Marsdenia maingayi (Apocynaceae: Asclepiadoideae), a rare rainforest woody climber rediscovered in Singapore

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ABSTRACT. *Marsdenia maingayi*, a rare rainforest climber previously thought to be extinct in Singapore, was rediscovered in the vicinity of MacRitchie Reservoir, Central Catchment Nature Reserve in July 2012. This is the second sighting of the taxon in Singapore since it was first collected in Changi in 1885—more than 120 years later. Based on this recent discovery, additional observations on the taxon are provided here and the conservation status of this species is revised to Critically Endangered for Singapore. *Marsdenia maingayi* is lectotypified here.

Keywords. Apocynaceae, Asclepiadoideae, Central Catchment Nature Reserve, extinct, lectotypification, MacRitchie Reservoir Park, *Marsdenia maingayi*, rediscovery, *Stephanotis maingayi*

Introduction

Marsdenia R.Br. (Apocynaceae, Asclepiadoideae) is a genus consisting of about 200 species of twining woody climbers and subshrubs distributed worldwide in the warm tropical and subtropical regions (Mabberley 2008). Robert Brown dedicated the genus to the First Secretary of the British Admiralty, William Marsden (1754–1836), who was an authority on Sumatran history and an avid promoter of botany (Brown 1810). *Marsdenia maingayi* (Hook.f.) P.I.Forst. is an elusive rainforest woody climber endemic to the Malay Peninsula (Peninsular Malaysia and Singapore). It has only been recorded five times (four records from Peninsular Malaysia, and once from Singapore) based on a survey of herbarium materials available in the Herbarium of the

Royal Botanic Gardens, Kew (K), Forest Research Institute Malaysia, Kepong (KEP), and Singapore Botanic Gardens (SING) (herbarium acronym follows Thiers 2013). The species was initially described as *Stephanotis maingayi* Hook.f. (Hooker 1885), based on a collection from Melaka made by Maingay on 23 June 1865 or 1866. Forster (1995a) later recombined it as *Marsdenia maingayi* after conclusive findings based on morphological characters revealed that *Stephanotis* Thouars and *Marsdenia* were taxonomically congeneric (Forster 1995b).

The first collection of the species in Singapore was made by Hullett from Changi in 1885 (Gamble 1908; Ridley 1923). Ridley (1923), however, could not find any living material in Singapore or Peninsular Malaysia and remarked that the species could have gone extinct. As the species was not sighted in Singapore in the more than a century since Hullett's discovery this prompted Tan et al. (2008) and Chong et al. (2009) to list the taxon as Presumed Nationally Extinct in Singapore. However, in 2012 we rediscovered this flowering climber in the vicinity of MacRitchie Reservoir Park and report it here. The conservation status for the species in Singapore is revised, based on Davison (2008).

The IUCN conservation status of *Marsdenia maingayi* is also assessed throughout its range using GeoCAT (Bachman et al. 2011), an IUCN Red List (IUCN 2001) compliant software that generates the IUCN threat categories based on (i) extent of occurrence (EOO), and (ii) area of occurrence (AOO). Data used for the assessment here are based on herbarium records that are represented in three herbaria, i.e., K, KEP and SING.

The discovery at MacRitchie Reservoir Park

The *Marsdenia maingayi* specimen discovered in the vicinity of MacRitchie Reservoir is a vigorous woody climber found just beside a jogging trail, along the forest margin (Fig. 1). The climber was undetected initially, even though the first author made regular visits to the park, as it was growing high up in the tree canopy at about 8–10 m above ground. However, a recent tree fall at the spot eventually brought parts of the climber down, closer to the ground. Subsequently, the climber flowered, and was spotted by the first author in July 2012, who collected a small flowering specimen and forwarded it to SING for identification. The newly collected material was eventually found to match the Hullett collection from Changi. Furthermore, it also matched the type specimens (*Maingay 1731 / Kew Distrib. No. 1112*) in the Herbarium of the Royal Botanic Gardens, Kew (K). Upon ascertaining the identity and rarity of this plant, a second visit to the site was made in August 2012 to properly document, observe and make a herbarium collection of the specimen to be deposited at SING, along with duplicate material of this rare species.

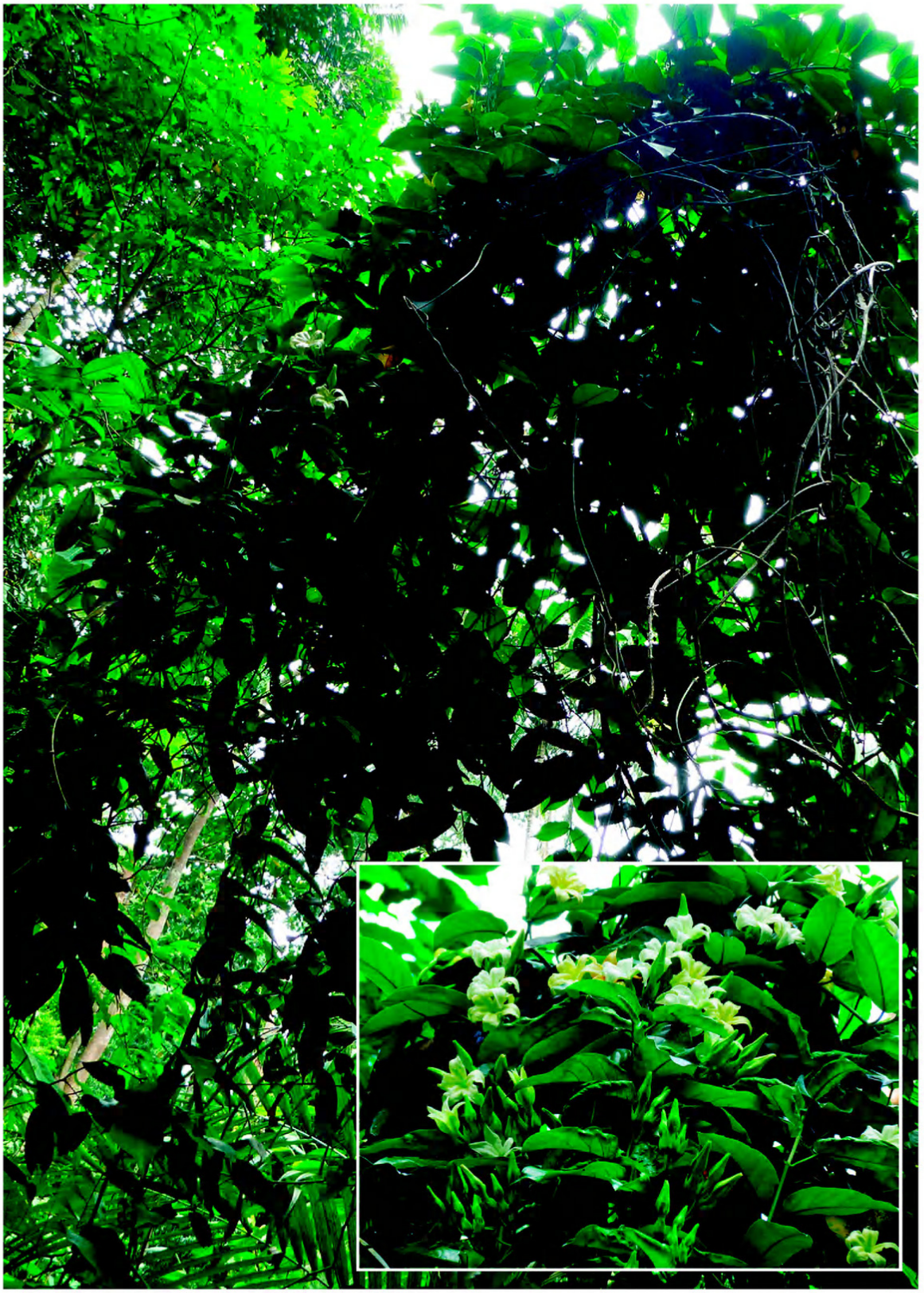

Fig.1. The vigorous MacRitchie specimen of *Marsdenia maingayi* growing along the forest margin, beside a jogging track (Photo: C.K. Yeo). *Inset:* Gregarious flowering observed in July 2012. (Photo: Y.S. Yeoh)

Taxonomy

Marsdenia maingayi (Hook.f.) P.I.Forst., Austral. Syst. Bot. 8(5): 700 (1995). — *Stephanotis maingayi* Hook.f., Fl. Brit. India 4: 39 (1885); Gamble, J. Asiat. Soc. Bengal 74(2): 550 (1908); Ridley, Fl. Mal. Pen. 2: 389 (1923). TYPE: *Maingay 1731,* Peninsular Malaysia, Melaka, 23 Jun 1865-1866 *(Kew Distrib. No. 1112)* (lecto K! barcode K000821736, designated here; isolecto K! barcode K000821737). Fig. 2.

Robust twining woody climber, exudate clear. Indumentum of pale yellow-brown erect unicellular eglandular trichomes on most parts. ***Stems*** woody, twining, cylindrical, 2–4(–5) mm wide, sparsely pubescent when young, usually glabrous on older parts, older parts lenticellate; internodes (9.2–)10–15.5(–18.5) cm long. Petiole (1.8–)2–2.5(–3) cm long, 1–1.5 mm wide, sparsely pubescent. ***Leaf lamina*** elliptic to ovate, (8–)9.5–11(–15) cm long, (4.6–)5.5–5.8(–9.5) cm wide, chartaceous; colleters on adaxial surface of the lamina base up to 9, conical, pale to dark brown; lamina base cordate; apex acute to acuminate; venation pinnate, midrib flat to sunken and minutely puberulent on upper surface, prominent and puberulent on lower surface; secondary veins 6–9(–11) pairs, flat and subglabrous on upper surface, prominent and sparsely puberulent on lower surface; tertiary venation reticulate. ***Inflorescence*** extra-axillary, racemiform, 2.5–6 cm long; peduncles 2.5–5 cm long, 1.7–2 mm wide, sparsely pubescent; bracts narrowly lanceolate, 5–8 mm long, outside sparsely pubescent, inside glabrous. ***Flowers*** 2–5 per inflorescence, 7.5–9 cm long, 7–8 cm wide; pedicels 2–3.5 cm long, 1–1.8 mm wide, sparsely pubescent. Sepals lanceolate, 1.4–2.4 cm long, 2–3 mm wide at base, 5–10 mm at the widest portion narrowing towards the apex; outside sparsely pubescent, inside glabrous. ***Corolla*** salver-shaped with right-contorted lobes, white turning pale yellow, then yellow-orange; tube 1.8–2.7 cm long, 4–5.5 mm wide at the mid portion, 4–7 mm wide at throat, outside sparsely pubescent, inside glabrous on most of the upper parts except for narrow V-shaped patches of retrose trichomes around the base of the staminal column; lobes 5, lanceolate, 2–3.2 cm long, 7–11 mm wide, outside sparsely pubescent, inside glabrous. ***Staminal corona*** 8–9 mm long, up to 5 mm wide, tips overtopping style-head. ***Staminal column*** up to 12 mm long, up to 5 mm wide; anther appendages with an irregularly hyaline-membranous apex surrounding the style-head, ovate, 4–5 mm long, up to 2 mm wide; alar fissure c. 4 mm long. ***Style-head*** umbonate, c. 4 mm long, c. 2 mm wide. ***Pollinarium*** c. 1.2 mm long, c. 1.5 mm wide; pollinium ellipsoid, c. 1 mm long, c. 0.3 mm wide; corpusculum ovate, c. 0.8 mm long, c. 0.7 mm wide; caudicles c. 0.3 mm long, c. 0.1 mm wide. ***Fruit*** a single follicle, cylindrical-oblong, c. 24.6 cm long, c. 4 cm wide; seeds many, ovate, 1.3–1.5 cm long, 0.7–0.9 cm wide, comose at germinating end, coma c. 8 cm long, golden brown.

Distribution. Endemic to the Malay Peninsula (Peninsular Malaysia and Singapore) (Fig. 3).

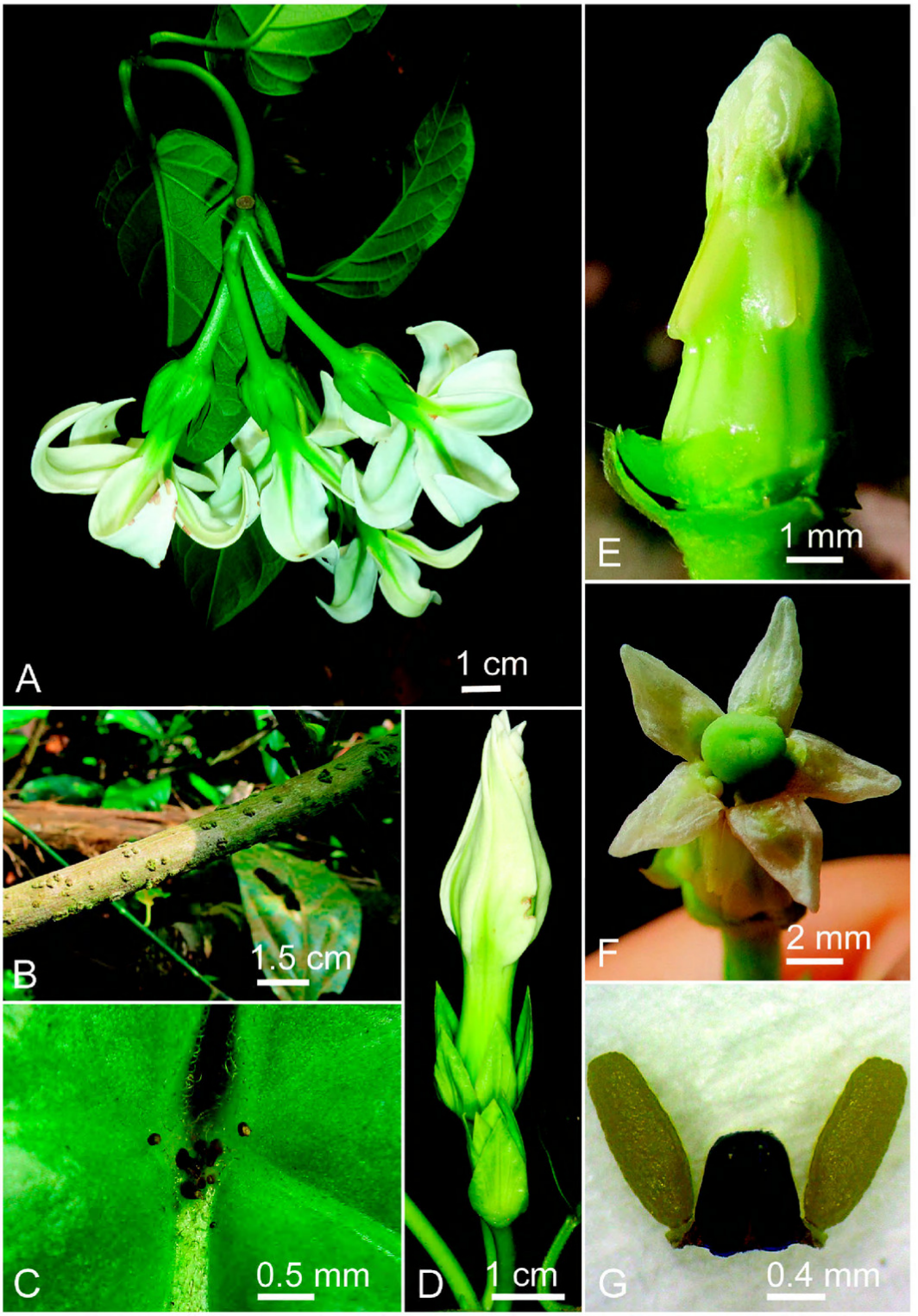

Fig. 2. *Marsdenia maingayi* (Hook.f.) P.I. Forst. **A.** The showy pendulous inflorescence with salver shaped flowers. **B.** Lenticellate bark observed on older woody stems. **C.** Close-up of dark coloured colleters at the base of lamina on adaxial surface. **D.** Flower bud with right contorted corolla lobes. **E.** Close-up of staminal column. **F.** Hyaline-membranous anther appendages artificially forced open to expose the pale green umbonate stigma. **G.** Close-up of a pollinarium showing dark-coloured corpusculum with two pollinia attached. (Photos: A, C.K. Yeo; B–C & E–F, Y.S. Yeoh; D, W.F. Ang; G, Y.W. Low)

Habitat and ecology. Forest margin and open forest gaps of disturbed lowland forests, to 230 m elevation.

Proposed conservation status. Marsdenia maingayi is proposed here for Singapore as Critically Endangered (CR), as the MacRitchie specimen is the only mature individual known to exist in the wild. This matches the status proposed in Davison (2008). This is largely due to habitat loss attributed to Singapore's economic transformation and development since colonial times.

Over its entire distribution the IUCN conservation status for *Marsdenia maingayi* is assessed using GeoCAT as Endangered EN B2ab(iii,iv) (IUCN 2001). The B2 designation is given because the Area of Occurrence (AOO) is estimated to be less than 500 km^2 (about 24 km^2 for *Marsdenia maingayi*); the 'a' designation because it is known to exist at no more than five locations (Singapore: MacRitchie Reservoir; Peninsular Malaysia: Kuala Aring Forest Reserve (Kelantan), Jengka (Pahang), and Gunung Panti Forest Reserve (Johor)); and the b(iii, iv) category indicates that there is a continuing decline in area and quality of habitat, and number of locations. Habitat loss is a major concern for the species as Peninsular Malaysia and Singapore continue to undergo modernisation. However, these proposed statuses for the species would require reassessment periodically as more efforts are underway in the region to systematically document the flora of Singapore, as well as the flora of Peninsular Malaysia.

Additional notes. Two sheets of the type material, *Maingay 1731 (Kew Distrib. No.: 1112)* were present at Kew. As these were not clearly indicated in Forster (1995a), we would here like to designate the sheet identified by barcode K000821736 as the lectotype, while the other sheet (K000821737) is an isolectotype. At MacRitchie, the flowers of *Marsdenia maingayi* were observed to be visited by lepidopterans, *Quedara monteithi monteithi* (Wood-Mason & de Nicéville 1887), a dark-coloured skipper. A dark-coloured liquid, possibly nectar (Fig. 4), was also observed to be present. The nature of the dark-coloured liquid was not investigated, but was suspected to be produced by the plant as it was sweet to taste. Furthermore, coloured nectar has been recorded for other members of the Asclepiadoideae (*Hoya* R.Br. species) (Hansen et al. 2007). The plant failed to produce mature fruits after the end of the flowering period based on observations carried out by the first author on subsequent visits over a period of six months. *Ex situ* conservation attention for the species has been initiated at the National Parks Board's Pasir Panjang Nursery as this is the only known living specimen to exist in Singapore. As this species certainly has much ornamental value, given its large showy and mildly fragrant flowers that change from white to yellow-orange as they mature, it could be introduced to streetscapes in the near future. Special effort is also needed to protect and preserve this living specimen on site, in the vicinity of MacRitchie Reservoir, as a long term *in situ* conservation effort.

Additional specimens examined: PENINSULAR MALAYSIA. **Kelantan.** Kuala Aring Forest Reserve, 1992, *Kiew KBH26* (KEP; SING! barcode no. SING0015422); **Pahang.** Jengka,

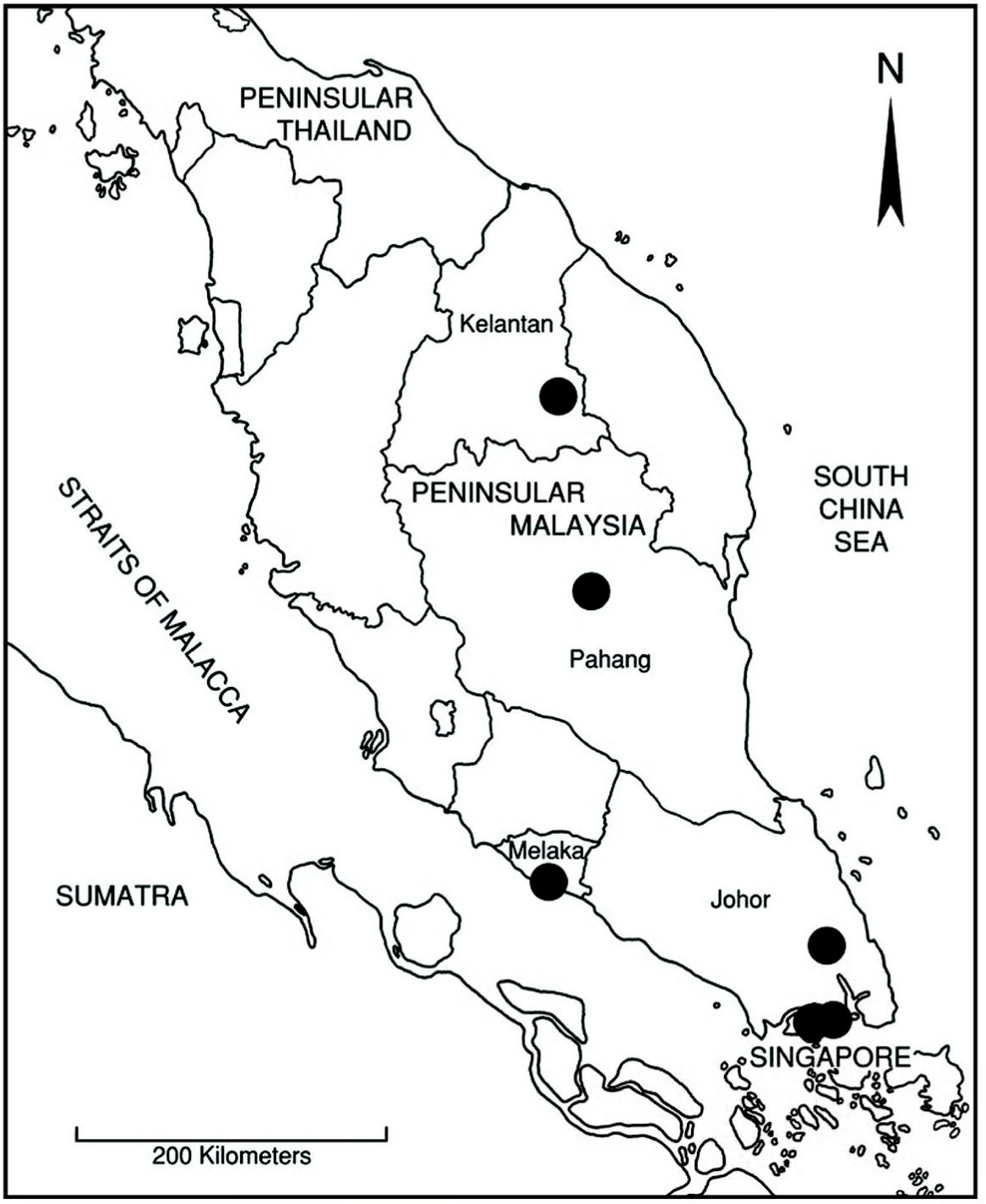

Fig. 3. Distribution of *Marsdenia maingayi* in the Malay Peninsula, indicated by black dots.

18 May 1983, *Ng FRI27408* (SING! barcode no. SING0122332); **Johor.** Gunung Panti, 22 May 1966, *Heaslett s.n.* (SING! barcode no. SING0122331). SINGAPORE. Changi, July 1885, *Hullett 147* (SING! 2 sheets, barcode nos. SING0003975 & SING0003974); Central Catchment Nature Reserve, MacRitchie Reservoir Park, 27 Aug 2012, *Low et al. LYW523* (K! SING! barcode no. SING0166282)

Fig. 4. The dark brown skipper, *Quedara monteithi monteithi* (Wood-Mason & de Nicéville, 1887), was spotted visiting *Marsdenia maingayi* flowers. (Photo: W.F. Ang)

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