiopsis* and listed a more complete collection, *Balansa 766* near Nera River at Bourail. This population still exists but is much reduced as this area is now converted to agricultural land. Vieillard reported the vernacular name of Kipe for this species in Canala and said it exceeded 30 m tall and outgrew the coconuts from which *K. oliviformis* differed only by the small red fruits.

Derivation of name. The epithet means olive-shaped, and refers to the shape of the fruits.

Kentiopsis oliviformis is distinctive within the genus by the very asymmetrical staminate flowers, not glossy in bud, the bracteoles not sepal-like and mesocarp fibers adherent to endocarp throughout. Other distinguishing features include the dense white indument on the leaf sheath, petiole, rachis, bracts and peduncle, bright, pale green expanding leaf and erect inflorescences with scarcely divergent rachillae. "Saxophone" type establishment growth is present. Leaves are spirally arranged in young juvenile plants and petioles have prominent dark brown scales becoming marginally more and more white-fimbriate and finally white-floccose with age of the plant.

3. *Kentiopsis piersoniorum* Pintaud & Hodel **sp. nov.** (Figs. 5, 9)

K. magnificae (H. E. Moore) Pintaud & Hodel affinis sed folliis valde recurvatis, pinnis erectis, vaginis purpurascensibus vel purpureis-viridibus glabrescentibus ceraceis albis, staminodiis 6, filamentis basaliter distinctis, pistillodiis circa fila aequantibus differt. Typus: New Caledonia, Mont Panié, 570 m elev,

20°34'S, 164°48'E, 29 Dec. 1995, Pintaud 309 (holotypus P; isotypus BH).

Emergent palm. Trunk 10–15 m tall or more, 18–25 cm dbh, gray, sometimes with an expanded base. Leaves 10–12, sharply recurved; sheath 80–120 cm long, purplish-green to purple obscured by a layer of bright glaucous wax and dotted with tiny brown scales abaxially, only slightly splitting opposite petiole and there bearing small auricles 1 cm long; petiole 12–18 cm long, rachis 2.2–2.3 m long, petiole and rachis purplish, soon glabrescent but covered initially by a dense, short white tomentum; pinnae 35–40 on each side, median ones 110 × 3–4.5 cm, proximal 2 pairs continuing into lorae, all straight, narrowly acute, coriaceous, 1-ribbed, ascending in a narrow V, adaxially waxy, glaucous-green, midrib bearing abaxially twisted brown ramenta on proximal 1/2 to 3/4 of the pinnae. Inflorescences 80–100 cm wide, spreading, branched to three orders, all parts except flowers and bracts strikingly glaucous and discretely spotted with minute, brown scales; peduncle short, encircling half the trunk; prophyll 60–70 × 20 cm, acute, with marginal wings 2–5 cm wide; first peduncular bract 60–70 × 15–18 cm, rostrate, both bracts densely covered abaxially with brown indument; rachis 30 cm long, main branches 6–10 cm long, 1–2 cm wide, ± rounded, swollen at base; bracts subtending branches small, triangular proximally, reduced to a low ridge distally; rachillae 100–200 or more, 35 cm long, 0.5 cm diameter, straight to reflexed, rounded, glabrous. Flowers in triads in proximal 2/3–3/4 of rachilla, bract subtending triads a thin, sharp-edged, rounded shelf 1.5–1.75 mm high; flowers glossy, dark brown in bud, flowering basipetally; staminate flowers in bud 9.5 × 4.5 mm, bullet-shaped, slightly asymmetrical; calyx 4 × 6 mm, cupular, triangular, sepals cup-shaped, rounded or truncate apically, strongly angled abaxially; petals 8 × 4.5 mm, long-ovate, connate in basal 1/4–1/3, pink adaxially; stamens 35–38, exceeding petals, filaments 5 mm long, slender, white, attenuate apically, straight or inflexed, free or nearly so, anthers 4–4.5 mm long, slender, dorsifixed 1.5 mm from base, connective narrow, tanniferous; pistillode 3.5–4 mm high, 2/3 as high to equalling filaments, conic basally, attenuate apically; outer bracteole surrounding pistillate flower conspicuous, 2.5 mm high, inner bracteole very large, sepal-like, 4.5 mm

high, only partly surrounding flower on one side, rounded; pistillate flowers at anthesis 10×5 mm, ovoid-elongate; calyx 5×5.5 mm, cup-shaped, sepals broadly rounded apically; petals cup-shaped, acute apically; staminodes 6, \pm thick, connate basally and forming a crownlike ring 0.6 mm high; gynoecium 6×4 mm at anthesis, ovoid, stigmatic lobes thick, blunt, straight at anthesis, recurved later, angled, ovule pendulous. Fruits $17\text{--}23 \times 9\text{--}10$ mm, cylindrical and smooth when fresh, purplish, drying bullet-shaped and pebbled, fruiting perianth 6.5 mm high, stigmatic remains apical; mesocarp with a layer of flat, mostly separate, longitudinal fibers included in a thick layer of tannin cells; endocarp thin. Seeds $10\text{--}15 \times 6.5\text{--}7$ mm, bullet-shaped but truncate at both ends, endosperm homogeneous. Seedling with deeply bifid eophyll, lobes narrowly lanceolate to 15 cm long, with prominent nerves adaxially; trunkless juvenile individuals with spirally arranged leaves; saxophone growth absent.

Additional specimens examined. NEW CALEDONIA. East slope of Mont Panié, 600–700 m elev., $20^\circ 34' \text{ S}$, $164^\circ 48' \text{ E}$, 23 June 1971 (fr.), H. E. Moore, Jr., H. Brinon, M. Schmid & J.-M. Veillon 9968 (BH, NOU); Mont Panié, on trail to summit, in open shrubby vegetation dominated by *Araucaria montana*, 570 m elev., 12 Jun. 1995 (juv.), J.-C. Pintaud & M. Olivier 208 (NOU, NY, P); 211 (ster.) (P); id. 26 Jul. 1995 (juv.), J.-C. Pintaud & P.-O. Albano 238 (P); id. 17 Jan. 1996 (pist. fl.), J.-C. Pintaud 318 (BH, BRI, K, NY, P); id. 18 Mar. 1996 (pist. fl.), J.-C. Pintaud 341 (leg. D. R. Hodel), (NOU); id. 5 Jun. 1996 (juv.), J.-C. Pintaud & D. R. Hodel 367 (NOU).

Distribution. *Kentiopsis piersoniorum* occurs in a very limited area on the east slope of Mt Panié where it mainly occupies one valley and adjacent hills and ridges at (400)500–800(1000) m elevation.

Ecology. *Kentiopsis piersoniorum* grows as an emergent, gregarious, dominant, exposed tree in shrubby to forested vegetation on steep slopes and ridges on schists. Associated palm species include *Basselinia velutina*, *Chambeyronia lepidota*, *Moratia cerifera*, and *Brongniartikentia lanuginosa*. Mass germination occurs in the dense stands.

Phenology. Anthesis occurs from November through April; fruits mature from August through October (Fig. 2). The two accessible individuals

from which all collections have been made (including Moore's) at 570 m elevation on the trail to the summit of Mt Panié have flowered once in two years (1995–1996), and the large proportion of sterile individuals in the main population on the opposite ridge southward suggests that flowering may be normally biennial or even more infrequent, with the production of only a single inflorescence each time.

Conservation status. Status is low risk but conservation dependant (LRcd, proposed according to IUCN [1994]). Although very abundant at the place where it occurs, *K. piersoniorum* is restricted to several hundred hectares of forest only. The population of *K. piersoniorum* is afforded some protection, especially against fire, since it occurs entirely in the Mt Panié Botanical Reserve where its habitat is undisturbed and difficult to access.

Taxonomic history. H. E. Moore, Jr. first collected this species in 1971. Despite vegetative differences, Moore assigned it to *Mackeeea magnifica*, basing his decision on his incomplete collection consisting only of immature fruits. We were able to collect this palm in flower in 1995–1996, the more complete material showing it to be a distinct species.

Derivation of name. The epithet honors the Pierson families, Robert and Geneviève of Tontouta and their sons and daughters-in-law, Jean and Chantal, and Gilles and Marie-Christine of Nouméa, who have gone to exceptional measures to increase our knowledge of New Caledonia palms and encourage and support our work leading to a book on this island's extraordinary palms.

Kentiopsis piersoniorum is an impressive and spectacular palm. The sharply recurved, grayish leaves and glaucous crownshaft are remarkable, even among the many palm species with recurved leaves on Mt Panié and the strikingly glaucous color of the inflorescence contrasts aesthetically with the glossy brown buds, pink petals, white filaments and yellow anthers of the staminate flowers. Unfortunately for visitors, the breathtaking populations of *K. piersoniorum* are hardly accessible.

Kentiopsis piersoniorum is distinctive by the complete staminodial ring but also by its low rate of reproduction and long delay (one month) between anthesis of staminate and pistillate flowers in the same triad. *Kentiopsis piersoniorum* resembles *K. magnifica* in inflorescence mor-



3. *Kentiopsis magnifica*: emergent in remnant forest at Col d'Amos, 500 m (see Centerfold, left, for color). 4. *Kentiopsis oliviformis*: tall trees standing at the edge of a gallery forest in Bogen valley, 50 m (see Centerfold, right, for color). 5. *Kentiopsis piersoniorum*: a group in low montane forest. Mont Panié, 700 m. 6. *Kentiopsis pyriformis*: habit.



7. *Kentiopsis pyriformis*: view of the crown at Goro, 50 m. 8. *Kentiopsis pyriformis*: newly opened, pink inflorescence.

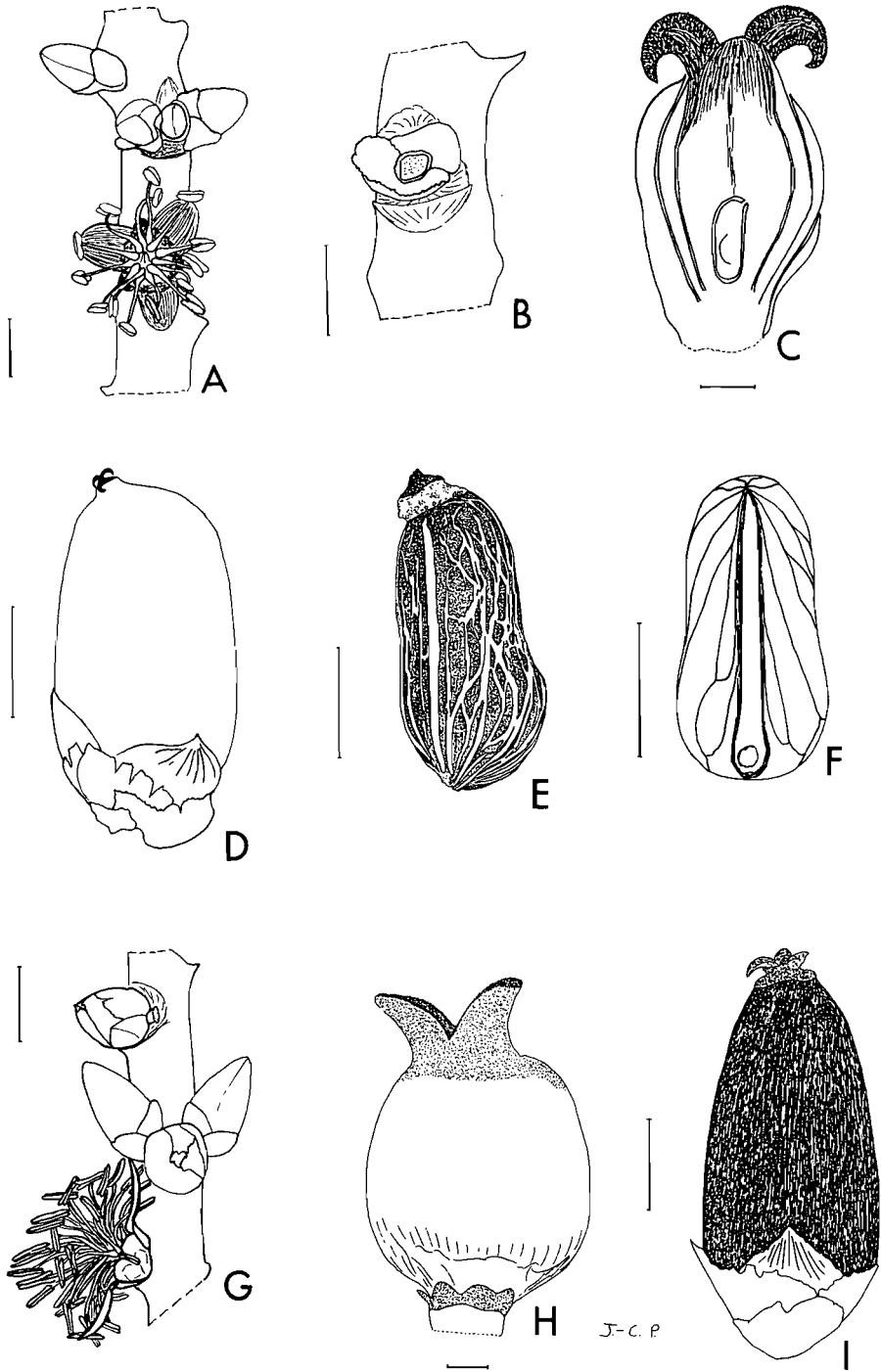
phology, both species having stout glaucous and sparsely scaly branches, glossy-brown buds and unequal bracteoles, the inner one sepal-like, but they differ markedly in flower shape and structure, leaf shape, and indument. The two species occur about 50 air kilometers apart.

4. *Kentiopsis pyriformis* Pintaud & Hodel sp. nov. (Figs. 6–9)

Kentiopsis oliviformi (Brongn. & Gris) Brongn. affinis sed foliorum vaginis glabrescentibus ceraceis cupreis vel vinosis, inflorescentiis effusis ramis principalibus angulatis, floribus masculis symmetricalibus, staminibus 11–20 differt. Typus: New Caledonia, Goro, mouth of Kuebini River, 50 m elev., 22° 16' S, 167° E, 6 Dec. 1995, *J-C Pintaud & D. R. Hodel 303* (holotypus P; isotypi BH, BRI, K, NOU, NY).

Subcanopy to emergent palm. Trunk 10–18 m tall, 10–22 cm dbh, brown becoming gray, sometimes enlarged or bulging at the base, adventitious roots visible. Leaves 7–12, ascending to spreading, moderately recurved or nearly straight; leaf sheath 70–130 cm long, copper-colored or purplish red, with a thin cover of glaucous-white wax and minutely punctulate with tiny brown lacerate scales abaxially, splitting in the distal 1/4–1/3 opposite petiole and there bearing small auricles 1 cm long or terminating on petiole with two wings 10 cm long; petiole 20–45 cm long (sometimes to 2.6 m long in trunkless juveniles), glabrescent, green or reddish to purplish; rachis 2.5–3 m long, petiole and rachis variously covered initially by thin feltlike indument of brown-centered, white-margined scales; pinnae 40–58 on each side, median ones 110–130 × 5–8 cm, proximal two pairs continuing into lorae, all acute, coriaceous, one-ribbed, ascending and held in open V or borne in one plane and flat to slightly pendulous, green and glossy adaxially, midrib and sometimes secondary ribs bearing abaxially membranous, medifixed ramenta in groups of 2–20. Inflorescences 1–2, 60–100 cm wide, spreading, branched to four orders; peduncle 6–10 cm long; prophyll 40–50 × 20 cm, splitting into two halves; first peduncular bract 50–60 × 15–18 cm, beaked, slightly exceeding the prophyll, both bracts pale green or dark purple, glabrescent to variously tomentose abaxially; rachis 30–40 cm long with 10 main branches 2–10 cm long, 1–4 cm wide, sharply angled, dorsiventral-

ly flattened, brownish green to bright purple; peduncle and rachis with thin indument of brown-centered, white-margined minute scales; bracts subtending branches small, triangular-obtuse to acuminate and finally reduced to a ridge; rachillae 100–400, slender, 20–30 cm long, 0.5 cm diameter, folded and mucilaginous in inflorescence bud, rounded, glabrescent, very pale green to cream-colored in bud, becoming brown or dark purple. Flowers in horizontal triads of a central pistillate flower flanked by two median-lateral earlier-opening staminate flowers; triads in proximal 2/3 and sometimes nearly to apex of rachillae, paired staminate flowers only distally, or sometimes paired staminate flowers on unisexual rachillae; bracts subtending triads a thin, rounded, sharp-edged lip to 1 mm high; staminate flowers in bud 6 × 3.5–4 mm, glossy brown, almost symmetrical; calyx 2.5 mm high and 3.5 mm in diameter, cupular, sepals keel-like, truncate or broadly rounded apically; petals ovate, boat-shaped, spreading at anthesis, adnate to the receptacle basally and with a swollen pulvinus just above, pinkish adaxially; stamens 11–20, just exceeding petals, filaments free or nearly so, 2.5 mm long, slender, slightly fluted, white, straight, and not attenuate apically, anthers 2–2.5 mm long, slender, dorsifixed 1/3 up from base, connective white, not tanniferous; pistillode 1–1.5 mm high, much shorter than filaments and petals, conical to columnar and fluted or rarely spindle-shaped; outer bracteole surrounding pistillate flower 1–2.5 mm high, sepal-like or not, inner bracteole 2.75 mm high, always sepal-like, sometimes forming a tube with the outer bracteole; pistillate flowers 5–6 × 3–4.5 mm, rhomboid and laterally compressed or globose-ovoid; calyx 4–4.5 × 4–4.5 mm, cupular, sepals strongly bowl-like to cup-shaped; petals bowl-like to cup-shaped, scarcely exceeding or much exceeding sepals; staminodes 3, 0.5–0.9 mm high, toothlike, thin, membranous; gynoeceum 4–5.5 × 2.5–3 mm, stigmatic lobes recurved, angled, laying between corolla lobes or short, erect; ovule laterally attached or pendulous. Fruits to 17 × 7 mm, oblong, purplish pink, fruiting perianth 6 × 8 mm, stigmatic residue subapical; mesocarp with abundant, mostly elongate, but at times wandering or reticulate fibers not adherent to endocarp, tannin cells in a thick layer between fibers and endocarp; endocarp whitish, fragile. Seeds 10–12 × 5–6 mm, pyriform, rarely ± ellipsoid,



9. (A-F). *Kentiopsis pyriformis*. (A). Portion of rachilla at staminate anthesis. (B). Portion of rachillae, fruit removed, showing bracteoles. (C). Longitudinal section of pistillate flower at anthesis. (D). Ripe fruit. (E). Fruit with outer mesocarp removed to show pattern of fibers. (F). Seed (hilum view). (G-I). *Kentiopsis piersoniorum*. (G). Portion of rachilla at staminate anthesis. (H). Gynoecium just after anthesis, showing the staminodal ring. (I). Dried fruit. Scale bars: vertical = 5 mm, horizontal = 1 mm. A: from *Pintaud 303*; B, D, E, F: from *Pintaud 348*; C: from *Pintaud 310*; G: from *Pintaud 309*; H: from *Pintaud 341*; I: from *Moore 9968*.

hilum elongate, lateral, raphe branches mostly longitudinal, anastomosing little, slightly embedded. Bifid leaves 5–6 before first pinnate leaf; trunkless juvenile individuals with distichously arranged leaves, becoming spirally arranged with age, petioles glabrous, glossy reddish to dark purple; “saxophone” growth present.

Additional specimens examined. NEW CALEDONIA. Coastal locations: Touaourou, edge of the rain forest, 10 m elev., 22° 12' S, 166° 58' E, 26 Apr. 1995 (ster.), J.-C. Pintaud 174 (leg. T. Tonnelier, M. Dumas & R. Lavoix), (NOU); Goro, mouth of Kuebini River, 50 m elev., 22° 16' S, 167° E, 5 May 1995 (fr.), J.-C. Pintaud & M. Dumas 190 (NOU, NY); id. 26 May 1995 (juv.), J.-C. Pintaud & C. Pierson 203 (NOU), 204 (P); id. 10 Sept. 1995 (buds), J.-C. Pintaud & M. Dumas 265 (BH NOU, P); id. 6 Dec. 1995 (stam. fl.), J.-C. Pintaud & D. R. Hodel 304 (BH, BRI, K, NOU, NY, P); id. 4 Jan. 1996 (pist. fl.), J.-C. Pintaud, T. Jaffré & J.-M. Veillon 310 (BH, K, NY); id. 4 May 1996 (fr.), J.-C. Pintaud & M. Dumas 348 (BH, BRI, K, NOU, NY, P); Kaa Drumia south of Goro, 50 m elev., 22° 19' S, 167° E, 26 Jun. 1996 (old infru.), J.-C. Pintaud 374 (leg. J.-M. Veillon), (NOU); Inland location: South of Mts Nengone, near Port Boisé, 200 m elev., 22° 20' S, 166° 55' E, 26 May 1995 (juv.), J.-C. Pintaud & C. Pierson 200 & 201 (P), 202 (K, NY); id. 10 Dec. 1995 (buds & pist. fl.), J.-C. Pintaud & D. R. Hodel 306 (BH, BRI, K, NOU, NY, P); id. 13 Jan. 1996 (juv.), J.-C. Pintaud & M. Dumas 316 (P); id. 12 Feb. 1996 (seeds), J.-C. Pintaud 325 (leg. R. Lavoix) (NOU).

Distribution. *Kentiopsis pyriformis* ranges from along the east coast of New Caledonia south of Yaté, where it occurs in a fringe of forest 20 km long and 100–500 m wide from Touaourou to Goro villages at 5–100 m elevation, inland to the southwest about 11.5 air kilometers distant in remnant patches of forest at about 200 m elevation, at the southern end of Monts Nengone, near Port Boisé. The main population is at Goro on a steep, unstable, rocky slope above the mouth of Kuebini River.

Ecology. A more or less gregarious, sub-canopy to canopy species, *Kentiopsis pyriformis* is found in lowland rain forest on ultramafic rocks, both on oxydic colluvium on flat land and steep, rocky, eroded slopes of peridotitic mountains and hills. The largest and more gregarious population at the Kuebini River near Goro grows

with other palms including *Actinokentia divaricata*, *Basselinia pancheri*, *Clinosperma bracteale*, and *Cyphokentia macrostachya*. The population near Port Boisé is much smaller and the individuals more scattered. Associated palms there include *A. divaricata*, *B. gracilis*, *B. pancheri*, *Chambeyronia macrocarpa*.

Phenology. Flowers usually occur from November through February with a 15-day delay between anthesis of staminate and pistillate flowers in the same triad; fruits mature from April through June (Fig. 2).

Conservation status. Status is critically endangered (proposed). Occupying less than 2 ha, the main population of *K. pyriformis* at the Kuebini River is unprotected and consists of less than a hundred trunked individuals. Fire severely affected the entire population about 1980, destroying nearly all saplings and damaging trunks of many mature individuals. Despite an abundant and regular production of readily germinating seeds, regeneration remains extremely low due to the difficulty of seedling establishment in an unusually steep, rocky, unstable habitat. In March 1996, Cyclone Beti caused the fall of at least 25% of the adults, nearly all of them more wind-prone since the earlier fire destroyed protective vegetation and damaged trunks. In one group of eight adults, the cyclone felled seven of them.

Farther north along the coast at Touaourou, the forest is restricted to a narrow fringe inland from the road and next to the mountains. Here, burning, clearing for gardens and homes, and recent road improvements and rural electrification have all taken a toll on the forest. Also, native inhabitants probably harvested the palms, perhaps for the edible palm heart or cabbage and/or construction, since not one adult tree has been observed there. Some other small groups composed of a few adults and juveniles occur south of Goro where they are affected by landslides and stream erosion.

The Port Boisé population is known from ca. 20 adult trees, less than a hundred juveniles with trunks, and numerous saplings, which locally dominate the understory, and is partly, although marginally, included in a botanical reserve. Felling of trees for construction and edible palm heart has decimated this population. Jean-Marie Veillon (personal communication) reports that as a forestry officer in the 1970s, he cited people for illegal cutting of palms in the Botanical Reserve.

Taxonomic history. Lucien Lavoix, an ardent palm enthusiast, first noticed this palm and brought it into cultivation in the early 1970s, using seedlings removed from the Port Boisé population. Donald R. Hodel saw the species in the forest at Touaourou in 1977, and suspected it might be a new species. However, *Kentiopsis pyriformis* remained undocumented until we made the only collections of mature, flowering trees in 1995–1996, relying on information from Raymond Lavoix, son of Lucien, and several members of Association Chambeyronia, the New Caledonia Palm Society.

Derivation of name. The epithet means pear-shaped, and refers to the unusual and distinctive shape of the seeds.

Since each of the two collected populations of *Kentiopsis pyriformis* (Kuebini River and inland near Port Boisé) has conspicuous differences, some explanation is needed to justify their inclusion in a single, variable species.

The two populations have the same major structural characteristics, both in vegetative and reproductive morphology. Distichous and glabrous juvenile stages associated with saxophone growth, highly branched inflorescences with flattened and sharply angled branches, slender rachillae, symmetrical flowers arranged horizontally in the triad, staminate flowers with sharply costate sepals, rather few stamens with short filaments not attenuate apically, white connectives and short pistillodes, pistillate flowers with three staminodes born within one petal, and pyriform seeds are constant and diagnostic characters. Purplish-pink fruits with subapical stigmatic remains and distinctive, elongate, wandering, reticulate mesocarp fibers may also prove to be good diagnostic characters, although mature fruits are yet unknown from populations near Port Boisé where only pyriform seeds removed from seedlings have been found so far.

The most striking differences in vegetative morphology concern the habit of the palm and characters of the leaf sheath. Individuals from the coastal population have only 7–8 recurved leaves with a copper-colored sheath bearing small auricles at apex, and pinnae held straight in an open V, while individuals of the inland population have 10–12 spreading leaves with attractive, purplish to burgundy sheaths lacking auricles, terminating in wings, and flat to slightly drooping pinnae. However, exploration in July 1996, south of Goro and on the eastern side of

Port Boisé mountains not previously visited has uncovered additional populations of *Kentiopsis pyriformis* with a mix of vegetative characters and sometimes intermediate forms, which show that these features are quite variable and, in fact, lead nearly to a continuum between the two collected populations.

In reproductive morphology, the coastal and inland populations differ mainly in the shape of the pistillate flowers (rhomboid or ovoid) and surrounding bracts (forming a tube or not) and other pistillate structures such as stigmas (recurved or straight) and ovule attachment (lateral or pendulous), but we have made only one collection with pistillate flowers at each location, and thus we do not know the possible variability of these structures.

Biogeography

The discovery of two new species enhances our understanding of patterns of evolution and biogeography of *Kentiopsis*. Two species are restricted to the northeastern schistose range derived from the ancient rocks of East Gondwanan origin (Paris 1981). The rich flora of this region has been interpreted as a modified sample of the late Cretaceous East Gondwanan flora (Morat et al. 1986). With two genera and three species, Mt Panié, which is clearly a refuge for rain forest taxa, is not surprisingly rich in Archontophoenicinae, an autochthonous East Gondwanan subtribe supposedly of late Cretaceous origin. In contrast, *Kentiopsis pyriformis* has probably differentiated on more recent ultramafic substrates dating from the late Eocene, 38 million years ago (Jaffré et al. 1987). *Kentiopsis oliviformis* is unique among New Caledonia palms in growing in semihumid transitional forest, a vegetation type of late Tertiary to early Quaternary origin, rather poor in species and dominated by the possibly introduced *Aleurites moluccana* (L.) Willd. (Euphorbiaceae) and containing numerous elements of the dry sclerophyllous flora (Jaffré et al. 1993). *K. oliviformis* is, as presently known, the only endemic plant species of transitional forest. The genus has spread from the northern to the southern ends of the island in very different habitats but, despite efficient reproductive systems and gregarious behavior, the species of *Kentiopsis* remain highly localized, a pattern common to many New Caledonia endemic taxa and one still not clearly explained.

Horticultural value of *Kentiopsis*

The species of *Kentiopsis* have great horticultural appeal. They are tall, solitary, pinnate-leaved palms with prominent crownshafts. In many ways, they are the quintessential palm, and are highly sought after by palm collectors around the world. *K. magnifica* has the new leaf expanding bright red, especially when in the juvenile state; *K. pyriformis* often has attractive burgundy-colored leaf sheaths, *K. piersoniorum* has tightly recurved and arching leaves with upright pinnae and bright glaucous leaf sheaths. *Kentiopsis oliviformis* is the most widely cultivated, while *K. magnifica* can be admired in some botanic gardens in Australia and Hawai'i. The new species are rarely cultivated, even in New Caledonia. An attractive group of *Kentiopsis pyriformis*, about 25 years old with 1–2 m trunks, exists at the Lavoix home garden on Mt Koghi, where another plant of similar height is most probably *K. piersoniorum*. Seeds of *K. pyriformis* have recently been widely distributed and healthy seedlings are now growing in New Caledonia and elsewhere, and will be a valuable ornamental addition to gardens and the landscape.

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