

PALMS

Journal of the International Palm Society

Vol. 68(4) Dec. 2024



THE INTERNATIONAL PALM SOCIETY, INC.

The International Palm Society

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Palms (formerly PRINCIPES)

Journal of The International Palm Society

Publication of PALMS is made possible by a generous gift from Drs. Kathleen Grant and Tom Jackson.

PALMS (ISSN 1523-4495) is an illustrated, peer-reviewed quarterly devoted to information about palms and published in March, June, September and December by The International Palm Society Inc., 1401 Lavaca St. #751, Austin, Texas 78701 USA.

Periodical postage paid at Austin, TX, USA and additional mailing offices. Postmaster: Send address changes to PALMS, The International Palm Society Inc., 1401 Lavaca St. #751, Austin, Texas 78701 USA.

Editors: William J. Baker, w.baker@kew.org
Scott Zona, scott.zona@yahoo.com

Associate Editor: John Dransfield, j.dransfield@kew.org

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Mailed at Hanover, Pennsylvania 16 Dec. 2024
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***Pinanga* of Peninsular Malaysia
and Singapore**
L.G. Saw



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Pinanga malaiana var. *malaiana*, young infructescences, Pahang. See article by L.G. Saw, p. 161. Photo by L.G. Saw.

BACK COVER

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Pinanga auriculata var. *merguensis*, infructescence with immature red to maroon fruits, Kedah. See article by L.G. Saw, p. 161. Photo by L.G. Saw.

Pinanga of Peninsular Malaysia and Singapore

SAW LENG GUAN¹

Twenty-two species of *Pinanga* are recognized in Peninsular Malaysia and Singapore. This account clarifies the circumscription of a number of taxa with ten new synonyms and one species reduced to a subspecies. A key to all species found in Peninsular Malaysia and Singapore is provided. The conservation status of all species is provisionally assessed here.

Blume first described *Pinanga* in 1838 (Blume 1838). There are 145 species recognized (POWO 2024) ranging from the Himalayas and south China to New Guinea, with the greatest diversity in the perhumid areas of the Sunda Shelf. Twenty-two species are recorded in Peninsular Malaysia and Singapore. Ten species are endemic to Peninsular Malaysia. Seven species are shared between Peninsular Malaysia and Singapore. For Peninsular Malaysia and Singapore, relevant revisions include accounts by Ridley (1907, 1925), Whitmore (1973) and Lim (2001).

Pinanga in Peninsular Malaysia and Singapore comprises only forest understory species. They are mostly miniature to middle-sized palms. Only one species, *Pinanga acaulis* has an acaulescent habit. The rest have erect stems and are solitary or clustering. The largest species include *P. adangensis*, *P. pantiensis* and *P. malaiana*, reaching 8–9 m in height, with stems to 5 cm diam. They are predominantly lowland species with a few species ranging into upper hill dipterocarp forest. Among these, species such as *P. disticha*, *P. glaucescens*, *P.*

limosa, *P. paradoxa*, *P. scortechinii* and *P. simplicifrons* range into lower montane forest. *Pinanga perakensis*, *P. sembilan* and *P. subintegra* are found in upper elevations in lower montane and montane forests. *Pinanga polymorpha* is recorded only in montane forest. *Pinanga riparia* is found in freshwater swamps, and *P. palustris* and *P. singaporensis* are often found in both swampy areas and near riverbanks subject to occasional floods.

This account has been produced in preparation for the palm account for the Flora of Peninsular Malaysia project. Provisional, regional, extinction risk assessments (IUCN 2001) are provided for each species within are the Malay Peninsula.

Taxonomic Treatment

Pinanga Blume, Rumphia 2: 76 (1839).
Lectotype: *P. coronata* (Blume ex Mart.) Blume
Cladosperma Griff., Not. Pl. Asiat. 3: 165 (1851).
Type: *C. paradoxa* (Griff.) Becc. (= *Pinanga paradoxa* (Griff.) Scheff.).

Ophiria Becc., Ann. Jard. Bot. Buitenzorg 2: 128 (1885) Type: *O. paradoxa* (Griff.) Becc. (= *Pinanga paradoxa* (Griff.) Scheff.).

Pseudopinanga Burret, Notizbl. Bot. Gart. Berlin-Dahlem 13: 188 (1936) Type: *P. insignis* (Becc.) Burret (= *Pinanga insignis* Becc.).

¹Forest Research Institute of Malaysia
52109 Kepong, Selangor, Malaysia
sawlg55@gmail.com

Distribution: About 145 species (POWO 2024) ranging from the Himalayas and south China to New Guinea, with the greatest diversity in the wet areas of the Sunda Shelf. Twenty-two species in Peninsular Malaysia.

Habitat: All species found in Peninsular Malaysia are forest understory species, including lowland dipterocarp forest to montane forest, freshwater swamp forest and sandstone heath vegetation. Some species are also recorded at the base of limestone hills but never on limestone outcrops. Most species are lowland species; a few species are found in montane forests, e.g. *Pinanga polymorpha*, *P. perakensis* and *P. subintegra*. Only *Pinanga riparia* is found in freshwater swamps or along riparian edges subjected to flooding.

Key to *Pinanga* species in Peninsular Malaysia

1. Acaulescent palm **1. *P. acaulis***
 - Palms with visible stems **2**
2. Palm with stolon-like runners **17. *P. sarmentosa***
 - Palms without stolon-like runners **3**
3. Inflorescence enclosed in a persistent prophyll **4**
 - Inflorescence shedding its prophyll at the onset of flowering or soon thereafter **5**
4. Leaves with rachis 26–40 cm or longer, leaflets 22–47 cm long, inflorescences infrapetiole, prophyll 10–19 cm long, male flowers borne on pseudopetiole, fruits 2.5–5 cm long **5. *P. cleistantha***
 - Leaves with rachis 15–28, leaflets 10–18 cm long, inflorescences interpetiole, becoming infrapetiole, bursting through the persistent leaf sheaths, prophyll 2.5–3 cm long, male flowers sessile, fruits 1.4–2 cm long **20. *P. simplicifrons***
5. Solitary palms **6**
 - Clustering palms **9**
6. Inflorescences spicate **8. *P. limosa***
 - Inflorescences branched to 2 or more rachillae **7**
7. Triads spirally arranged **8**
 - Triads distichously arranged **3. *P. auriculata***
8. Inflorescences erect, rachillae 3 or 4 **7. *P. glaucescens* (in part)**
 - Inflorescences reflexed or pendulous, rachillae (8 or) 9 **19. *P. sembilan***
9. Inflorescences erect **10**
 - Inflorescences reflexed or pendulous **13**
10. Triads spirally arranged **11**
 - Triads distichously arranged **12**
11. Inflorescence with 2–4 rachillae, staminate flowers with 6 stamens, fruits green maturing red **7. *P. glaucescens***
 - Inflorescence with 5–11 rachillae, staminate flowers with 18–22 stamens, fruits white to cream maturing pink to red to black **18. *P. scortechinii***
12. Short-stemmed palm with internodes 2.5–5 cm long, rachillae 2–4, turning shades of pink or red, fruits red maturing black, 3–3.5 × 1.5–2 cm **10. *P. palustris***
 - Moderately tall palm with internodes 14–18 cm long, rachillae (3–)5–8, turning green, fruits green turning dark red or black, 1.4–2 × 0.7–1 **21. *P. singaporensis***
13. Triads spirally arranged **15. *P. polymorpha***
 - Triads distichously arranged **14**
14. Small palms with stem diam. less than 1.5 cm, leaf rachis less than 40 cm **15**
 - Medium palms with stem diam. more than 1.5 cm, leaf rachis more than 50 cm . . . **17**
15. Leaf blade usually mottled, mostly undivided, when undivided cuneate with apical notch, when divided lower leaflets broadly obliquely triangular; fruits ellipsoid, 1.1–2 × 0.6–0.9 cm, endosperm ruminant **6. *P. disticha***
 - Leaf blade uniformly green, not mottled, mostly divided, when undivided oblong with apical notch, when divided lower leaflets sigmoid to linear-lanceolate; fruits narrowly ellipsoid, endosperm homogenous **16**
16. Larger palms with close clustering habit, 1–3 m tall, larger middle leaflets ca. 13–23 × 4.3–8 cm, inflorescence with 1–3 rachillae, 5.5–15 cm long **12. *P. paradoxa***
 - Smaller palms with loosely clustering habit, 1–2 m tall, smaller middle leaflets, ca. 5.5–11 × 1.5–6 cm), inflorescence spicate, 4–6.5 cm long **22. *P. subintegra***
17. Species of freshwater swamp or riparian habitat, rachillae (with immature fruits) dark purple, densely covered with caducous white hairs; immature fruits pale glaucous green **16. *P. riparia***
 - Species of inland, dry habitats, rachillae (with immature fruits) green to red, glabrous to glabrescent; immature fruits not glaucous **18**



1. *Pinanga acaulis*, cultivated in Putrajaya Botanic Gardens from a wild collected plant from Perak, habit (photo credit: Mohamad Nazrin Ahmad Azmi & Mohamad Amini Nordin).

18. Inflorescence rachillae yellow to orange, strongly zig-zagging when in fruit; fruits large, 3.2–3.5 cm long 11. *P. pantiensis*
Inflorescence rachillae red, green, not zig-zagging when in fruit; fruits smaller, less than 3 cm long, if larger rachillae red 19
19. Fruiting rachillae thick and stout, greater than 5 mm width, fruits large, 2–3.5 cm long 9. *P. malaiana*
Fruiting rachillae thinner, neither thick nor stout, less than 5 mm width, fruits smaller, less than 2 cm (rarely to 3 cm) 20
20. Crownshaft or leaf sheath yellow to bronze to pale brown 21
Crownshaft or leaf sheath green 22
21. Rachillae 16–26 cm long 2. *P. adangensis*
Rachillae 5–8 cm long 14. *P. perakensis*
22. Leaflets narrowly divided, middle leaflets 2-costate, ca. 1.5–2 cm wide; fruits loosely arranged along rachillae, ca. 2–3 fruits/cm 4. *P. badia*
Leaflets broadly divided, middle leaflets 3–5-costate, ca. 4–6 cm wide; fruits tightly arranged along rachillae, ca. 3–4 fruits/cm 13. *P. pectinata*

1. *Pinanga acaulis* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 202 (1905). Type: PENINSULAR MALAYSIA. Perak: Sungei Siput, 18 July 1904, *Machado s.n.* (holotype SING [SING0058004]). (Fig. 1)

Distribution: Endemic in Perak, Peninsular Malaysia, an extremely rare species.

Habitat: Lowland dipterocarp forests, 150 m elevation.

Provisional conservation status: Critically Endangered B1 B2b(i)(iii). Its extent of occurrence (EOO) was calculated as 84 km² only, and area of occupancy (AOO) 12 km² (IUCN 2001). Known from only two localities, both in forest reserves that are subjected to logging.

Notes: It is the smallest of Peninsular Malaysian species. No other *Pinanga* in Peninsular Malaysia has an acaulescent habit with erect spicate inflorescence.

2. *Pinanga adangensis* Ridl., J. Straits Branch Roy. Asiat. Soc. 61: 62 (1912). Type: THAILAND. Peninsular: Satun, Rawi Island, April 1911, *Ridley 15885*. (holotype SING [SING0059774], isotype K [K00208042]). (Fig. 2)



2. *Pinanga adangensis*, cultivated in Penang Botanic Gardens, plant of origin unknown.

Distribution: Southern Peninsular Thailand and Peninsular Malaysia (Perlis and Kedah only).

Habitat: Forest understory palm in lowland dipterocarp forest from sea level to 100 m.

Provisional conservation status in Peninsular Malaysia: Endangered B1B2b(ii) (iii). AOO was calculated as only 8 km². Currently restricted to Gunung Raya, Langkawi Island and likely Perlis. It is not rare in Gunung Raya. Globally, it is probably not threatened



3. *Pinanga auriculata* var. *leucocarpa*, Taman Negara, Pahang.

(Henderson in Barfod & Dransfield 2013).

Notes: The species has a distinctive yellow to bronze crown shaft, often covered with brownish indumentum.

3. *Pinanga auriculata* Becc., Malesia 3: 134 (1886). Type: MALAYSIA. Sarawak: Kuching, Beccari PB 589 (holotype FI [FI013500]).

Distribution: Borneo (Sarawak, Kalimantan),



4. *Pinanga auriculata* var. *leucocarpa*, infructescences with pale yellow immature fruits, Terengganu.

Thailand, Myanmar and Peninsular Malaysia. Variety *auriculata* is endemic to Borneo. Varieties *leucocarpa* and *merguensis* are both found in Peninsular Malaysia and Thailand.

Notes: This species has three varieties: the typical variety is distributed in Borneo, var. *merguensis* from Myanmar, Peninsular Thailand and northwest Peninsular Malaysia, and var.

leucocarpa from SE Peninsular Thailand and Peninsular Malaysia. Variety *auriculata* is a more robust palm with stem diam. greater than 2 cm, leaflets that are larger, 35–40 cm long and generally more numerous, (5–)12–21, and infructescence with dark red rachillae even when with immature fruits; var. *merguensis* and var. *leucocarpa* with more slender stems, 0.9–1.6 cm diam., smaller leaflets, 15–33 cm long and generally fewer leaflets, 5–10, rachillae pale green to pale creamy yellow to reddish on maturing infructescence.

Key to the varieties of *P. auriculata* in Peninsular Malaysia

Rachillae pale green to pale creamy yellow, immature fruits creamy white often with green tips, ripening black

. **3a. var. *leucocarpa***

Rachillae reddish to pink, immature fruits orange-red to burgundy

. **3b. var. *merguensis***

3a. *Pinanga auriculata* var. *leucocarpa*
C.K.Lim, Gard. Bull. Singapore 50: 93 (1998a).
Type: PENINSULAR MALAYSIA. Pahang: Kuala Tenok, 1891, *Ridley* 3158 (holotype SING [SING0059773], isotypes FI, K). (Figs. 3–5)

Pinanga jamariensis C.K.Lim, Gard. Bull. Singapore 50(1): 100 (1998b), **synon. nov.**
Type: PENINSULAR MALAYSIA. Johor: Bukit Jamari, 1993, *Lim*, *H* 1456 (holotype SING [SING0058006, SING0058007, SING0058-008].

Distribution: Peninsular Malaysia (Kelantan, Terengganu, Pahang, Negeri Sembilan and Johor), Singapore and SE Peninsular Thailand.

Habitat: Lowland dipterocarp to upper hill dipterocarp forests, also recorded in swamp forest, 50–650 m.

Provisional conservation status in Peninsular Malaysia: Least Concern. Widespread in Peninsular Malaysia.

Notes: Lim (1998a) clarified the confusion between a number of species with sigmoidal leaflets including *Pinanga patula*, *P. pectinata*, *P. riparia* and *P. auriculata*.

Varieties *leucocarpa* and *merguensis* can be differentiated only with live material or with description of the color of the rachillae and fruits. Leaflet numbers of var. *leucocarpa* are generally smaller (3–)5–8, whereas var. *merguensis* has 5–10 leaflets. They cannot be differentiated with dried material. The varieties

5. *Pinanga auriculata* var. *leucocarpa*, immature plant with its distinctive sigmoidal leaflets, Terengganu.





6. *Pinanga auriculata* var. *merguensis*, Kedah.



7. *Pinanga badia*, cultivated in Kepong Botanic Gardens, plant originated in Perlis.

have been maintained solely due to the consistent fruit characteristics and their geographical separation. Variety *leucocarpa* is distributed in Peninsular Malaysia and to the northernmost distribution in the east coast of Peninsular Thailand. The two varieties do not overlap in their distributions.

Pinanga jamariensis is a form of *P. auriculata* var. *leucocarpa* with fewer and broader leaflets. Lim (1998b) noted that both forms grew sympatrically. It is difficult to separate them, as the leaflet dimensions overlapped with this form.

3b. *Pinanga auriculata* var. *merguensis* (Becc.) C.K.Lim, Gard. Bull. Singapore 50: 89 (1998a). *Pinanga patula* var. *merguensis* Becc. in Martelli, Atti. Soc. Toscana Scienze Naturali Res. Memorie 44 (1934) 125. Type: MYANMAR. Mergui: Tarapon, *Meebold 14380* (lectotype MRSL, here designated); isoelectotype FI). (Figs. 6 & Table of Contents)

Pinanga patula Ridl. auct. non Blume Mat. Fl. Malay. Pen. 143 (1907); Fl. Malay Peninsula 5: 11 (1925); Whitmore, Palms Malaya 92 (1977).

Distribution: Myanmar, southern Peninsular Thailand and Peninsular Malaysia (only Perlis).

Habitat: Lowland forest near limestone hills, 100–300 m.

Provisional conservation status in Peninsular Malaysia: Critically Endangered B2a b(ii)(iii). Its AOO was calculated as 8 km². It is critically endangered in Peninsular Malaysia due to its restricted distribution only in Mata Ayer Forest Reserve, Perlis.

4. *Pinanga badia* Hodel, Palm J. 136: 16 (1997). Type: PENINSULAR THAILAND. *Satum*, Hodel & Vatcharakorn 1671 (holotype BK n.v.). (Figs. 7 & 8)

Distribution. Southern Peninsular Thailand and northern Peninsular Malaysia. The species is endemic to the region on the Malaysia-Thailand border in Perlis.

Habitat: Forest understory palm in lowland dipterocarp forest, at 150 m.

Provisional conservation status in Peninsular Malaysia. Critically Endangered B2a b(ii)(iii). The species is currently known from a single collection in Peninsular Malaysia, it just reaches into Malaysia at the Malaysia-Thailand border in Perlis. The state land reserve on the border can be subjected to conversion to other land uses.

Notes: The species looks like a miniature *Pinanga malaiana*. It is closely related to *Pinanga pectinata*, *P. badia* differs from it by its narrower leaflets, ca. 1.5–2 cm wide and more

8. *Pinanga badia*, infructescences.





9. *Pinanga cleistantha*, habit, Terengganu.

loosely arranged fruits along the rachillae, 2–3 fruits/cm; *P. pectinata* has broader leaflets, middle leaflets ca. 4–6 cm wide and more tightly arranged fruits, 3–4 fruits/cm.

5. *Pinanga cleistantha* J.Dransf. *Principes* 26: 127 (1982). Type: PENINSULAR MALAYSIA. Terengganu: Ulu Setiu Forest Reserve, foothills of Gunung Lawit, 50 m, 5 August 1977, Dransfield 5179, (holotype K [K00207949]; isotypes BH n.v., KEP [KEP22855, KEP167319], L [L0042156]). (Figs. 9 & 10)

Distribution: Endemic in Terengganu, Peninsular Malaysia.

Habitat: Forest undergrowth palm in lowland dipterocarp forest, 8–200 m.

Provisional conservation status: Endangered B2b(i)(iii). Its EOO was calculated as 1,787 km². It is a lowland species only known from forest

reserves, not known from totally protected areas. These forest reserves are subject to logging and in recent years, the logging in these forest reserves is concerning.

Notes: *Pinanga cleistantha* is most similar to *P. simplicifrons*, both species having enclosed inflorescences. The former can be distinguished from the latter by the much greater size of all its parts, by the broad leaf with mottled upper surface and pale lower surface, by the lanceolate rather than the ovate prophyll, the tomentose unbranched rather than glabrous bifid inflorescence axis, and the staminate flowers with extraordinary pseudo-pedicels (Dransfield 1982).

6. *Pinanga disticha* (Roxb.) H.Wendl. in Kerchove, *Palmiers* 253 (1878). *Areca disticha* Roxb., *Fl. Ind. ed.* (1832) 620, *Seaforthia disticha* (Roxb.) Mart., *Hist. Nat. Palm.* 3 (1838) 184.



10. *Pinanga cleistantha*, infructescence with immature fruits, Terengganu.



11. *Pinanga disticha*, habit, Perak.

Ptychosperma distichum (Roxb.) Miq. in Fl. Ned. Ind. 3 (1885) 28. Type: PENINSULAR MALAYSIA. Penang: Wallich? (not seen). (Figs. 11 & 12)

Pinanga bifida Blume, Rumphia 2 (1939) 92. Type: INDONESIA. Sumatra, Palembang, Praetorius s.n. (Holotype L).

Areca curvata Griff. in Ic. Pl. Asiat. 3 (1851) t. 248; *Pinanga curvata* (Griff.) Becc., Malesia 3 (1886) 128. Type: not seen.

Areca humilis Roxb. ex H.Wendl. in Kerch., Palmiers (1878) 231. Type: not seen.

Distribution: Peninsular Thailand, Peninsular



12. *Pinanga disticha*, infructescence with immature fruits, Perak.

Malaysia, Singapore and Sumatra. Widespread in whole of Peninsular Malaysia, probably the most common *Pinanga* in Peninsular Malaysia.

Habitat: Undergrowth palm in lowland dipterocarp to lower montane forest, 10–1375 m.

Provisional conservation status in Peninsular Malaysia: Least Concern.

Notes: The mottled variegated leaves of some populations are very attractive. I was unable to locate the type specimen for the species. It



13. *Pinanga glaucescens*, habit, Pahang.

is a likely a Wallich specimen from Penang.

7. *Pinanga glaucescens* Ridl., J. Straits Branch Roy. Asiat. Soc. 86: 311 (1922). Type: PENINSULAR MALAYSIA. Negeri Sembilan: Bukit Tangga, 19 December 1920, *Ridley s.n.* (holotype SING; isotypes K [K000208038,

K000208039]). (Figs. 13 & 14; Back Cover)

Pinanga fruticans Ridl. Fl. Malay Penins. 5: 9 (1925). Type: PENINSULAR MALAYSIA. Kelantan, Channing Woods, 21 Feb. 1919, *Ridley s.n.* (lectotype: K [K000208037] designated here).



14. *Pinanga glaucescens*, infructescence, Pahang.

Pinanga polymorpha auct. non Becc., Hodel, *Palms & Cycads Thailand* 150 (1998); Henderson, *Palms Southern Asia* 153 (2009); Henderson in Barfod & Dransfield, *Fl. Thailand* 11(3): 471 (2013).

Distribution: Peninsular Thailand and Peninsular Malaysia. Mainly in the northern states on the major mountain ranges in

Peninsular Malaysia; Kedah, Perak, Kelantan, Terengganu, Pahang, Selangor and Negeri Sembilan.

Habitat: Forest undergrowth palm in lowland dipterocarp to lower montane forest, often in moist valleys at 82–1200 m.

Provisional conservation status in Peninsular Malaysia: Least Concern.



15. *Pinanga limosa*, plant with entire leaves, Pahang.

Notes: Both Hodel (1998) and Henderson (2009, 2013) misapplied *Pinanga polymorpha* to *P. glaucescens* in Thailand. *Pinanga polymorpha* does not reach Thailand and the species remains endemic in Peninsular Malaysia. See *Pinanga polymorpha* for the differences between the two species.

Lim (2014) erroneously cited the type of *Pinanga fruticans* as *Ridley s.n.*, a specimen collected from Bukit Tangga, Negeri Sembilan in 1920. That specimen is the type for *Pinanga glaucescens*. I agree with Lim (2014) that *Pinanga fruticans* is synonymous to *P. glaucescens*.

8. *Pinanga limosa* Ridl. J. Straits Branch Roy. Asiat. Soc. 44: 201 (1905). Type: SINGAPORE. Selitar, *Ridley s.n.* (holotype SING [SING0058030]). (Figs.15–17)

Pinanga limosa var. *montana* C.K.Lim, Folia Malaysiana 2: 253 (2001), **synon. nov.** Type: PENINSULAR MALAYSIA. Pahang: Bentung, Genting Highlands, Gunung Bunga Buah, 27 May 1966, *Whitmore FRI 313* (holotype KEP [KEP22929]).

Distribution: Peninsular Malaysia, Singapore and Borneo (Sarawak). In Peninsular Malaysia, the species is recorded from Terengganu, Pahang, Selangor, Negeri Sembilan and Johor.

Habitat: Forest undergrowth palm in lowland dipterocarp to lower montane forest at 30–1260 m.

Provisional conservation status in Peninsular Malaysia: Least Concern.

Notes: *Pinanga limosa* var. *montana* cannot be maintained. According to Lim (2001), var. *montana* is a taller plant in comparison with the typical variety. However, comparison between plants from the Main Range where var. *montana* is found and specimens elsewhere, showed that all the characters overlapped.

The species can be confused with *Pinanga auriculata*, especially with the larger form of *P. limosa*. Both have similar solitary habit and sigmoidal leaflets. They can be differentiated by the larger size of *P. auriculata* and inflorescences with 2–5 rachillae, whereas *P. limosa* is smaller with spicate inflorescences.

Undivided leaf forms are found mainly in Terengganu, Taman Negara, Johor and Singapore.

9. *Pinanga malaiana* (Mart.) Scheff., Natuurk. Tijdschr. Ned.-Indië 32: 175 (1872). *Seaforthia malaiana* Mart., Hist. Nat. Palm. 3 (1838) 183; *Areca malaiana* (Mart.) Griff., Calcutta J. Nat. Hist. 5 (1845) 457; *Ptychosperma malaianum*



16. *Pinanga limosa*, plant with segmented leaves, Johor.

(Mart.) Miq., Fl. Ned. Ind. 3 (1855) 25. Type: PENINSULAR MALAYSIA. Penang: *Wallich s.n.*, (lectotype M [M0209301 and M0209302] here designated).

Areca haematocarpa Griff., Not. Pl. Asiat. 3 (1851) 165, Plate CVIII, D. Type: not seen.

Distribution: Peninsular Thailand, Peninsular Malaysia, Singapore and Sumatra. Recorded throughout Peninsular Malaysia. Together with *Pinanga disticha*, they are the most widespread palms in Peninsular Malaysia.

Habitat: Forest undergrowth palm in lowland

to hill dipterocarp forests, also recorded in swampy habitats edging freshwater swamp at 70–700 m altitude. It is often seen in scattered populations and does not dominate the understory vegetation. I have observed weevils visiting the newly opened flowers.

Notes: It is rather variable species but the distinctive pendulous infructescence with bright red peduncle and rachillae with distichously arranged fruits is characteristic. The leaves of the typical subspecies almost always have narrow leaflets with two folds. Two specimens from Terengganu, *FRI 91935* and *FRI 39893*, have an erect infructescence. Both specimens were collected from Setiu district in Terengganu. Two subspecies are recognized.

Key to subspecies of *P. malaiana*

Tightly clustering habit, leaflets narrowly segmented, 17–22 leaflets on each side of rachis, middle leaflets often narrow, 2-costate **11b. *Pinanga malaiana* subsp. *malaiana*.**

Stoloniferous habit, distant stems up to 3 m apart, leaflets mostly broadly segmented, ca. 5–7 leaflets on each side of the rachis, middle leaflets often broad, 3–7-costate . . . **11a. *Pinanga malaiana* subsp. *johorensis*.**

9a. *Pinanga malaiana* subsp. *johorensis* (C.K.Lim & Saw) Saw, **comb. et stat. nov.** *Pinanga johorensis* C.K.Lim & Saw, Gard. Bull. Singapore 50(1): 104 (1998). Type: PENINSULAR MALAYSIA. Johor: Lenggong Forest Reserve 21 July 1991, *Saw FRI 37435* (holotype KEP [KEP22908, KEP171830, KEP171831, KEP171832]; isotype K). (Fig. 19)

Distribution: Endemic to southern Malay Peninsula; known only from Johor.

Habitat: Forest understory palm in lowland dipterocarp forest, often edging swampy habitats, in ca. 80 m elevation.

Provisional conservation status: Endangered B2a b(ii)(iii). Its EOO was calculated as 2,840 km². It is only known from Johor in forest reserves. It has not been recorded from totally protected areas.

Notes: I have reduced this taxon to a lower rank under *Pinanga malaiana* as a subspecies. It is not possible to differentiate this taxon from the typical species except for vegetative parts. The subspecies can be differentiated from the typical species by its more slender stems, stoloniferous habit and often broadly divided leaflets.

9b. *Pinanga malaiana* subsp. *malaiana* (Fig. 19 & Front Cover)

17. *Pinanga limosa*, infructescence, Pahang.



Distribution: Same as species.

Habitat: Same as species.

Provisional conservation status in Peninsular Malaysia: Least concern.

10. *Pinanga palustris* Kiew, Gard. Bull. Singapore 50(1): 106 (1998). Type: PENINSULAR MALAYSIA. Pahang: Rompin, Sungei Kinchin, 29 October 1989, Kiew 2806 (holotype KEP [KEP23033, KEP171827, KEP171828, KEP171829]). (Figs. 20 & 21)

Distribution: Endemic to south Peninsular Malaysia, known only from southern Pahang and Johor.

Habitat: Forest understory palm in lowland dipterocarp forest, usually along sides of streams and in swampy habitats, sometimes in sandstone outcrops. to ca. 300 m elevation.

Provisional conservation status: Near Threatened. Although the species can qualify as endangered with its calculated EOO as 1,942 km², it is more appropriately assessed as Near Threatened. The species is common and well protected in Endau-Rompin State Park in both Pahang and Johor.

Notes: The description for the flowers is based on Lim (1988), as I have no access to flowering material. All material that I have examined were fruiting specimens.

11. *Pinanga pantiensis* J.Dransf. Gard. Bull. Singapore 50(1): 110 (1998). Type: PENINSULAR MALAYSIA. Johor: Kota Tinggi, Gunung Panti Forest Reserve, Dransfield *et al.* JD 3048 (holotype SING [SING0058037]). (Fig. 22)

Distribution: Endemic to Johor, Peninsular Malaysia. Recorded in Linggui, Kota Tinggi and Gunung Panti Forest Reserve.

Habitat: Lowland dipterocarp forest, hill slope and ridge top, at altitudes up to 250 m.

Provisional conservation status: Endangered. Its EOO was calculated as 180 km². The species is on the verge of being Critically Endangered. The population in Linggui has been lost by flooding due to dam construction. Its extent is only known from two locations, i.e., Kota Tinggi and Gunung Panti Forest Reserve

Notes: This is a distinct species, with its zig-zagging yellow rachillae. In size, it is about that of *Pinanga malaiana*, but *P. malaiana* has red, rather straight rachillae.

12. *Pinanga paradoxa* (Griff.) Scheff., Natuurk. Tijdschr. Ned.-Indië 32: 179 (1872). *Areca paradoxa* Griff., Calcutta J. Nat. Hist. 5: 463 (1845). *Kentia paradoxa* Mart., Hist. Nat.



18. *Pinanga malaiana* var. *johorensis*, infructescences, Johor.

Palm 3: 312 (1837). *Nengella paradoxa* Becc., Malesia 1: 32 (1865). *Ophiria paradoxa* Becc., Ann. Jard. Bot. Buitenz. 2: 128 (1885). Type: PENINSULAR MALAYSIA. Malacca: Mt. Ophir, Griffith (not seen). (Figs. 23 & 24)

Pinanga paradoxa (Griff.) Scheff. var. *unicostata* C.K.Lim, Folia Malaysiana 2(4): 235 (2001), **synon. nov.** Type: PENINSULAR MALAYSIA. Negeri Sembilan: K. Pilah, Bukit Senaling, 11 May 1977, Dransfield & Chan JD 4990 (holotype KEP [KEP23051]; isotypes SING, K).

Distribution: Peninsular Malaysia and possibly Sumatra. It is distributed in the southern half of Peninsular Malaysia. Dransfield (1980) collected a specimen from Sungei Penuh, in the Tapan area of Sumatra (Dransfield & Mogege JD 4108) that fits into this species.



19. *Pinanga malaiana* var. *malaiana*, mature infructescence, Pahang.

Habitat: Lowland dipterocarp to lower montane forests in mossy forest, heath forest, riparian edges, at elevations from 40 to 930 m.

Provisional conservation status in Peninsular Malaysia: Near Threatened. Its EOO was calculated as 24,075 km².

Notes: There are some confusions over the identity of the species. Whitmore (1973),

Hodel (1998) and Henderson (2009, 2013) mistakenly identified *Pinanga paradoxa* as *P. subintegra*. Ridley (1925) had also included specimens from Taiping Hills and Kedah Peak in his distribution of the species; these too are *Pinanga subintegra*.

Both *Pinanga paradoxa* and *P. subintegra* have similar inflorescence and vegetative structure. However, *Pinanga paradoxa* is a larger statured



20. *Pinanga palustris*, habit, Johor.

palm (taller to 1–3 m, larger leaflets 13–23 × 4.3–8 cm, tightly clustering habit, inflorescence with 1–3 rachillae, 5.5–15 cm long, a species found mainly in lower elevations while *Pinanga subintegra* is smaller in stature (generally shorter 1–2 m, smaller leaflets middle leaflets 2–6 costate, ca. 5.5–11 × 1.5–6 cm) and having a loosely clustering habit, inflorescence spicate, 4–6.5 cm long and

found mostly in montane forest with some exceptions from the lowlands.

I have synonymized *Pinanga paradoxa* var. *unicostata* into the typical species. The variety cannot be maintained as collections of different leaf segmentation types are found growing sympatrically (e.g., Saw FRI 37354 & Saw FRI 37355, Dransfield 834 (both dimorphic



21. *Pinanga palustris*, infructescence, Johor.

forms were collected within the same specimen). I consider them as forms. However, I agree with Lim (2001) that there is a predominance of a particular form within a population.

Pinanga paradoxa is similar to *P. salicifolia* Blume from Borneo. The latter taxon however is often a larger statured palm in both stem and leaf sizes, with 2–7 rachillae per

inflorescence, the smaller sized former in Peninsular Malaysia has 1–3 rachillae. Further investigation, possibly with molecular data should be able to clarify if these taxa, including the Sumatran population are the same species. The complex is well elucidated by Dransfield (1980).

I was unable to locate type for the species, which was described as *Areca paradoxa* Griff.



22. *Pinanga pantiensis*, infructescence, Johor.

13. *Pinanga pectinata* Becc. & Hook.f. in Hook.f., Fl. Brit. India 6: 410 (1892). Type: PENINSULAR MALAYSIA. Perak: Gopeng, 500–800 ft, *Kunstler* 4393 (holotype FI; isotypes K [K000207946, K000207947], SING [SING 0327294]). (Figs. 25 & 26)

Distribution: Endemic in Peninsular Malaysia (Kedah, Perak and Penang (Province Wellesley).

Habitat: A lowland species on dry substrate to about 250 m altitude.



23. *Pinanga paradoxa*, cultivated in Forest Research Institute Malaysia, plant originated from Pahang.

Provisional conservation status: Endangered B1(b)(i)(iii). Its EOO was calculated as 4,020 km². The Penang populations were all converted to urban development, populations in both Kedah and Perak are all in forest reserves and subject to degradation from logging activities.

Notes: Whitmore (1970, 1973) included specimens of *Pinanga singaporensis* and *P. riparia* in his circumscription of the species. *Pinanga pectinata* differs from *P. singaporensis* by its pendent inflorescence, the latter has erect inflorescence. The immature rachillae of *Pinanga pectinata* is green whereas *P. riparia* is purplish, the former is a lowland species on dry habitats with close clustering habit, the latter is found in freshwater swamps and has a stoloniferous habit.

The epithet of the species refers to the comb-like structure of the young fruits on the rachillae rather than the arrangement of the leaflets as alluded by Whitmore (1973) and Lim (2001). *Pinanga pectinata* has broad leaflets and does not look comb-like whereas especially the dried infructescence with immature fruits does look very comb-like.

14. *Pinanga perakensis* Becc., Malesia 3: 175 (1889). Type: PENINSULAR MALAYSIA, Perak: Maxwell Hill, *Scortechini s.n.* (holotype FI n.v.).

(Figs. 30 & 31)

Pinanga densifolia Ridl. J. Fed. Malay States Mus. 4: 85 (1909). Type: PENINSULAR MALAYSIA. Pahang: Telom. Ridley 13917 (holotype SING [SING0058038]; isotypes BM [BM00 1040837], K [K000208040], SING [SING 0327319]).

Distribution: Peninsular Thailand (Yala) and Peninsular Malaysia mainly along the Main Range and Bintang Range (Kelantan, Perak and Pahang)

Habitat: Lower montane to montane forest, 487–2000 m altitude. Often along ridges in colonies.

Provisional conservation status in Peninsular Malaysia: Near Threatened. Its EOO was calculated as 14,139 km². Although it qualifies as vulnerable, it is assessed as near threatened. It is found mainly on ridges of high mountains. These are all in environmentally sensitive areas and are protected according to forestry classification.

Notes: Specimen *FRI 64739* has unusually large fruits (2.8–3 × 1.3–1.8 cm) but has been included as part of the variation for the species.

24. *Pinanga paradoxa*, young infructescence, Johor.





25. *Pinanga pectinata*, habit, Perak.

15. *Pinanga polymorpha* Becc., Malesia 3: 172 (1889). Type: PENINSULAR MALAYSIA, Perak, *Scortechini 345a* (holotype FI). (Figs. 29 & 30)

Pinanga robusta Becc., in Hooker f., Fl. British India 6: 408 (1892). Type: PENINSULAR

MALAYSIA. Perak: Gunong Booboo (Bubu), *King's collector 7372* (holotype: CAL in 3 sheets [CAL0000001202, CAL0000001203, CAL0000001204], isotype K [K000207945]).

Pinanga brewsteriana Ridl. J. Fed. Malay States Mus. 6 (1915) 188; Lim, Folia Malaysiana



26. *Pinanga pectinata*, infructescence, Perak.

15(1): 6 (2014), **synon. nov.** Type: PENINSULAR MALAYSIA. Pahang: Taman Negara, Gunung Tahan, July 1911. *Ridley* 15934 (lectotype K [K000207966] here designated).

Pinanga wrayi Furtado in Feddes Rept. 35: 276 (1934); Whitmore, *Principes* 14: 126 (1970). Type: PENINSULAR MALAYSIA. Perak: G. Batu Puteh. *Wray* 365 (holotype SING [SING0058034], isotype SING [SING0058035]).



27. *Pinanga perakensis*, habit, Perak.

Distribution: Endemic to Peninsular Malaysia, recorded from Perak, Kelantan, Terengganu, Pahang, Selangor and Negeri Sembilan. Restricted to high mountain ranges.

Habitat: Forest understory palm in lower montane to montane forest, (760–)1100–2078

m elevation. They often are found growing gregariously in moist valleys, dominating the understory.

Provisional conservation status: Near Threatened. A species on the highest mountains in Peninsular Malaysia, these areas



28. *Pinanga perakensis*, inflorescence, Perak.

are environmentally sensitive areas and are protected under forestry classification. Environmentally sensitive areas are protected under forestry use class categories where logging and other major environmental disturbances are prohibited.

Notes: *Pinanga polymorpha* is a variable species and can be confused with *P. glaucescens*. Differences between the two species are: *P. polymorpha* has stems often with longer internodes of ca. 2.7–9.8 cm, pendulous inflorescence and may spread out as the fruits begin to develop, staminate flowers with sepals narrowly triangular, ca. 2–4 × 1 mm, and 12–14 stamens, whereas *P. glaucescens* has stems with shorter internodes of ca. 1.5–2.5 cm, erect inflorescences, staminate flowers with linear sepals, ca. 7–8 × 0.4–0.5 mm, and 6 stamens. Whitmore (1970) subsumed *Pinanga*

glaucescens into *P. polymorpha* and as explained here and in agreement with Lim (2001), *P. glaucescens* is a good species.

Specimens from Gunung Padang, Terengganu are smaller in stature and have mainly spicate inflorescences (FRI 12693, FRI 12712, FRI 70886, FRI 70889). Specimen FRI 12722 from the same locality however has both spicate and bifurcating infructescences. Specimens elsewhere are rarely spicate but branched to two or more rachillae.

Lim (2014) reinstated *Pinanga brewsteriana*, I have examined other specimens from the locality in Gunung Tahan, Pahang (Kiew 2452, FRI 56331, FRI 56356), including the type specimens of *P. brewsteriana* (both the lectotype (Ridley 15934) and syntype specimens (Ridley 16041) and I cannot differentiate the species from *P. polymorpha*. Here I am subsuming *Pinanga brewsteriana* back to *P. polymorpha*. A major variation seen in the plates of Lim (2014) is the reddish-brown stem and crown shaft, in other populations the stems are generally green to grayish brown with green crown shaft. The specimen provided in plates of Lim (2014) appeared more like *Pinanga glaucescens* with its erect infructescence. I have no access to that collection (cited as Azizan *et al.* L8250).

Included in the variation of *Pinanga polymorpha* is a large form found near the summit of Gunung Bubu, Perak which was previously described as *P. robusta*. A recent collection (Chua FRI 40409), attested to this large form but unfortunately as when *P. robusta* was first described, the collection lacked flowering material. This variation may represent a new taxon, but until there is sufficient material, this variation is included within *Pinanga polymorpha*.

16. *Pinanga riparia* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 201 (1905). Type: PENINSULAR MALAYSIA. Johor: Sungei Tebrau, Ridley 11518 (lectotype SING [SING0058009] (selected by Lim 1998); isolectotype K). (Figs. 31–33)

Pinanga patula Blume var. *riparia* Becc. in Nuov. Giorn. Bot. Ital. NS 42: 71 (1935). Type: PENINSULAR MALAYSIA. Johor: Kukub, Ridley 14170 (lectotype FI, isolectotype SING [SING0327370]).

Distribution: Peninsular Thailand, Peninsular Malaysia, Singapore, Sumatra and possibly Borneo. In Peninsular Malaysia found in Terengganu, Pahang, Negeri Sembilan and Johor.



29 (top). *Pinanga polymorpha*, colony, Pahang. 30 (bottom). *Pinanga polymorpha*, infructescence, Pahang.



31. *Pinanga riparia*, habit, cultivated in Forest Research Institute Malaysia, plant of unknown origin.

Habitat: Riparian species in freshwater swamps and along riverbanks, to 280 m altitude

Provisional conservation status in Peninsular Malaysia: Endangered B2b(ii) (iii)(iv). Its EOO was calculated as 28,476 km², and AOO 48 as km². The freshwater swamp forest

in Johor is highly degraded, most of which has been lost to land conversion and logging. Elsewhere, freshwater swamps are often drained and subject to land conversion. The only location where the species is found in some level of protection is in Pasoh Forest



32. *Pinanga riparia*, immature infructescence showing purplish rachillae and glaucous green fruits.

Reserve; it is a Virgin Jungle Reserve. Here, only one population with a colony is known in the forest reserve.

Notes: It is a distinctive species when seen living, with its loosely clustering stems, purplish rachillae with immature fruits. It can

be mistaken for *Pinanga singaporensis* and *P. pectinata*, see notes on *P. pectinata* for their differences.

17. *Pinanga sarmentosa* Saw, Palms 47(3): 141 (2003). Type: PENINSULAR MALAYSIA. Terengganu: Kemaman, Sungei Nipah Forest



33. *Pinanga riparia*, mature infructescence with red rachillae, red to dark purplish to almost black fruits.

Reserve, Saw *et al.* FRI 48154 (holotype KEP [KEP64955]; isotypes FTG, K, KEP [KEP67572, KEP67573, KEP67574]). (Figs. 34 & 35)

Distribution: Endemic in Terengganu, Peninsular Malaysia. So far, the species is known only from the type locality.

Habitat: Lowland dipterocarp forest. The species formed scattered colonies of individuals on the upper slopes and ridges of a lowland dipterocarp forest (Saw 2003). Here they were found in large numbers, becoming one of the common understory palms of the forest floor. Individual shoots were spaced rather widely apart. The species was absent from the lower slopes or in valleys.

Provisional conservation status: Critically Endangered B2(a)(bii). The species is only known from the type locality, no other sighting was seen in the area.

Notes: A very distinctive *Pinanga*, like no other species in Peninsular Malaysia. The species

looks superficially like *Pinanga tenacinervis* J.Dransf. from Sarawak; however, the long stolons and the longer leaflets found in the new species distinguish it from the latter. Furthermore, *P. sarmentosa* has a thinner textured leaf than *P. tenacinervis*; the former has red rachillae, ellipsoid fruits, ca. 13 × 8 mm, maturing black, while the latter has green rachillae with fusiform fruits, ca. 12 × 4 mm that will mature crimson (Dransfield 1980).

18. *Pinanga scortechinii* Becc., *Malesia* 3: 170 (1889). Type: PENINSULAR MALAYSIA. Perak: *Scortechinii* 546a (lectotype FI [FI013941] designated here. (Figs. 36 & 37)

Distribution: Peninsular Thailand and Peninsular Malaysia (Kedah, Penang, Perak, Kelantan, Terengganu, Pahang, Selangor and Negeri Sembilan).

Habitat: Lowland dipterocarp forest to lower montane forest, 60–1180 m elevation. The species is an understory palm, found often found on well drained hill slopes.

Provisional conservation status in Peninsular Malaysia: Least Concern. It is a widespread species, north of Pahang and Negeri Sembilan.

Notes: This is a distinctive species, easily recognized by its erect inflorescence and spirally arranged flowers or fruits. The fruits are creamy white with pink tips when immature. The more common form has broad, sometimes mottled leaflets.

19. *Pinanga sembilan* C.K.Lim, *Folia Malaysiana* 15(1): 2 (2014). Type: PENINSULAR MALAYSIA. Negeri Sembilan: Gunung Berembun Forest Reserve, 28 April 2014, *Lim* L 12352 (holotype UKMB n.v.; isotype SING [SING0232398, SING0242399]).

Distribution: Endemic in Negeri Sembilan, Peninsular Malaysia, known only from its type locality.

Habitat: Montane forest on steep slopes

Provisional conservation status: Critically Endangered B2(a)(bii). Known only from the type locality, a rare species, not common at site.

Notes: This is a distinct species in Peninsular Malaysia, no other species has the pendulous inflorescence with spirally arranged triads and large number of rachillae.

20. *Pinanga simplicifrons* (Miq.) Becc., *Malesia* 3: 124 (1886). *Ptychosperma simplicifrons* Miq., *Fl. Ned. Ind. Eerste Bijv.* 590 (1861). Type: INDONESIA. Sumatra: Palembang, prope



34. *Pinanga sarmentosa*, habit, note the stoloniferous runners at the base of the shoots, Terengganu.

Maura-enim, Miquel 3994 (holotype U [U0149869]). (Figs. 38–41)

Pinanga subruminata Becc., Malesia 3: 174 (1889), **synon. nov.** Type: PENINSULAR MALAYSIA. Perak: Padang Batang, July 1886, King's collector 7797 (holotype FI [FI014002]; isotype K [K000207940]).

Pinanga simplicifrons var. *pinnata* C.K.Lim, Folia Malaysiana 2(4): 237 (2001), **synon. nov.** Type: PENINSULAR MALAYSIA. Terengganu: Ulu Setiu Forest Reserve, Dransfield JD 5148 (holotype KEP [KEP23262]; isotypes SING, K).

Distribution: Sumatra, Peninsular Thailand, Borneo, Singapore and Peninsular Malaysia (Penang, Kedah, Perak, Kelantan, Terengganu, Pahang and Johor). The distribution is east of the Main Range, except in the north where its distribution includes northern Main Range and N of the Kledang Saiong Range, and Penang Hill.

Habitat: Lowland dipterocarp to lower montane forest, 50–1500 m elevation.

Provisional conservation status in Peninsular Malaysia: Least Concern.

Notes: Together with *Pinanga cleistantha*, they are the only species with an enclosed inflorescence at anthesis and the prophyll remains attached to the infructescence even when in fruiting stages. For differences between the two species see notes under *Pinanga cleistantha*.

The species has a rather variable leaf characteristics, varying in size both width and length, and leaf division. In most populations, the leaves are undivided but varying degree of segmentation are found in different populations.

Other than the more cuneate and shorter leaves of *Pinanga subruminata*, there is no other character to distinguish this species with *P. simplicifrons*. Both species exhibit undivided leaf and divided leaf forms. Considering the variation found in *Pinanga simplicifrons*, I have subsumed *Pinanga subruminata* into *P. simplicifrons*. Ridley's (1907, 1925) *Pinanga subruminata* included specimens of *P. simplicifrons*. He seemed to have missed *Pinanga simplicifrons* in his accounts.

Vegetatively, the shorter leafed form is very similar to *Pinanga disticha*, the difference between the two is in the inflorescences, *P.*

35. *Pinanga sarmentosa*, close up of infructescence.





36. *Pinanga scortechinii*, habit, Pahang.

disticha has caducous prophyll, i.e., the prophyll drops off almost immediately at anthesis whereas *P. simplicifrons* has persistent prophyll.

Pinanga simplicifrons var. *pinnata* cannot be maintained, some specimens from Terengganu have both the pinnately divided and the entire leaf forms in the same population (e.g., FRI 20234 (in Kuala Kerbat), FRI 39890 (in Ulu

Setiu Forest Reserve) and FRI 44831 (in Hulu Besut Forest Reserve)). It is also commonly found mixed among populations or within a clump, stems with entire leaves and stems with upper leaflets broadly divided with a few basal leaflets more narrowly divided (many specimens, e.g. FRI 83611, FRI 389960, KEP 70993, KEP 30668, Dransfield 6501, Kiew 1396, etc.).



37. *Pinanga scortechinii*, infructescences with immature pink fruits and a few mature black fruits, Pahang.

21. *Pinanga singaporensis* Ridl., J. Straits Branch Roy. Asiatic Soc. 41: 38 (1904). TYPE: SINGAPORE. Bukit Timah Mandai, Seletar, Ridley 11267 (holotype SING). (Figs. 42–44)

Distribution: Singapore and Peninsular Malaysia (Pahang and Johor).

Habitat: Lowland dipterocarp forest, often near riverbanks. Once collected in a coastal forest.

Provisional conservation status in Peninsular Malaysia: Near Threatened. Its EOO was calculated as 16,688 km². The species is widespread in Endau-Rompin State Parks in both sides of the Pahang and Johor. It is also recorded in Tioman Island which is a marine park, and its forest is protected.

Notes: There was some confusion over the circumscription of this species with *Pinanga*



38. *Pinanga simplicifrons*, habit of entire leafed form, Johor.

pectinata (Whitmore 1970, 1973). See notes under *Pinanga pectinata* the clarification.

22. *Pinanga subintegra* Ridl., Mat. Fl. Malay Peninsula 2: 141 (1907). *Pinanga paradoxa* auct. non Ridl., Hodel, Palms and Cycads of Thailand 148 (1998); Henderson, Palms Southern Asia 152 (2009); Henderson in Barfod

& Dransfield, Fl. Thailand 11: 471 (2013). Type: PENINSULAR MALAYSIA. Perak: Batang Padang, Bujung Malacca, 1898, *Ridley* 9798 (lectotype SING [SING0058011], here designated). (Figs. 45 & 46)

Pinanga beccariana Furtado, Feddes Repert. Nov. Regni. Veg. 35: 278 (1934), **synon. nov.**



39. *Pinanga simplicifrons*, habit of dissected leafed form, Terengganu.

Pinanga subintegra var. *beccariana* (Furtado) C.K.Lim, *Folia Malaysiana* 2(4): 259 (2001), **synon. nov.** Type: PENINSULAR MALAYSIA. Kedah: Kedah Peak, June 1893, *Ridley s.n.* (holotype SING [SING0058005]).

Pinanga subintegra var. *intermedia* Furtado ex C.K.Lim, *Folia Malaysiana* 2(4): 258 (2001),

synon. nov. Type: PENINSULAR MALAYSIA. Kedah: Kedah Peak, *Ridley* 5202 (holotype SING [SING0058010]; isotypes FI, K).

Pinanga paradoxa (Griff.) Scheff. var. *multifida* Becc., *Atti Soc. Tosc. Sci. Nat. Pisa*, Mem. 44: 129 (1934), **synon. nov.** *Pinanga subintegra* var. *multifida* (Becc.) C.K.Lim, *Folia*

Malaysiana 2(4): 257 (2001), **synon. nov.**
Type: PENINSULAR MALAYSIA. Gunung
Ijuk, *Scortechini s.n.* (holotype FI).

Distribution: Peninsular Malaysia and into
Southern Thailand. The species is restricted to
northern parts of Peninsular Malaysia: Pahang,
including Tioman Island (southernmost
distribution of the species), Perak, Terengganu,
Kelantan and Kedah.

Habitat: It is a species of mostly higher
elevations, mostly in upper hill dipterocarp to
montane forests, but has also been recorded
in the lowlands. Reported from 168 to 1243
m elevation.

**Provisional conservation status in Pen-
insular Malaysia:** Least Concern. Widespread
species mostly in montane forest.

40. *Pinanga simplicifrons*, enclosed infructescence and immature infructescence, Terengganu.



Notes: The three varieties Lim (2001) recognized are difficult to maintain. As with the varieties he recognized in *Pinanga paradoxa* (see notes in that species), they are local population forms of the species and with the variations merging into each other. In Gunung Jerai, both unicostate or narrow leaflet form (var. *beccariana*; Ridley s.n., June 1893, Dransfield 5102) and broad leaflet form (can be considered either as var. *intermedia* or var. *multifida*; Symington FMS 46844) were collected. The two to three costate leaflets form were collected not just from Bukit Larut, Perak (e.g. Saw JKB 2449) but also from Gunung Bubu, Perak (FRI 52655) and Taman Negara, Pahang (Dransfield 637). Dransfield 637 has both narrow and broad leaflets within its shoot. Furthermore, in both locations (Gunung Bubu and Taman Negara), they also have collections with the broad leaflet form (var. *intermedia*, e.g., Dransfield 654, Wong & Wyatt-Smith 36, Kiew 22975 and FRI 15352). As a result, I have subsumed all of these varieties into the typical variety.

The form with entire or sub-entire leaves are generally less common, the broad leaflet form is commonest.

Henderson (2009) included *Pinanga subintegra* in its distribution into Thailand based on Lim's (2001) account, although he had not seen any specimen of that distribution. As explained under *Pinanga paradoxa*, Henderson's *P. paradoxa* is *P. subintegra*, and *P. paradoxa* does not occur in Thailand.

The species is quite close in its morphology to *Pinanga paradoxa*, see notes in this species for their differences.

Acknowledgments

The author is grateful to the curators of E, FL, K, KEP, L, SAN, SAR and SING. Access to images of type specimens was also made possible by the JSTOR Global Plants, Naturalis BioPortal and Europeana websites. I am grateful to the Ministry of Water, Land and Natural Resources for providing financial support (SPPIII No. P23085100010021 & P23085100018003) under the Flora of Peninsular Malaysia project, which was the focus of this study. I am indebted to John Dransfield for his comments and corrections on the initial draft. I am thankful to my former colleagues in the Forest Research Institute Malaysia, particularly Dr Ruth Kiew and Dr Richard Chung for their support. Serena Lee (SING) was particularly helpful in providing images of the SING herbarium specimens for this revision.

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