

## Rediscovery and lectotypification of a native vine, *Plukenetia corniculata* Sm. (Euphorbiaceae), in Singapore

Le Min Choo<sup>1\*</sup>, Xin Yi Ng<sup>2</sup> & Hock Keong Lua<sup>3</sup>

<sup>1</sup>Singapore Botanic Gardens, National Parks Board, 1 Cluny Road, Singapore 259569, Republic of Singapore; Email: [choolemin@gmail.com](mailto:choolemin@gmail.com) (\*corresponding author)

<sup>2</sup>Native Plant Centre, Horticulture and Community Gardening Division, National Parks Board, 100K Pasir Panjang Road, Singapore 118526, Republic of Singapore

<sup>3</sup>National Biodiversity Centre, National Parks Board, 1 Cluny Road, Singapore 259569, Republic of Singapore

**Abstract.** *Plukenetia corniculata* (Euphorbiaceae) has been rediscovered for Singapore. Taxonomic notes, a description of the plant and proposed conservation measures for the species are discussed, and a lectotype is designated for this species.

**Key words.** Acalyphoideae, Plukenetieae, *Pterococcus*, vegetable

**Recommended citation.** Choo LM, Ng XY & Lua HK (2022) Rediscovery and lectotypification of a native vine, *Plukenetia corniculata* Sm. (Euphorbiaceae), in Singapore. *Nature in Singapore*, 15: e2022001. DOI: 10.26107/NIS-2022-0001

### INTRODUCTION

*Plukenetia* L. is a pantropical genus of 25 species of non-stinging twining lianas, vines and, rarely, subshrubs from the Plukenetieae tribe (subfamily Acalyphoideae) of the Euphorbiaceae family (Gillespie, 2007; Cardinal-McTeague & Gillespie, 2020). The genus can be reliably differentiated from other plants of a similar habit by its 4-carpellate fruit and ovary, as well as the presence of a pair of basilar glands or extra-floral nectaries on the leaf margin near the petiole (Gillespie, 2007; Cardinal-McTeague & Gillespie, 2020). Of the 25 species, 12 species are found in the Neotropics, while seven species are found in the Paleotropics, mainly in Africa and Madagascar, with only one species, *Plukenetia corniculata* Sm., present in Asia (Gillespie, 2007; Gillespie & Larsen, 2007; Cardinal-McTeague & Gillespie, 2020). *Plukenetia corniculata* is a rarely collected plant but has a wide distribution from South Asia to Southeast Asia and Malesia (Gillespie, 2007; Gillespie & Larsen, 2007).

The presence of *Plukenetia corniculata* was first brought to our attention through a post on social media by a member of the public in February 2020. The plant was located in an open area at the Rail Corridor on swampy ground next to a stream (Fig. 1A, 1C), and was identified as a *Plukenetia* because of its unique four-winged fruits (Fig. 2E, 2F). In Singapore, the species was previously known from three collections: the first two from Chua Chu Kang and the Singapore Botanic Gardens by H. N. Ridley in 1889, and the third collected by C. X. Furtado in 1944 from a plant cultivated in a garden. Because of the lack of further collections, it was presumed to be nationally extinct (Tan et al., 2008; Chong et al., 2009). The recent sightings and collections thus represent a rediscovery of the species for Singapore.

### TAXONOMIC NOTES & DISCUSSION

A description of the species based on the newly collected specimens, supplemented with other specimens from Singapore deposited at the Singapore Botanic Gardens' Herbarium (SING), is provided here, along with photographs of the recent collections. Taxonomic and nomenclatural notes relating to the presence of the species in Singapore are detailed below and a lectotype is also designated for the species. A lectotype is a single specimen or illustration chosen from original material referred to by the author of the name, if the author did not originally designate a type. A choice stated by the author at the point when the name is first described is known as a holotype. Type specimens, such as lectotypes or holotypes, among others, are important as they fix the application of a name to a particular taxon. In this particular case, a lectotypification is required as a type specimen had never been formally designated for *Plukenetia corniculata*. Earlier publications which mentioned a type specimen for this species, namely Gillespie (2007) and Cardinal-McTeague & Gillespie (2020), did not effectively lectotypify the name by using the term 'lectotype', as required in Article 9.23 of the International Code of Nomenclature for Fungi, Algae and Plants (Shenzhen Code) (Turland et al., 2018). This meant that the type of the name could still be open to contest. To fix the application of the name to the currently accepted consensus, a lectotype is designated here to confirm the type specimen listed in Gillespie (2007) and Cardinal-McTeague & Gillespie (2020). Further information relating to the presence of the species in the region or worldwide, as well as botanical illustrations,

are available from Gillespie (2007: 794, fig. 1), Gillespie & Larsen (2007: 510, fig. 66) and Cardinal-McTeague & Gillespie (2020: 517).

***Plukenetia corniculata*** Sm., Nova Acta Regiae Soc. Sci. Upsal. 6: 4 (1799); Ridley, J. Straits Branch Roy. Asiat. Soc. 35: 90 (1902). — *Pterococcus glaberrimus* Hassk., Flora 25(2, Beiblätter): 41 (1842), nom. illeg.; Ridley, Fl. Malay Penins. 3: 309 (1924). — *Pterococcus corniculatus* (Sm.) Pax & K. Hoffm., Pflanzenr. (Engler) IV. 147. IX: 22 (1919); Keng, Gard. Bull. Singapore 33(2): 366 (1980); Keng, Concise Fl. Singapore, vol. 1, Gymn. Dicot. 113 (1990); Turner, Chua & Tan, J. Singapore Natl. Acad. Sci. 18 & 19: 68 (1990); Turner, Gard. Bull. Singapore 45: 87 (1993); Turner & Tan in Wee & Ng (eds.), First Look Biodivers. Singapore: 115 (1994); Tan et al. in Davison et al. (eds.), Singapore Red Data Book, ed. 2: 223 (2008); Turner, Gard. Bull. Singapore 47: 230 (1997 [“1995”]); Chong et al., Checkl. Vasc. Pl. Fl. Singapore: 73, 131, 197 (2009). — TYPE: [Published illustration] Indonesia, Moluccas, Ambon Island, “Bagulae Regione, Amboinae”, in Herb. Amboin. (Rumphius) 1: Tab 79, fig. 2 (1741) (lectotype designated here).

**Description.** Plant with stems twining, climbing up to 5 m (Fig. 1A), pubescent with simple hairs. Stipules persistent, lanceolate, 10–25 × 4–5 mm, dark green when dry, surface glabrous and margins sparsely pubescent. Leaves: petioles densely pubescent, 3.9–10.2 cm, lower 0.9–1.5 cm of petiole swollen when fresh but shrunken in dry specimens; lamina thinly chartaceous, triangular to ovate, 7.6–14 × 3.5–7.7 cm, apex acuminate to 0.8–1.8 cm, base cordate (Fig. 1B); upper surface sparsely pubescent to glabrous, midrib and secondary veins slightly raised and pubescent, lower surface glaucous, dotted with small raised bumps but otherwise glabrous, midrib and secondary veins clearly raised and pubescent; margins serrate and pubescent, serrations each tipped with a gland which is more visible from the lower surface (Fig. 2B); venation palmate at the base, becoming pinnately veined up the leaf, with 3–5 pairs of secondary veins, tertiary veins scalariform and sometimes reticulate; stipels at base of leaf near petiole 0.5–1 mm long, recurved when dry; basilar glands 2, located on the margin along the base of the leaf, round to elliptic, 0.5–1 mm wide (Fig. 2A). Inflorescence 3.5–6.5 cm long, a compact thyrse appearing racemose, terminal but appearing leaf-opposed, bisexual with the pistillate flower solitary at basal-most node and staminate flowers many above (Fig. 2C); inflorescence branches puberulous; peduncle 3–10 mm; flowers 1–2 per node, bracts triangular, generally glabrous except for a few hairs at the base, 1–1.2 × 0.5–0.7 mm. Staminate flowers: pedicel 1–2.5 mm long, sparsely pubescent to glabrous, with a constriction halfway up the pedicel, glabrescent; buds broadly ovoid to globose, apex obtuse, 0.7–1 × 0.5–0.7 mm, glabrous; sepals 4, ovate, 0.8–1.2 × 0.5–1 mm, base sparsely pubescent; androecium domed, c. 0.5 mm high and 0.8–1 mm wide; stamens 9–13; filaments very short, less than 0.1 mm; anthers c. 0.2 mm wide, with 4 locules. Pistillate flowers: pedicel 1–1.2 mm long when mature, pubescent; with 2 bracteoles measuring 0.6–0.7 × 0.3 mm, sparsely pubescent to glabrous; sepals 4, ovate to lanceolate, 1.2–2 × 1–1.3 mm, base puberulous; ovary 1.5–2 mm in diameter not including wings, wings 2–2.5 mm long but elongating as ovary develops, pubescent along wing margin, styles connate into a small globose column c. 0.8 mm long and 1–1.5 mm wide, with a cross-shaped stigmatic surface at the apex (Fig. 2D). Fruit: 4-lobed capsule with persistent sepals at the base and a persistent stigma at the tip, measuring 2–3.5 × 1.8–2.3 cm including wings, 0.8–0.9 cm thick, glabrescent, surface green turning pale yellow, each of the 4 carpel lobes with a wing measuring 0.8–1 × 0.7–0.9 cm (Fig. 2E, 2F); pedicels 3–4 cm. Seeds 4, broadly lenticular and compressed around the margins, 0.9–1 × 0.7–0.8 × 0.6 cm, margins 0.5–1 mm wide, surface smooth, pale brown with irregular dark brown streaks.

**Occurrence in Singapore.** Previously known from Chua Chu Kang (1889), the Singapore Botanic Gardens (1889) and recorded as cultivated in a garden (1944). Here newly recorded from the Rail Corridor (Fig. 1C).

**Local status.** Prior to the rediscovery of the current population, *Plukenetia corniculata* was listed as presumed nationally extinct in Singapore (Tan et al., 2008; Chong et al., 2009). Although the species was described to be cultivated in gardens and eaten as a vegetable, mostly in Malaysia and Indonesia (Ridley, 1924; Burkill, 1953; van den Bergh, 1993; Gillespie, 2007), its use was little mentioned in Singapore and may have diminished into obscurity with the loss of village settlements and rapid urbanisation of the landscape over the last few decades.

The site of the current population is part of a former railway. It was cleared of most vegetation following the removal of the railway tracks in 2011, and was cleared again soon after for water pipeline works. The *Plukenetia corniculata* plants we observed are scrambling over young trees that have regenerated in the past few years. This is the only known population in Singapore; the species has not been previously recorded at the current location. It is unlikely to be a remnant of an older population nor past cultivation due to the relatively young age of the vegetation where it was found and the absence of any other cultivation in the immediate vicinity. Plants may possibly have been cultivated in private gardens nearby or there may have been unknown populations in adjacent secondary forests. The seeds may have been brought to the current location by small scatter-hoarding mammals, which is suggested as a mode of dispersal for small-seeded *Plukenetia* species with dehiscent fruits (Cardinal-McTeague et al., 2019). While we cannot completely rule out the possibility that the occurrence of this population is due to human activities, we propose to treat this population of *Plukenetia corniculata* as native until further evidence is available. Measures such as ex situ propagation have been undertaken for its conservation.

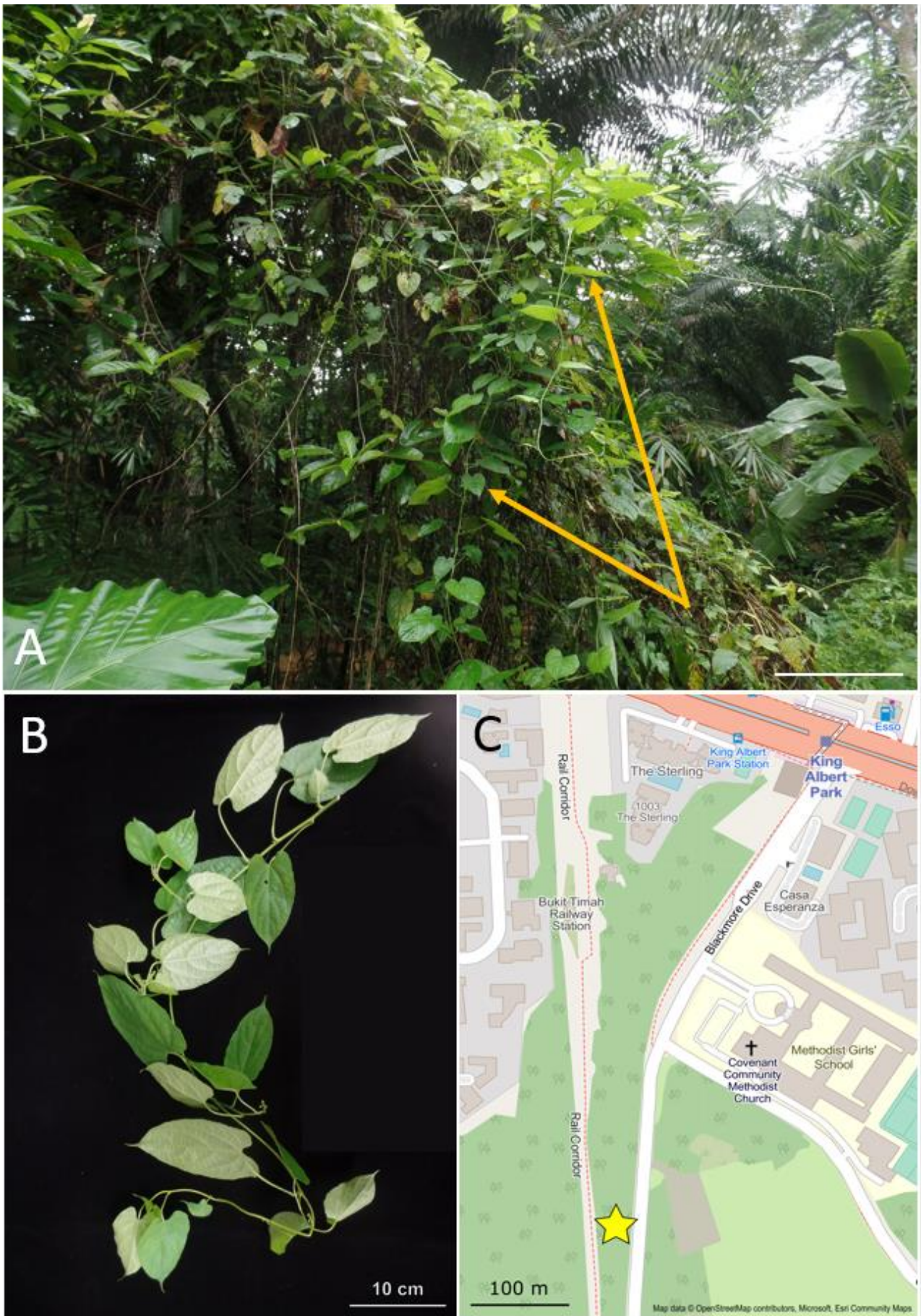


Fig 1. *Plukenetia corniculata* Sm. A, plant in situ at the Rail Corridor, arrows pointing to the plant growing among other climbers; B, close-up of the plant showing both surfaces of the leaves and the soft, flexible stem; C, map of part of the Rail Corridor, with the star indicating the locality of the plant. Scale bars: A, 50 cm; B, 10 cm; C, 100 m. All from Choo L. M. SING2021-515 (SING). (Photographs by: Choo L. M.).

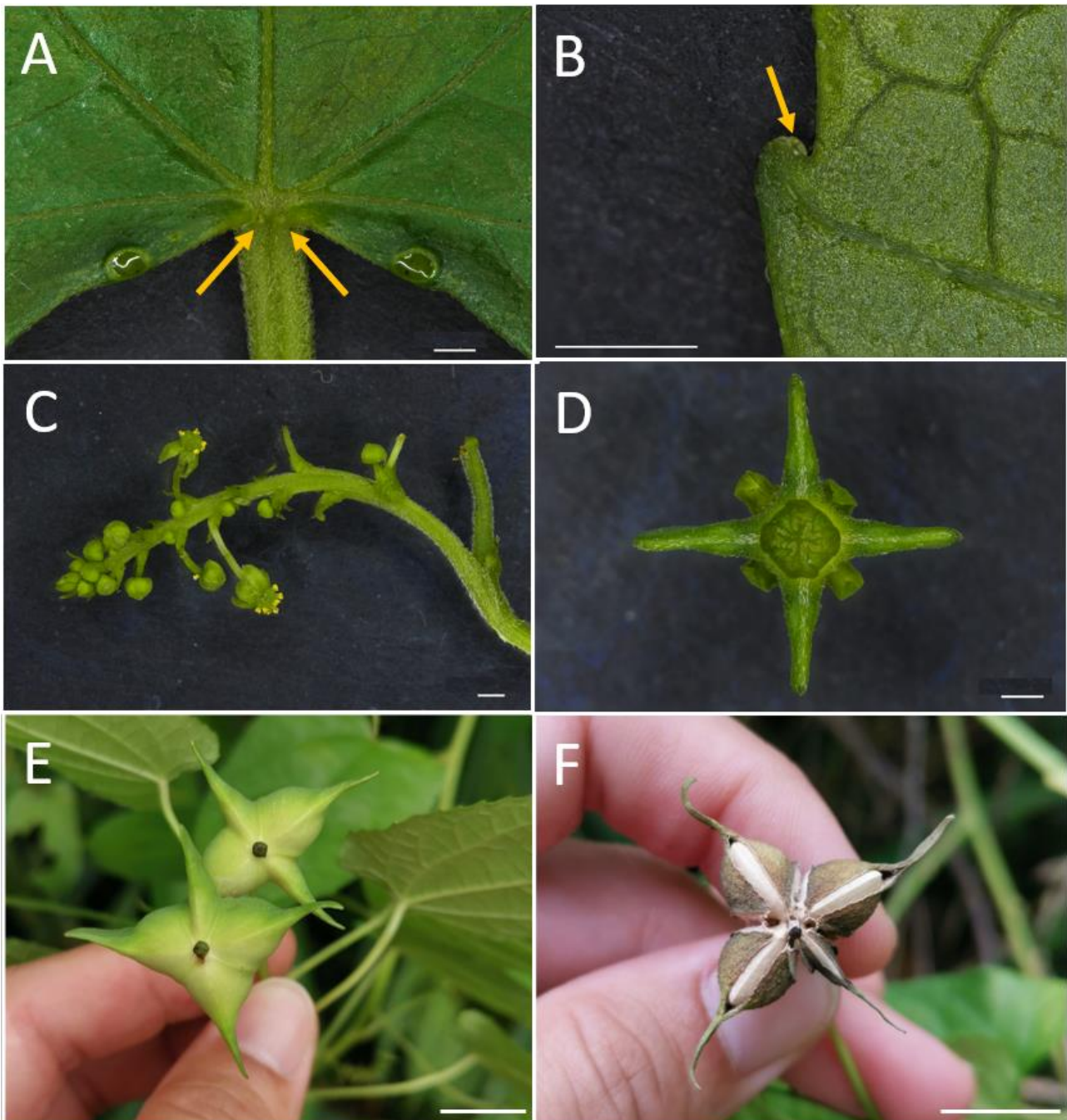


Fig. 2. *Plukenetia corniculata* Sm. A, basylaminar glands, arrows showing the stipels on the upper leaf surface; B, arrow indicating gland on leaf serration on the lower surface; C, male inflorescence; D, female flower showing the cross-shaped stigmatic surface; E, developing fruits; F, mature fruit just before dehiscing. Scale bars: A–D, 1 mm; E, F, 1 cm. A–D from Choo L. M. SING2021-515 (SING); E, F from Lua H. K. SING2020-655 (SING). (Photographs by: A–D, Choo L. M.; E, F, Lua H. K.).

**Specimens examined.** Chua Chu Kang, 1899, Ridley H. N. s.n. (SING [SING0011109]); Singapore Botanic Gardens, Lower Garden, 1899, Ridley H. N. 10724 (SING [SING0291019]); B. K. Sahib’s Garden, 13 December 1944, Furtado C. X. s.n. (SING [SING0291018]); Rail Corridor, 200 m away from Bukit Timah Railway Station, 7 July 2020, Lua H. K. SING2020-655; Rail Corridor, off Old Holland Road and Bukit Timah Road, 29 March 2021, Boo C. M. SING2021-112; Rail Corridor, 14 July 2021, Choo L. M., SING2021-515.

**Distribution.** Widespread but relatively uncommon, from South Asia to Southeast Asia and Malesia. The species has been recorded from India, Myanmar, Thailand, Malaysia, Singapore, Indonesia and the Philippines (Gillespie, 2007; Gillespie & Larsen, 2007).

**Ecology.** *Plukenetia corniculata* is a slender, twining climber that is found on open ground, along trails and in disturbed areas of lowland rainforests to an altitude of 500 m (Turner, 1997 [“1995”]; Gillespie, 2007; Gillespie & Larsen, 2007).

**Vernacular names.** In Malaysia, the species is referred to as “chumbai”, “akar pina-pina” or “pepina” (Ridley, 1924; Whitmore, 1973; van den Bergh, 1993).

**Provisional conservation assessment for Singapore.** Critically Endangered (CE). The species is currently only known from one locality in Singapore, with the population consisting of a few adult plants and several young climbers occupying an area of approximately 8 by 3 metres.

**Proposed conservation measures.** The species is being propagated by stem cuttings and seeds at the Native Plant Centre of the National Parks Board, Singapore, and will be reintroduced to suitable habitats around Singapore.

**Uses.** The species is known to be cultivated in Sarawak and Sumatra (Gillespie, 2007). The leaves, young shoots and young fruits are eaten as vegetables and the mature seeds can be eaten as nuts (Ridley, 1924; Burkill, 1953; van den Bergh, 1993; Gillespie, 2007).

## ACKNOWLEDGEMENTS

The authors would like to thank Warren Cardinal-McTeague from Agriculture and Agri-Food Canada, and the Canadian Museum of Nature for confirming the identity of the species. Paul Leong and Paul Parusuraman Athen are thanked for their assistance in locating the specimens. The authors are grateful to David Middleton for providing a copy of the species treatment in the Flora of Thailand, and to Stuart Lindsay for help with the literature relating to the species. The authors would also like to thank Associate Editor Louise Neo and an anonymous reviewer for their constructive comments.

## LITERATURE CITED

- Burkill IH (1953) Vegetables eaten with rice. *Gardens' Bulletin Singapore*, 14: 17–29.
- Cardinal-McTeague WM & Gillespie LJ (2020) A revised sectional classification of *Plukenetia* L. (Euphorbiaceae, Acalyphoideae) with four new species from South America. *Systematic Botany*, 45: 507–536.
- Cardinal-McTeague WM, Wurdack KJ, Sigel EM & Gillespie LJ (2019) Seed size evolution and biogeography of *Plukenetia* (Euphorbiaceae), a pantropical genus with traditionally cultivated oilseed species. *BMC Evolutionary Biology*, 19: 29.
- Chong KY, Tan HTW & Corlett RT (2009) A Checklist of the Total Vascular Plant Flora of Singapore: Native, Naturalised and Cultivated Species. Raffles Museum of Biodiversity Research, National University of Singapore, Singapore, 273 pp.
- Gillespie LJ (2007) A revision of paleotropical *Plukenetia* (Euphorbiaceae) including two new species from Madagascar. *Systematic Botany*, 32: 780–802.
- Gillespie LJ & Larsen SS (2007) *Plukenetia*. *Flora of Thailand*, 8: 509–512.
- Keng H (1980) Annotated list of seed plants in Singapore (VI). *Gardens' Bulletin Singapore*, 33: 329–367.
- Ridley HN (1924) *Pterococcus* Hassk. *Flora of the Malay Peninsula*, 3: 308–309.
- Tan HTW, Tan KX, Ali I, Chew PT, Chua KS, Duistermaat H, Ganesan SK, Goh MWK, Gwee AT, Kiew R, Lee SML, Leong PKF, Lim J, Lok AFSL, Loo AHB, Lum SKY, Morgany T, Saifuddin S, Sim S, Samsuri A, Wee YC, Yap KF, Yeo CK & Yong JWH (2008) Checklists of threatened species—seed plants. In: Davison GWH, Ng PKL & Ho HC (eds.) *The Singapore Red Data Book: Threatened Plants & Animals of Singapore*. 2nd Edition. Nature Society (Singapore), Singapore, pp. 213–245.
- Turland NJ, Wiersema JH, Barrie FR, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Kusber WH, Li DZ, Marhold K, May TW, McNeill J, Monro AM, Prado J, Price MJ & Smith GF (eds.) (2018) International Code of Nomenclature for Algae, Fungi, and Plants (Shenzhen Code) Adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. *Regnum Vegetabile* 159. Koeltz Botanical Books, Glashütten, 254 pp. <https://doi.org/10.12705/Code.2018> (Accessed 15 November 2021).
- Turner IM (1997 [“1995”]) A Catalogue of the Vascular Plants of Malaya. *Gardens' Bulletin Singapore*, 47: 37–346.
- van den Bergh MH (1993) *Pterococcus corniculatus* (Smith) Pax & Hoffm. In: Siemonsma JS & Piluek K (eds.) *Plant Resources of South-East Asia*. No. 8: Vegetables. PROSEA Foundation, Bogor, Indonesia. <https://prota4u.org/prosea/view.aspx?id=2300> (Accessed 20 July 2021).
- Whitmore TC (1973) *Pterococcus* Hassk. *Tree Flora of Malaya*, 2: 126.