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## ***Areca jokowi*: A New Species of Betel Nut Palm (Arecaceae) from Western New Guinea**

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### Abstract

A new species of betel nut palm, *Areca jokowi*, is described and illustrated here. This is the third species of *Areca* to have been described recently from New Guinea that is closely related to the widespread, economically important species *A. catechu*, the cultivated betel nut palm. A discussion of its morphological characters, distribution, ecology, habitat, uses and conservation status is provided, as well as a new identification key for western New Guinean *Areca*.

**Key words:** Arecaceae, Palmae, palms, New Guinea, taxonomy

### Introduction

In spite of the completion of a monograph of the betel nut palm genus *Areca* (Arecaceae) in East Malesia (Heatubun *et al.* 2012), new species *Areca* within this area are still being discovered (Heatubun *et al.* 2013). During two recent expeditions to Yamor Lake, Kaimana, West Papua Province, Indonesia, a further new species was found, which is described here. The first expedition was conducted by Pusat Penelitian Lingkungan Hidup (Centre for Environmental Research), Universitas Papua in June 2015, and the second was Ekspedisi Negera Kesatuan Republik Indonesia (NKRI) Koridor Papua Barat 2016 by the Indonesian Army Special Forces in April 2016.

### Taxonomic Treatment

*Areca jokowi* Heatubun, *sp. nov.* Type:—CULTIVATED. Indonesia, West Papua Province. Kaimana Regency, Yamor District, Yamor Lake, Gariou (Urubika) village, 106 m elev., 3°41'48.87" S, 134°54'28.63", 06 June 2015, *Heatubun et al.* 1252 (holotype MAN!, isotype BO!, K!)

**Diagnosis:**—This new species is similar to *Areca catechu* L., *Areca mandacanii* Heatubun and *Areca unipa* Heatubun in habit and inflorescence structure, but differs by the inflorescence branched to four orders, the rachillae crowded, borne very close together and not expanding widely, sinuous especially in the distal two thirds, the floral clusters uniseriate in arrangement (although distichous near the tip of the rachilla), complete floral triads (comprising two staminate and one pistillate flower) always solitary at the base of rachillae, but absent from many rachillae, the remaining floral clusters consisting of dyads of staminate flowers, or solitary staminate flowers near the rachilla tip, and the pistillate flowers with striking white calyx at anthesis.

Solitary, slender palm to 15 m. Stem 7–8 cm diam.; internodes 30–34 cm. Leaves 9 in crown, pinnate, 90–93 cm long (including petiole); sheath tubular, smooth, not fibrous, light green, becoming dull green; crownshaft well-defined, up to 40 cm long; petiole 5–6 cm long, flattened to slightly channelled adaxially, rounded abaxially; rachis slender, 45–69 cm long, ascending but not arching, with adaxial longitudinal ridge, rounded abaxially; leaflets 11 on each side of rachis, concolorous, more or less regularly arranged, spaced by 3–10 cm, basal leaflets 47 × 7–9 cm, with 7–10 folds,

sigmoid, middle leaflets  $47 \times 3-7$  cm, with 3-5 folds, lanceolate, terminal leaflet  $30-37 \times 4-7$  cm, with 1-3 folds, truncate, notched tips, papery. Inflorescence infrafoliar, 30-37 cm long and 46 cm wide, crowded and compact, primary branches strongly divaricate, protandrous, about 30 primary branches, branching to 4 orders; prophyll not observed; peduncle 3 cm long, 1.5 cm wide, with prophyll scar half way along length of peduncle, green with numerous stellate hairs, darker green than rachis above prophyll; rachis green with thick stellate hairs as peduncle; rachillae numerous, crowded, not expanding widely, 14-17 cm long and 1-2 mm wide, green, elongate, sinuous especially in the distal two thirds, when sinuous part appearing thicker. Floral clusters uniseriate, distichous near the tip of rachillae, complete floral triads (comprising two staminate flowers and one pistillate flower) always solitary at the base of rachillae, but absent from many rachillae, ca. lower third to half of rachilla naked (with exception of solitary complete triad if present), the remaining floral clusters consisting of dyads of staminate flowers, or solitary staminate flowers near the rachilla tip. Staminate flowers sessile, triangular, elongate or tear drop-shaped,  $3.2-4.3 \times 2.0-2.5$  mm in bud, asymmetric; sepals 3, low,  $1.6-2.0 \times 1.0-1.5$  mm, united at the base, cream to light green; petals 3, triangular, elongate or spatulate,  $3.5-3.7 \times 1.5-1.6$  mm, striate, cream-tinged with light green; stamens 6,  $1.5-2.5$  mm long and  $0.2-0.7$  mm wide; filaments thick, 0.5 mm long and 0.1 mm wide, darker than anther; anthers  $1.3-2.0$  mm long and  $0.2-0.7$  mm wide, sagittate, longer than the filaments; pistillode shorter than stamens,  $1.3 \times 0.4$  mm, irregular. Pistillate flowers larger than the staminate, triangular, borne on the enlarged basal portion of rachillae, ca.  $11 \times 9.1$  mm at anthesis; sepals 3, strongly imbricate, ca.  $4.5 \times 9.0$  mm, triangular, asymmetrical, striate; petals 3, imbricate, triangular, ca.  $10 \times 8$  mm striate; gynoecium 5.5 mm long and 3.0 mm wide; stigma ca. 1 mm long, pointed with 3 lobes; style ca. 4 mm long; staminodial ring not found. Fruit ovoid,  $3.2-3.5 \times 2.5-2.8$  cm (young fruits); epicarp smooth, shiny, dark green (young), mature fruits not seen; mesocarp fibrous, ca. 1 cm thick, 1.75 cm thick at the base (below the seed); endocarp very thin, adhering closely to the seed. Seed not fully develop (young fruits); endosperm ruminant. Eophyll bifid. (Figures 1 & 2).

**Distribution:**—Known only from two individuals palms cultivated in Gariau (Urubika) village, on the SW shore of Yamor Lake in Yamor District, Kaimana Regency, West Papua Province, Indonesia. These palm were grown from the seeds brought from hill forest at Kepala Air Kali Ima (headwaters of Ima river) in Gunung Daweri (Mt. Daweri), near Kewo village on the border of Nabire Regency of Papua Province.

**Habitat:**—Based on information gathered from the person who brought the seeds and planted this betel nut palm, the species grows in hill forest at an elevation of about 300 m altitude on soils derived from sandstones.

**Local names:**—*Siaku* (Yamor dialect, Kamoro language).

**Uses:**—The fruits are chewed as a betel nut substitute. However, the palm has potential as an ornamental.

**Conservation status:**—Data Deficient (IUCN 2012). Further study is needed to assess the conservation status of this palm, especially the population status. However, this betel nut palm is a cause for concern since its distribution appears to be limited and located within a logging concession.

**Etymology:**—The specific epithet refers to the acronym the President of Republic Indonesia, His Excellency Joko Widodo-Jokowi. This new species is dedicated to Mr. Joko Widodo for his exemplary leadership, his simplicity, and more importantly for his concern for the development of Tanah Papua (the Indonesian Provinces of Papua and West Papua). The common name “pinang jokowi” is suggested here.

**Discussion:**—*Areca jokowi* is similar to *A. catechu* Linnaeus (1753: 1189), *A. mandacanii* Heatubun (2008: 199) and *A. unipa* Heatubun (2013: 59) in its solitary, moderate tree palm habit and inflorescence structure, but it can immediately be distinguished by its inflorescence, which is branched to four orders, although we note that this is difficult to observe due to the crowding of the branching at the base. The rachillae are crowded, being inserted very close together, and do not expand widely, appearing swept forward within primary branching systems. They are sinuous, especially in the distal two thirds and the floral clusters are arranged along one side (uniseriate), but are distichous near the tip. The basal third to half of each rachilla is naked (with the exception of a complete triad if present). Complete floral triads, comprising two staminate and one pistillate flowers, are always solitary and found only at the base of some of the rachillae. The remaining floral clusters consist of dyads of staminate flowers, or solitary staminate flowers near the rachilla tip. The pistillate flowers have a striking white calyx at anthesis. In contrast, the other three species have more laxly branched inflorescences with straighter rachillae (especially *A. mandacanii* and *A. unipa*, which expand and spread widely). Their floral clusters are distichously arranged, often with more than one complete triad at the base of rachillae, and the naked portion of the rachilla is much shorter. The calyx of the pistillate flowers is light to dark green at anthesis.

The discovery of another distinctive new species closely related to the domesticated betel nut palm, *Areca catechu*, draws further attention to western New Guinea as a potential area of origin of this economically important and widespread species (Heatubun *et al.* 2012, Heatubun *et al.* 2013). The most immediate concern, however, is the

need to protect these important crop wild relative species from extinction risk and threats of habitat loss, due to land-use change, deforestation and forest degradation, over harvesting and even climate change.



**FIGURE 1.** *Areca jokowi*. A. Habit. B. Apical portion of leaf. C. Middle and basal portion of leaf. D. Partial inflorescence. E. Pistillate flowers on rachilla with staminate flowers scars. F. Staminate flower. G. Pistillate flower in section. Scale bar: A = 2.5 m; B, C = 8 cm; D = 4 cm; E = 1.5 cm; F = 7 mm; G = 3 mm. All from *Heatubun et al. 1252*. Drawn by Lucy T. Smith.



**FIGURE 2.** *Areca jokowi*. A. Slender habit with irregular crown shape. B. Leaf and inflorescence held by Christian Anggua for scale. C. Inflorescence—a strongly divaricate panicle with crowded rachillae. D. Pistillate flowers, striking in their white colour. E. Close up of pistillate flower at anthesis showing stigma. F. Young fruit in section. A–E photos were taken from the holotype specimen (*Heatubun et al. 1252*), F from voucher collected by Ekspedisi NKRI Koridor Papua Barat 2016. Photos: A, F (Lt. Ardiansyah), B–E (Charlie D. Heatubun).

## Key to Species of *Areca* in Western New Guinea

Based on their morphology (strongly divaricate inflorescences with crowded branches and rachillae, uniseriate appearance and distichous floral clusters with only complete triad at the very base of certain rachilla, the free sepals of staminate flowers (or sometimes fused at the base), six stamens and typical betel nut-like fruits), *A. jokowi*, *A. catechu*, *A. mandacanii* and *A. unipa* form a closely related group that is completely distinct from the most widespread (Maluku–New Guinea) species *A. macrocalyx* Zipp. ex Blume (1839: 75). For practical use and as aid in identification of species of *Areca* in western New Guinea, an updated identification key is provided, based on the key produced for species of *Areca* in East Malesia (Heatubun *et al.* 2012) with some modification to accommodate the two species described since that account, *A. unipa* (Heatubun *et al.* 2013) and *A. jokowi*.

1. Small, undergrowth to robust, emergent tree palm; inflorescence not divaricate and rachillae slightly congested along the main axis, branched to one order (rarely two orders); protogynous.....*Areca macrocalyx* Zipp. ex Blume
- Slender, moderate to robust, emergent tree palm; inflorescence divaricate, branched from two to four orders; protandrous.....2
2. Slender palm; stem diameter less than 8 cm; leaf including petiole less than 150 cm long, leaflets always multi-fold and less than 12 on each side of the rachis; inflorescence less than 40 cm long.....3
- Moderate to robust palm; stem diameter more than 8 cm; leaf including petiole 150–270 cm long, leaflets single-fold to multi-fold and 20–60 on each side of rachis; inflorescence 28–80 cm long.....4
3. Leaf about 120 cm long, petiole elongated to 16.5 cm long, leaflets sigmoid and broadly wedge-shaped; inflorescence divaricate and branches slightly reflexed to main axis, branched to 2 orders; peduncle slender and elongate (about 6 × 2 cm), prophyll scar about one-third way up the peduncle; floral cluster distichous, one or two complete triads including pistillate flower at the base of rachilla, naked portion lacking flowers in lower one fourth of rachilla; calyx of pistillate flower light green to green at anthesis.....*Areca unipa* Heatubun
- Leaf 90–93 cm long, petiole short (6–8 cm long), leaflets lanceolate, sigmoid and slightly cuneate; inflorescence strongly divaricate, but crowded and compact, branched to 4 orders; peduncle broad and short (about 3 × 1 cm), prophyll scar about half way up the peduncle; floral cluster largely uniseriate, only one complete triads including pistillate flower at the very base of rachilla, naked portion lacking flowers in lower one third to half of rachilla; the calyx of pistillate flower white at anthesis.....*Areca jokowi* Heatubun
4. Leaflets multi-fold, all on the same plane, 20–35 in on each of rachis; inflorescence divaricate, broad and crowded, mostly branched to three orders (rarely two); peduncle robust, about 6 cm long and 8 cm wide, prophyll scar about half way up the peduncle; fruits with beaked or rounded with pointed apex.....*Areca catechu* L.
- Leaflets single-fold, held on different plane (plumose), about 60 on each side of rachis; inflorescence somewhat elongate and slender, mostly branched to two orders (rarely three); peduncle somewhat elongated and slender, about 6 cm long and 2 cm wide, prophyll scar about one-third way up the peduncle; fruits with conspicuous woody discoid depression at the apex.....*Areca mandacanii* Heatubun

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