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Garcinia dumosa (Clusiaceae), a new record for Thailand, with associated lectotypifications

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ABSTRACT

Garcinia dumosa (Clusiaceae), previously known only from Peninsular Malaysia, is reported as a new record in tropical evergreen rain forest from Peninsular Thailand. A detailed morphological description, and notes including distribution, habitat, conservation status, as well as illustrations and a distribution map of the species, are presented. In addition, *G. dumosa* and its associated synonym, *G. tenuifolia*, are lectotypified.

KEYWORDS: dioecious shrub, *Garcinia tenuifolia*, lectotype, Peninsular Thailand, taxonomy.

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INTRODUCTION

Garcinia L. is one of the largest genera in Clusiaceae (Guttiferae) with 404 accepted species, and distributed throughout the tropics and subtropics (POWO, 2022) with centres of diversity in South-East Asia and Madagascar (Sweeney & Rogers, 2008). In Asia, *Garcinia* is most diverse in the Malesian region but also spreads north into southern China, west to India and east to the Micronesian islands (Nazre *et al.*, 2018). Previous studies on *Garcinia* reported that the Malay Peninsula had ca 60 species (King, 1890; Ridley, 1922; Kochummen & Whitmore, 1973; Whitmore 1973). Species of *Garcinia* are usually small to large trees, but can occasionally be shrubs, e.g., *G. nuntasaenii* Ngerns. & Suddee found in Thailand and Laos (Ngernsaengsaruay & Suddee, 2016; Tagane *et al.*, 2018), *G. urophylla* Scort. ex King (shrub or small tree) in Peninsular Malaysia and Sumatra, and *G. dumosa* King in Peninsular Malaysia (King, 1890; Ridley, 1922; Kochummen & Whitmore, 1973; Whitmore, 1973; POWO, 2022). The genus is characterized by their dioecious habit (sometimes apparently plant polygamo-dioecious), yellow, pale yellow, white, cream or clear latex secreting from cut boles, twigs and also leaves and fruits; decussate leaves with scattered black or brown gland dots, or interrupted wavy lines of differing lengths; 4- or 5-merous flowers; many to numerous stamens, always united in a bundle at the centre of the flowers: 4 or 5 bundles, distinctly or weakly 4-lobed, 4-angled, a column or a ring; fruits berries, and seeds usually with thick or thin sarcotesta.

A taxonomic revision of the genus *Garcinia* has recently been undertaken by the first author for the Flora of Thailand. During field work at Kamphuan Forest Protection Unit, Khlong Nakha Wildlife Sanctuary, Kamphuan Subdistrict, Suk Samran District, Ranong Province, we collected specimens of a species of *Garcinia* with male and female flowers in tropical evergreen rain forest, ca 100 m alt. in October 2019, and those with fruits in same locality in February 2020 and in July 2020. In addition, the first author found herbarium specimens of same species collected from Ranong, Phatthalung, Songkhla and Narathiwat Provinces. These specimens match the type and description of *G. dumosa*, previously only known from Peninsular Malaysia. Therefore,

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it is reported here as a new record from Thailand, with a description and illustrations, together with information on distribution, a full list of specimens examined, habitat, IUCN conservation status, phenology and the vernacular name.

In addition, the authors found that the names *Garcinia dumosa* and *G. tenuifolia* Ridl. lacked proper typification, the latter a synonym of *G. dumosa* (Kochummen & Whitmore, 1973); these two names are lectotypified here following the ICN (Turland *et al.*, 2018).

MATERIALS AND METHODS

The collected specimens were examined by consulting taxonomic literature, and by comparing with herbarium specimens deposited in the following herbaria AAU, BK, BKF, BM, C, K, P, PSU, QBG, SING, and those included in the digital herbarium databases of AAU (https://www.aubot.dk/search_form.php), BM (https://www.nhm.ac.uk/our-science/collections/botany-collections.html), CAL (https://archive.bsi.gov.in/phanerogams), E (https://data.rbge.org.uk/search/herbarium/), K (http://www.kew.org/herbcat), JSTOR (https://plants.jstor.org/), L, U, WAG (https://bioportal.naturalis.nl/) and P (https://science.mnhn.fr/institution/mnhn/collection/p/item/search) were also examined. The morphological characters, distribution, habitat and phenology are described from our field observations and from label information from the specimens examined. The assessment of conservation status was performed following the IUCN Red List Categories and Criteria (IUCN Standards and Petitions Committee, 2019) by calculating the Area of Occupancy (AOO) and Extent of Occurrence (EOO) with the GeoCAT (Bachman *et al.*, 2011).

TAXONOMIC TREATMENT

Garcinia dumosa King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 59(2): 167. 1890; Vesque in A.DC. & C.DC., Monogr. Phan. 8: 465. 1893; Ridl., Fl. Malay Penins. 1: 178. 1922, reprint 1967; Kochummen & Whitmore, Gard. Bull. Singapore 26(2): 274. 1973; Whitmore in Whitmore, Tree Fl. Malaya 2: 210. 1973; I.M.Turner, Gard. Bull. Singapore 47(1): 261. 1995. Type: Peninsular Malaysia, Perak, Batu Puteh (originally "Batu Iogoh, 200 ft alt." on the label), flowers very pale yellowish green, June 1885, *Wray 2162* (lectotype designated here **CAL** [CAL0000005840, photo seen], isolectotypes **BM** [BM000611761!], **K** [K000677669!]).

— *Garcinia tenuifolia* Ridl., Bull. Misc. Inform. Kew 1928(2): 72. 1928; Kochummen & Whitmore, Gard. Bull. Singapore 26(2): 274. 1973. Type: Peninsular Malaysia, State of Pahang, "Pulau Tioman, Ayer Besar, 800 ft elevation", shrub 1.8–2.4 m tall; flowers pale yellow, 30 Apr. 1927, *Nur 18760* (lectotype designated here **K** [K000677671!], isolectotypes **L** [L2417881, L2417882, photos seen], **SING** [SING0067970!]). Figs. 1–4.

Shrubs 0.5–1.5 m tall; latex pale yellow, sticky; branches decussate; branchlets 4-angular. *Bark* smooth, green when young, turning dark brown when mature, usually lenticellate; inner bark pale yellow. *Terminal bud* concealed between the bases of the uppermost pair of petioles. *Leaves* opposite, decussate; lamina oblong-elliptic, elliptic or oblanceolate, 6–12.7 × 2–4.2 cm, apex caudate, sometimes acuminate, base cuneate, margin undulate, thinly coriaceous, bullate, shiny dark green above, paler below, glabrous on both surfaces, with scattered black gland dots below, midrib and secondary veins distinctly grooved above and raised below, visible on both surfaces, secondary veins 5–9 pairs, curving towards the margin connected in distinct loops and united into an intramarginal vein, with intersecondary veins, veinlets reticulate, visible on both surfaces; petiole 0.5–1 cm long, 0.8–1.2 mm in diam., grooved above, twisted, transversely rugose, glabrous, with a small basal appendage clasping the branch; young leaves pale green. *Inflorescences* axillary, sometimes on branches at leafless nodes (in axils of fallen leaves). *Flowers* unisexual, plants dioecious, 4-merous; sepals and petals decussate; sepals green in young flower buds, turning pale yellowish green, pale yellow or creamy white, concave, membranous, the outer pair smaller and thicker than the inner pair; petals pale yellow or creamy white, concave, fleshy, smaller than the inner pair sepals. *Male flowers* in fascicles of 2–7 flowers, 3–4.5 mm in diam.; bracts triangular, 0.3–0.5 × 0.3–0.8 mm, apex acute, caducous; pedicel pale yellowish green, pale yellow, creamy white or red, slender, 1.5–2.5 mm long, 0.2–0.4 mm in diam., glabrous; sepals 4, the outer pair ovate, 1.2–1.8 × 1–1.3 mm, apex obtuse, the inner pair semi-orbicular, 1.5–3 × 2–2.5 mm, apex rounded; petals 4, subequal, suborbicular, 2.5–3.2 × 2.5–3.2 mm, apex rounded;

stamens 7–10, united in a central short column, filaments very short, anthers yellow, reniform or suborbicular, 0.3–0.5 × ca 0.3 mm, transversely dehiscent; pistillode absent. *Female flowers* solitary or in fascicles of 2 flowers, 4–5 mm in diam.; bracts triangular, 0.4–0.7 × 0.5–1 mm, apex acute, caducous; pedicel pale green, thicker, 0.5–1 mm long, 0.7–1 mm in diam., glabrous; sepals 4, the outer pair broadly ovate, 1–1.5 × 1.2–1.7 mm, apex obtuse, the inner pair semi-orbicular, 2.2–3.2 × 2.5–3 mm, apex rounded; petals 4, subequal, suborbicular, 2.5–3.5 × 2.7–3.5 mm, apex rounded; staminodes 7–8, filaments 1–1.2 mm long; pistil mushroom-shaped, 2.4–2.8 mm long; ovary green, subglobose or broadly ellipsoid, 1.5–2 × 1.3–1.6 mm, 3-locular; stigma sessile, convex, ca 0.7 mm long, ca 1.5 mm in diam., radiate, shallowly 4–8-lobed, papillate. *Fruits* a berry, subglobose, 1–1.3 × 0.8–1 cm, green, smooth, glabrous, glossy, pericarp ca 0.6 mm thick; sepals persistent and becoming a little larger than at flowering; persistent stigma dark brown, flattened, suborbicular, 1.2–2 mm in diam., radiate, shallowly 4–8-lobed, papillate; fruiting stalk 1–2 mm long, 0.8–1.2 mm in diam. *Seeds* 3, bean-shaped, 7.5–8 × 3.5–4 mm, with thin sarcotesta.

Thailand.— PENINSULAR: Ranong [Khlong Nakha Wildlife Sanctuary, Kapoe District, in dense evergreen forest, shrub 1.5 m tall, with male flowers, 7 Sept. 1984 (misidentified as *Urophyllum*), *Fukuoka et al. T-35946* (**BKF**); Kamphuan Forest Protection Unit, Khlong Nakha Wildlife Sanctuary, Kamphuan Subdistrict, Suk Samran District, in tropical evergreen rain forest, ca 100 m alt., shrub, with male flowers, 3 Oct. 2019, *Ngernsaengsaruay et al. G06-03102019*, *G07-03102019*, *G08-03102019* (**BKF**, **QBG**); ibid., shrub, with female flowers, 3 Oct. 2019, *Ngernsaengsaruay et al. G09-03102019*, *G10-03102019* (**BKF**, **QBG**); ibid., shrub, with fruits, 11 Feb. 2020, *Ngernsaengsaruay et al. G11-11022020*, *G12-11022020*, *G13-11022020* (**BKF**, **QBG**); ibid., shrub, 0.8 and 1 m tall respectively, with fruits, 20 July 2020, *Ngernsaengsaruay et al. G14-20072020* (dry and spirit collections), *G15-20072020* (**BKF**, **QBG**)]; Phatthalung [Tamot Waterfall, Tamot District, margins of the disturbed evergreen forest near the river, 75 m alt., shrub, with male flowers, 5 Oct. 1986 (misidentified as *G. urophylla*), *Sirirugsa 1043* (**PSU**)]; Songkhla [Padang Besar, Thailand-Malaysia border, Sadao District, in evergreen forest, ca 200 m alt., shrub ca 0.5 m tall, with male flowers, 24 Dec. 1927, *Garcinia* sp., *Kerr 13621* (**C**, **K**); Khao Kaeo Range, Hat Yai District, in evergreen forest, shrub, with fruits, 13 Mar. 1928, *Garcinia* sp., *Kerr 14533* (**C**, **K**); Khao Kaeo (noted that Satun), in evergreen forest, shrub, 27 July 1928, *Garcinia* sp., *Kerr 15939* (**BM**); Khao Nam Khang, in evergreen rain forest, 180 m alt., undershrub, with male flowers, 28 Aug. 1995, *Garcinia* sp., *Larsen et al. 46099* (**AAU**)]; Narathiwat [Waeng District, in tropical rain forest, with flowers, 22 Nov. 1971 (misidentified as *Salacia*), *C.S.S. 256* (**BKF**)]. (Fig. 5).

Distribution.— Peninsular Malaysia (Kelantan, Perak, Pahang, Selangor, Johore).

Habitat.— Understorey in tropical evergreen rain forest, 50–200 m alt.

Phenology.— Flowering in April to December, fruiting in February to July.

Vernacular name.— Rong phum pak tai (รงพุ่มปักษ์ใต้) (suggested here).

IUCN Conservation status.— This species is distributed from Peninsular Malaysia to Thailand, and has Extent of Occurrence (EOO of 100,901.76 km^2) and Area of Occupancy (AOO of 44 km^2). In Thailand, this species is known only from the Peninsular Region in four provinces with all the collecting localities found within protected areas and has Extent of Occurrence (EOO of 16,843.29 km^2) and Area of Occupancy (AOO of 24 km^2). There does not appear to be any imminent threats to the plants or their habitats. We therefore consider the conservation assessment as Least Concern (LC).

Notes.— *Garcinia dumosa* belongs to section *Hebradendron* (Graham) Planch. & Triana, characterised by stamens united in one central column; anthers 1- or multithecous, dorsifixed; pollen porate, echinate; stigma generally completely divided into rays, verrucose; sepals and petals 4; and absence of a pistillode (Jones, 1980). It is related to *G. urophylla* and several vegetative and reproductive characters are overlap between species, but *G. dumosa* is distinguished by its typically larger leaves (6–12.7 × 2–4.2 cm); 5–9 pairs of secondary veins, these distinctly grooved above; and male flowers in fascicles of 2–7 flowers. In contrast, *G. urophylla* has typically smaller leaves (5.7–7.6 × 1.8–3 cm); 3–5 pairs of secondary veins, seldom sunken above; and male flowers solitary or paired (characters of *G. urophylla* were taken from King, 1890; Ridley, 1922; Whitmore, 1973).

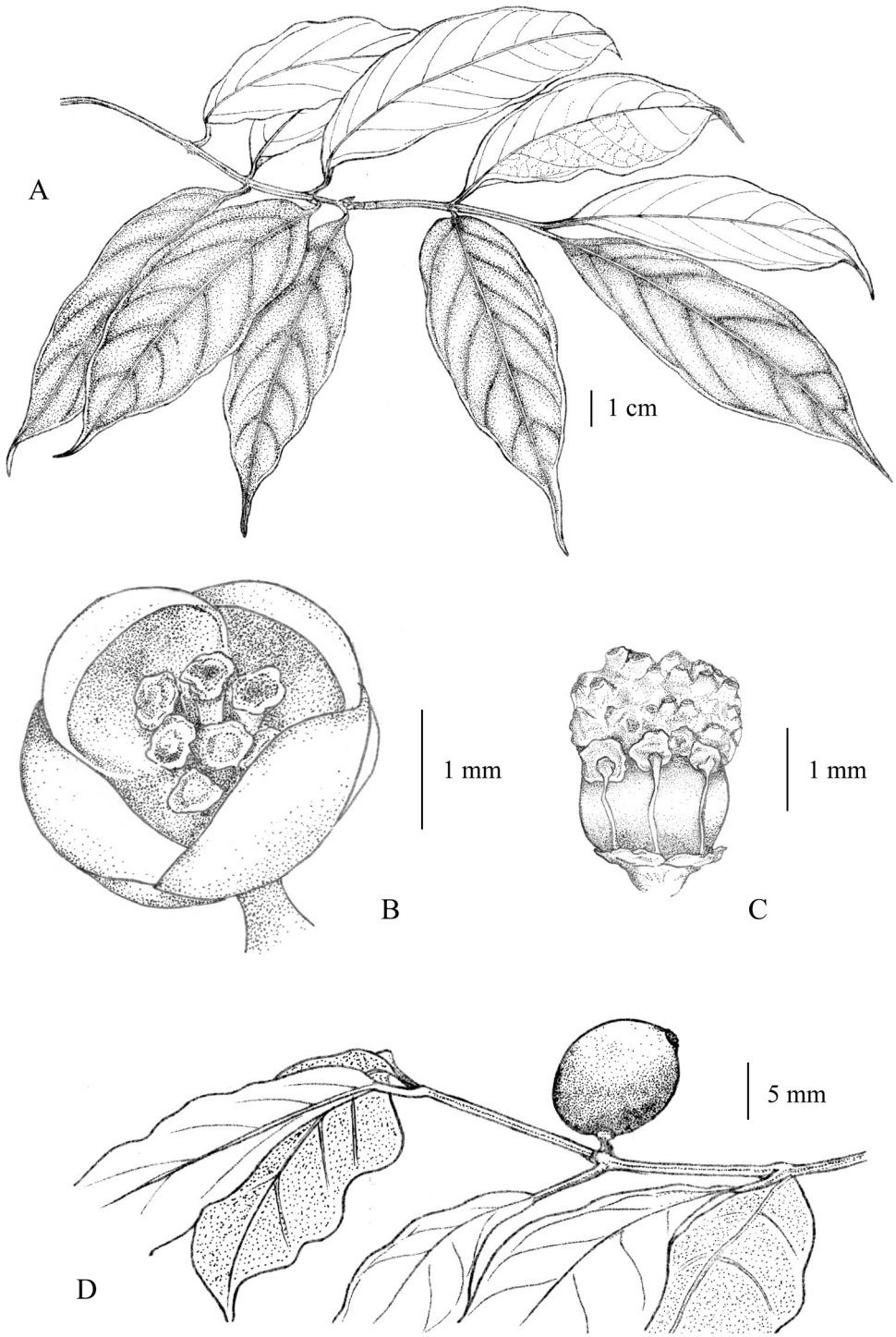

Figure 1. *Garcinia dumosa* King: A. branches and leaves; B. male flower; C. female flower showing pistil and staminodes (removed sepals and petals); D. fruiting branch with mature fruit. Materials from *Ngernsaengsaruay et al. G06-03102019*, *G09-03102019*, *G14-20072020*. Drawn by Paweena Wessapak.

Garcinia dumosa was named by King (1890: 167–168), who cited two gatherings, *Wray 2162* from Peninsular Malaysia, Perak, "Batu Iogoh" and *King's Collector 2531* from Peninsular Malaysia, "Lasu Perak", but did not mention the herbaria in which they were present, and according to Art. 9.6 of the ICN (Turland *et al.*, 2018) they constitute syntypes. We could locate the specimens *Wray 2162* at **CAL** [CAL0000005840, photo seen], **BM** [BM000611761!] and **K** [K000677669!] and *Kunstler 2551* at **CAL** [CAL0000005841, photo seen] and *K* [K000677670!, as *King's Collector 2851* on the label]. The material of the second collection is of Kunstler as many of his collections are labelled 'King's Collector' (van Steenis-Kruseman, 1950). The specimen number appears to be *2551*, so perhaps there has been a transcription error in the original protologue. TL2 states for King's material the 'main sets are at CAL and K' (Stafleu & Cowan, 1979). Therefore, the first collection is better preserved,

Figure 2. *Garcinia dumosa* King: A. habit; B. branches and leaves; C. flowering branch, inflorescences with male flower buds and open male flower; D. flowering branches: upper surface of leaves, inflorescences with male flower buds (on the left hand side); lower surface of leaves and female flower bud (on the right hand side); E. fruiting branch with mature fruit. Photos: Chatchai Ngernsaengsaruay (A–B, E) and Decha Duangnamon (C–D).

Figure 3. Lectotype of *Garcinia dumosa* King: *Wray 2162* (**CAL** [CAL0000005840]) from Peninsular Malaysia, Perak (© The Director, Botanical Survey of India, Kolkata).

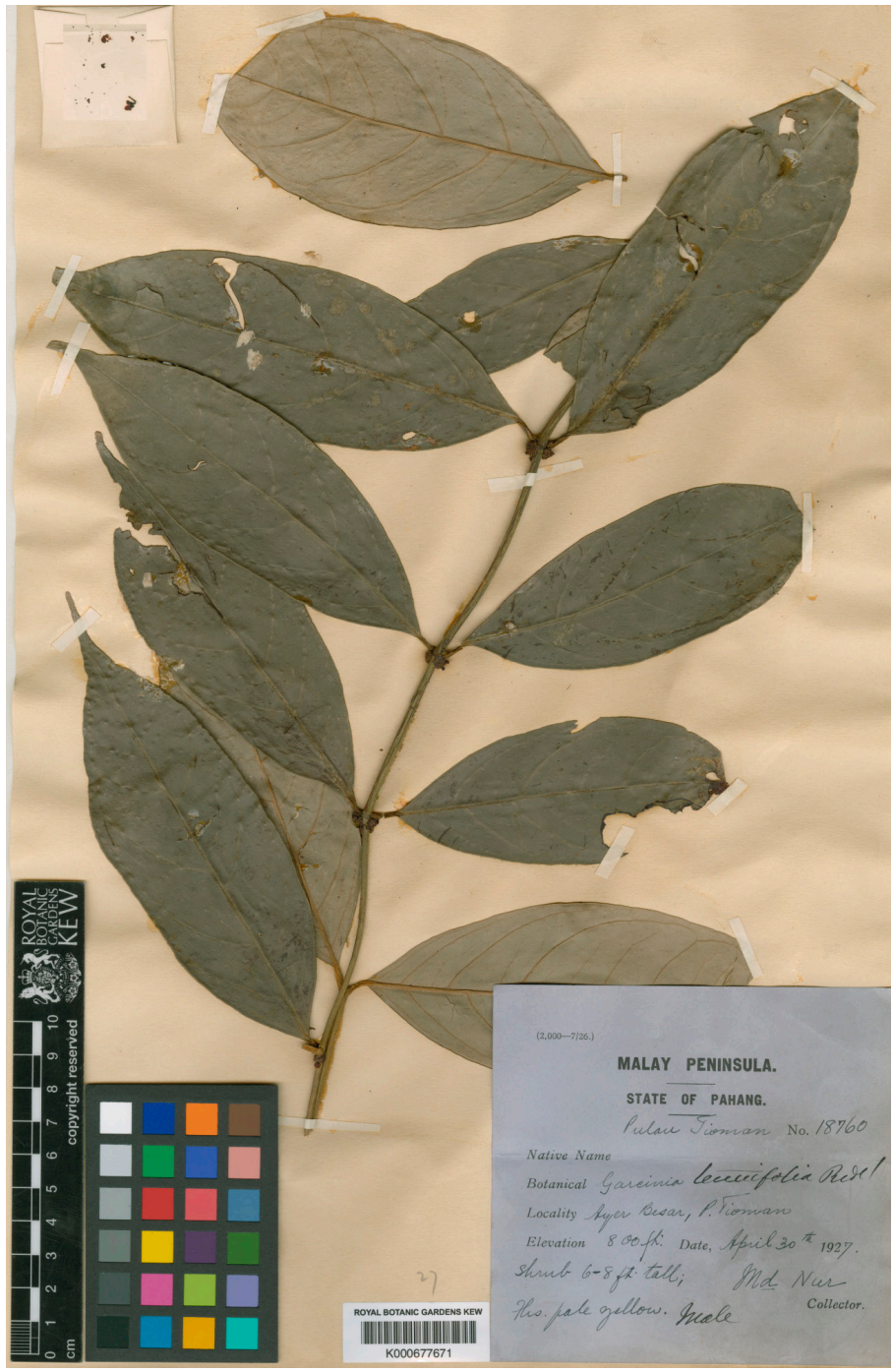

Figure 4. Lectotype of *Garcinia tenuifolia* Ridl.: *Nur 18760* (**K** [K000677671]) from Peninsular Malaysia, State of Pahang (http://specimens.kew.org/herbarium/K000677671).

and the **CAL** specimen is designated here as the lectotype in accordance to Art. 9.3 and 9.12 of the ICN (Turland *et al.*, 2018).

Garcinia tenuifolia was named by Ridley (1928: 72–73), cited two collections *Nur 18760* from Peninsular Malaysia, State of Pahang, "Pulau Tioman, Ayer Besar" and Henderson 18361 from Peninsular Malaysia, State of Johore, "Pulau Aor" but did not mention the herbaria in which they were present, and according to Art. 9.6 of the ICN (Turland *et al.*, 2018) they constitute syntypes. We located the specimens *Nur 18760* at **K** [K000677671!], **L** [L2417881, L2417882, photos seen] and **SING** [SING0067970!] and *Henderson 18361* at **K** [K000677672!, K000677673!] and **SING** [SING0067969!]). Ridley was a director of Botanic Gardens Singapore (1888–1912) then after his retirement from SING so he was based at K (Stafleu & Cowan, 1983). Therefore, the first collection, and the **K** specimen is designated here as the lectotype in accordance to Art. 9.3 and 9.12 of the ICN (Turland *et al.*, 2018).

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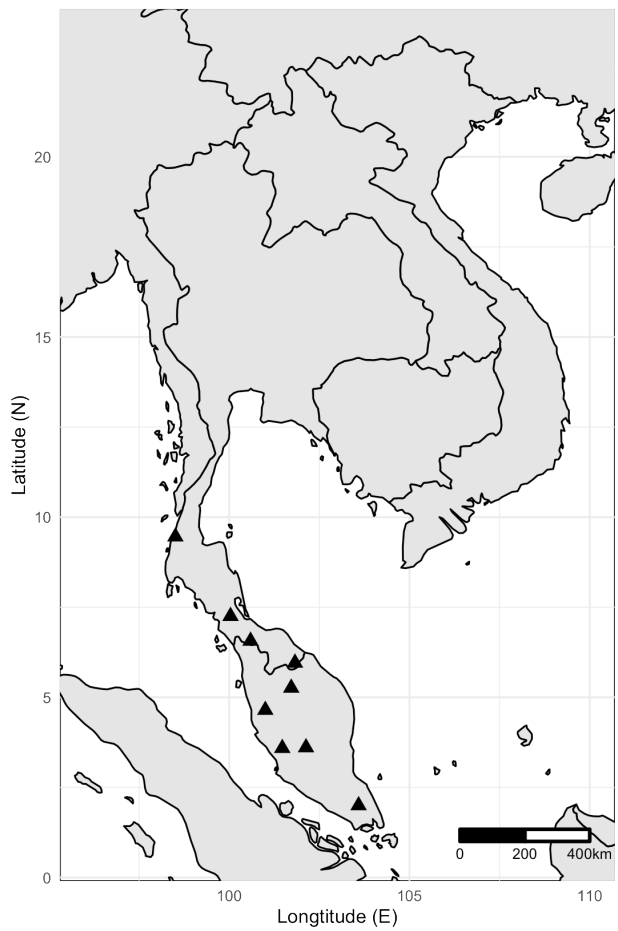

Figure 5. Distribution of *Garcinia dumosa* King.

Paweena Wessapak for the line drawings and Mr Nattanon Meeprom for making a distribution map of *Garcinia dumosa*. This work was financially supported by Basic Research Fund (BRF), Faculty of Science, Kasetsart University (2022), and The Carlsberg Foundation, Denmark (2018) managed by Prof. Dr Henrik Balslev.

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