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Research Article

Ardisia ledangensis (Primulaceae-Myrsinoideae), a new species from southern Peninsular Malaysia

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ABSTRACT

Ardisia ledangensis Julius & Utteridge, a new species from Gunung Ledang, Johor, in the southern part of Peninsular Malaysia, is formally described and illustrated. Its placement within subgenus (§) *Crispardisia* is justified by diagnostic characters such as vascularised glandular nodules along the leaf margin and a terminal inflorescence borne on a lateral shoot, accompanied by a normal foliage leaf (rather than a reduced, bract-like leaf). The species is distinctive among Peninsular Malaysian members of the subgenus by its slender, descending habit, narrowly elliptic leaves densely covered with black glandular-dots, and unbranched, strictly terminal inflorescences. *Ardisia ledangensis* is known only from a single locality within a protected area, and its conservation status is provisionally assessed as Least Concern (LC).

Keywords: Conservation status; Gunung Ledang; Johor; montane; subgenus *Crispardisia*; Ericales.

INTRODUCTION

Ardisia Sw. (Swartz, 1788: 48), with about 730 species distributed across the Americas, Asia, Australia, and the Pacific Islands, is one of the megadiverse and understudied understorey plant groups in the tropics (Frodin, 2004; POWO, 2025). Due to the rich biodiversity and incomplete botanical exploration across Southeast Asia, especially for many medium-sized to large genera, the ongoing discovery of new species and records is to be expected (Middleton et al., 2019). Since the last treatment in Stone's Tree Flora of Malaya (1989a), six new species have been described (Julius & Utteridge, 2012, 2021, 2022; Julius et al., 2017, 2023) from Peninsular Malaysia. In an annotated key to the genus, Stone (1989a) documented 74 species in the Tree Flora of Malaya, but full descriptions of most taxa were lacking because the majority of *Ardisia* species do not reach the size required to merit a full treatment.

Currently, the genus is classified into 17 subgenera, delineated by growth form, leaf characteristics, inflorescence position, and floral structures (see Mez, 1902; with additional subgenera published by Stone (1993), §*Scherantha*; Larsen & Hu (1995), §*Tetrardisia*; Yang & Hu (2022), §*Odontophylla*). Eleven of these subgenera are present in the Malesian region (see Stone (1982) for a discussion and key to the groups in Malesia; Larsen & Hu (1995) for §*Tetrardisia*; and Utteridge et al. (2023) for an updated discussion and key to the groups in Borneo). Whilst the definition of the genus is potentially problematic as it may need to be either expanded or restricted (see Larson et al., 2023), the subgenera, with re-evaluation of some species placements, are useful for classification and identification (Julius et al., 2021; Utteridge et al., 2023). All eleven Malesian subgenera are also present in Peninsular Malaysia, including §*Crispardisia*, to which the new species belongs. This subgenus is characterised by crenate or crenulate leaves with distinct dark or swollen nodulations, usually located in each marginal sinus or at the apex of the teeth, and rarely on the upper or lower surfaces near the leaf margin (e.g., *Ardisia caloneura* C.M.Hu & J.E.Vidal and *A. prolifera* C.M.Hu & J.E.Vidal from Laos). The inflorescences are terminal or lateral (axillary); when terminal, they are on a lateral branch, usually subtended by one to several leaves, rarely without leaves. Additionally, many species, including the taxon described here and other members of the subgenus in Peninsular Malaysia, are characterised by numerous leaves along the lateral branch, rarely 2–3 leaves, as observed in *A. recurvipetala* Julius, Siti-Munirah & Utteridge from Terengganu and *A. filipendula* C.M.Hu & J.E.Vidal from Laos.

Fieldwork conducted in the southern part of Johor in 2015 and 2022, aimed at obtaining new collections of Primulaceae for the family revision of the Flora of Peninsular Malaysia, led to the discovery of an unidentified taxon of *Ardisia* from Gunung Ledang. Fruiting material was collected during the 2015 fieldwork, while only sterile individuals were observed in the field during the 2022 survey. Examination of herbarium specimens of §*Crispardisia* at KEP, K, and SING revealed additional specimens of the same taxon, including flowering material housed at KEP. Access to both flowering and fruiting specimens enabled a detailed comparison with existing taxa and facilitated a formal description of the new species. Thus, *Ardisia ledangensis* Julius & Utteridge is formally described and illustrated here as a new endemic species to Peninsular Malaysia.

METHODOLOGY

Field observations of living specimens were undertaken by the first author in 2015 and again in 2022. These were complemented by a comparative examination of herbarium collections of other *Crispardisia* taxa housed at KEP, K, and SING. To support identification and description, key taxonomic references (e.g., Stone, 1982; Larsen & Hu, 1991; Chen & Pipoly, 1996; Hu & Vidal, 2004) were reviewed, and digital specimen images were consulted via JSTOR Global Plants (http://plants.jstor.org/), Plants of the World Online (POWO: http://www.plantsoftheworldonline.org/), and the Naturalis Biodiversity Center BioPortal (http://bioportal.naturalis.nl/). Herbarium acronyms follow Index Herbariorum (Thiers, 2024). Morphological assessments were made using both fresh and herbarium specimens, including rehydrated floral parts. Descriptive terms for shapes follow the conventions of the Systematics Association Committee (1962). Collections with flowers and fruits are denoted as 'fl.' and 'fr.', respectively, while the subgenus is marked as '§'. The conservation status was evaluated according to IUCN Red List criteria (IUCN 2012; IUCN Standards and Petitions Subcommittee, 2024).

RESULTS

Taxonomic treatment

Ardisia ledangensis Julius & Utteridge **sp. nov.** (§*Crispardisia*) (Figs. 1–2)

Diagnosis. Distinguished from other species in §*Crispardisia* by the slender, descending woody stem; subcoriaceous, narrowly elliptic leaves measuring 3–10.5 cm long with dense black glandular-dots on both surfaces; unbranched inflorescences borne strictly at the terminal of lateral branches; and glabrous floral parts (excluding pedicels) that are also marked with dense, black glandular-dots.

Type: — MALAYSIA. Peninsular Malaysia: Johor, Gunung Ledang, 2° 22' N, 102° 37' E, 1160 m elevation, lower montane, 18 October 1994 (fl.), *Mat Asri Ngah Sanah FRI 38678* (holotype KEP!).

Figure 1: *Ardisia ledangensis* sp. nov. **A.** Habit. **B.** The young leaves [Photos by Avelinah Julius].

Description. Shrub, 1.5–2.5 m tall, with slender stems descending, except erect in the new shoots, *c.* ≤ 1 cm in diam. *Indumentum* of simple, short, white hairs on the vegetative parts

when young. *Leaves* spirally arranged, petioles brown-red, (2–)4–10 mm long, slender, winged, sparsely hairy abaxially when young, glabrous when mature; lamina brownish red to dark green with pinkish margin when young, completely green except dark brown-red base when mature, subcoriaceous, narrowly elliptic, 3–10.5 × 0.6–2.5 cm, densely covered with prominent glandular-dots on both surfaces, base cuneate–attenuate, margins crenulate with 4–8 crenulations on each side with vascularised glandulars present on sinuses between crenatures, revolute, apex acute to acuminate, sometimes slightly caudate, with acumen 3–8 mm long, glabrous except in young leaves which are sparsely hairy beneath; midrib flat above, raised beneath; lateral veins distinct above, prominent below, 7–13 pairs, arching and joining towards margins to form intramarginal veins; intercostal veins obscure. *Inflorescences* subsessile, strictly terminal on lateral leafy branches, condensed, unbranched, racemose. *Flowers* 5–merous; pedicels 1.8–3 cm long, slender, glabrous; calyx lobes ovate, 1.8–2 × 1.2–1.5 mm, recurved downward in fruits, margins irregular, not ciliate, slightly overlapping at the base, glabrous but densely covered with black glandular-dots on both surfaces; corolla lobes lanceolate-ovate, *c*. 5 × 3 mm, margin hyaline, apex acute, glabrous but densely covered with black glandular-dots on both surfaces; stamens 5, subsessile, anthers lanceolate, *c*. 3 × 1 mm, connectives mucronate, thecae not locellate, dehiscent by longitudinal slits, densely covered with black glandular-dots abaxially; ovary subglobose, 1.3–1.5 × 1–1.3 mm, glabrous but covered with dense, black glandular-dots, ovules 2 arranged in 1-series, style 1.2–1.5 mm long with slender stigma. *Fruits* red (ripe), sub-globose, *c*. 1 × 1 cm, glabrous but rough, densely covered with black glandular-dots on the surface.

Phenology: — Based on the two available specimens, this species was observed in fruit in September, and in flower in October. The apparent sequence of fruiting prior to flowering may reflect incomplete sampling rather than the true phenological pattern. Additional collections will be necessary to clarify the flowering and fruiting chronology of this species

Habitat: — Lower montane forest on rocky soils. On Gunung Ledang, the plant was found near the summit, in a cool, humid, and shaded area.

Etymology: — *Ardisia ledangensis* is a highly localised species, currently only known from Gunung Ledang, which is the origin of its epithet.

Provisional conservation status: — Least Concern (LC). No threats have been identified for either the species or the habitat, i.e., there is no continuing decline in the extent of occurrence, area of occurrence, or habitat quality of this species. Additionally, Gunung Ledang is a National Park, a protected area. There is currently no information on the population size of this species as no species-specific surveys have been conducted in the area. Thus, the species is given a provisional assessment of Least Concern.

Additional specimen examined: — MALAYSIA. Peninsular Malaysia: Johor, Muar, Gunung Ledang FR, on the way to summit, 2° 22’ N, 102° 37’ E, 1234 m elevation, 9 September 2015 (fr.), *Julius et al. FRI 64039* (K; KEP!).

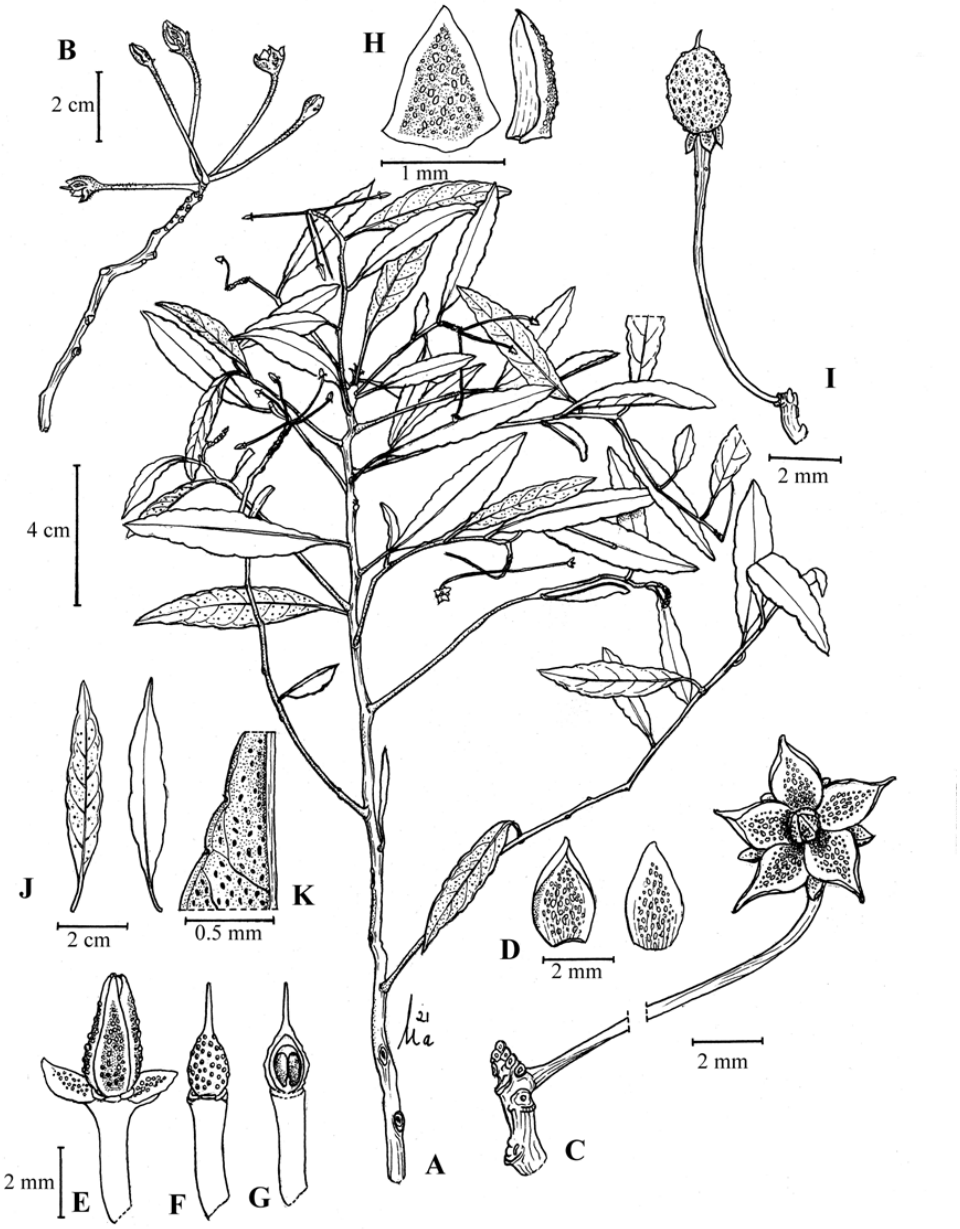

Figure 2: *Ardisia ledangensis.* **A.** Habit. **B.** Inflorescence. **C.** Flower with peduncle shown partially truncated to fit the plate layout. **D.** Corolla lobe, adaxial view (left), abaxial view (right). **E.** Stamen with corolla removed. **F.** Ovary. **G.** Ovary section showing the ovules. **H.** Calyx lobe, abaxial view (left), side-view (right) Vascularised glandulars on leaf margin. **I.** Fruit (young). **J.** Leaf, adaxial view (left), abaxial view (right). **K.** Lamina close-up showing leaf margin with vascularised glandulars and glandular-dots. [Drawn by Mohd Aidil Nordin].

DISCUSSION

In Peninsular Malaysia, members of §*Crispardisia* can be classified into two informal groups based on the inflorescence position (Stone, 1989a, 1989b; Julius & Utteridge, 2021). The first group has inflorescences strictly terminal on lateral (axillary) branches, while the second group is characterised by inflorescences that are lateral and/or terminal on the main stem or lateral branches. *Ardisia ledangensis* falls into the first group because its inflorescences are strictly

terminal on lateral (axillary) branches. Within this group, *Ardisia ledangensis* is morphologically similar to the montane species *A. rosea* King & Gamble, with both having smaller leaves less than 11 cm long (rarely up to approximately 13 cm long in the latter). However, the new species differs in several characters: the stem grows descending (vs. erect), the lamina is subcoriaceous and narrowly elliptic (vs. coriaceous, rarely subcoriaceous with ovate to elliptic lamina), the petiole is subsessile, rarely up to 1 cm long (vs. distinctly petiolate, 0.8–1 cm long), and the inflorescence is unbranched (vs. 1–2 branched).

The new species also resembles *Ardisia vidalii* C.M.Hu var. *vidalii* in the shrubby habit, glabrous mature leaves, and dense black glandular-dots on the lamina and floral parts. However, when compared to *A. vidalii* var. *vidalii*, which is a small, erect shrub (0.7–1 m tall) with glabrous vegetative parts, the new species is a taller shrub (1.5–2.5 m tall) with simple white hairs on young vegetative parts. The new species also differs in the subsessile, condensed, unbranched racemes with pedicels 1.8–3 cm long, compared to the short-pedicellate (5–6 mm), simple subumbels of *A. vidalii* var. *vidalii*; in addition, only 2 ovules per ovary are seen in the new species, whereas they are 7–8 in *A. vidalii* var. *vidalii*.

The new species also slightly resembles *Ardisia corymbifera* Mez in its shrubby habit, narrowly elliptic, and glabrous mature leaves. However, *A. ledangensis* differs in several characters: its leaves are much smaller (3–10.5 × 0.6–2.5 cm), subcoriaceous, and the lamina is densely covered with prominent black glandular-dots on both surfaces, whereas those of *A. corymbifera* are larger (*c.* 14 × 3 cm), thinly chartaceous, and the lamina is sparsely covered with glandular-dots. The inflorescences of *A. ledangensis* are subsessile, condensed, unbranched racemes with long slender pedicels (1.8–3 cm), while *A. corymbifera* bears nodding, branched to 2-order, umbellate-corymbose inflorescences with shorter, stout pedicels (1–1.3 cm long). In addition, the ovary and fruit of *A. ledangensis* are rough, covered with dense, glandular-dots, while those of *A. corymbifera* are smooth and lacking glandular-dots.

Specimens of §*Crispardisia* are often misidentified as the common and weedy species *Ardisia crenata* Sims, particularly by collectors unfamiliar with the group. As a result, the folder of *A. crenata* at KEP contains a mix of material, including a flowering specimen of the new species described here. This could be attributed to the elliptic leaf shape exhibited by both *A. ledangensis* and *A. crenata*. However, the leaf lamina of the new species is densely covered with prominent, glandular-dots on both surfaces (rather than smooth in *A. crenata*), with few tiny vascularised glandular areas on the sinuses visible to the naked eye (compared to many, larger, and more obvious glandular areas in the latter), secondary veins that are laxly spaced, arching and joining towards the margins to form intramarginal veins (vs. closely spaced and spreading towards the margins in the latter), and rough fruits covered with dense black glandular-dots (compared to smooth fruits without glandular-dots in the latter). Through these comparisons, *A. ledangensis* could not be matched to any existing species known in Peninsular Malaysia and adjacent areas, hence it is described as a new species here.

Ardisia is recognised as a significant indicator of the quality of tropical and subtropical forests due to the specific habitats some species occupy (Julius et al., 2021). For example, *A. recurvipetala* is currently only found in unlogged areas within Taman Negeri Kenyir, Terengganu, indicating its role as a marker of primary forest within the reserve. Similarly, the newly identified *A. ledangensis* serves as an indicator of intact habitats in the upper montane forest of Gunung Ledang. Uncovering and formally describing a new species is vital for cataloguing local biodiversity, advancing knowledge on species distributions, and offering

indicators of ecosystem integrity, especially within the context of the ongoing revision of the family Primulaceae in the Flora of Peninsular Malaysia project.

This latest discovery brings the number of §*Crispardisia* species native to Peninsular Malaysia to 12. The key to the species of this subgenus for Peninsular Malaysia is provided below. Of these, five species, including the new one, are endemic to Peninsular Malaysia: *Ardisia lankawiensis* King & Gamble, *A. ledangensis*, *A. minor* King & Gamble, *A. recurvipetala*, and *A. recurvisepala* Julius & Utteridge. Gunung Ledang, also known as Mount Ophir, is one of the key habitats for such endemic species and is considered among the most well-documented botanical sites in Peninsular Malaysia (Ridley, 1901) . However, despite its extensive historical collections, new plant species continue to be discovered, highlighting the importance of ongoing fieldwork. These discoveries not only enrich our understanding of the flora in this region but also underscore the need for continued documentation of Malaysia's plant diversity (Ridley, 1901; Kiew, 2018; Nordin et al., 2021). Gunung Ledang is home to several other endemic species, including *Cycas cantafolia* Jutta, K.L.Chew & Saw, *Fordia ophirensis* Ridl., *Garcinia montana* Ridl., and *Jasminum ledangense* Kiew, further emphasising that even well-studied areas can still yield surprises.

Key to *Ardisia* §*Crispardisia* in Peninsular Malaysia (updated from Julius & Utteridge 2021)

1. Inflorescences strictly terminal on lateral leafy branches 2
- Inflorescences lateral (axillary) and/or terminal on main stem or lateral branches 6

2*. Lamina coriaceous or/rarely subcoriaceous, relatively small 2.5–10.5 cm long, rarely up to *c*. 13 cm long; ……..... 3
- Lamina chartaceous, rarely subcoriaceous, larger (7–)9–16(–18) cm long 4

3. Lamina coriaceous, rarely subcoriaceous, ovate to elliptic, 2.5–6.5(–9) cm long, rarely up to *c*. 13 cm long, covered with dense black glandular-dots on both surfaces, prominent above, obscure beneath; inflorescences branched ..... **Ardisia rosea**
- Lamina subcoriaceous, narrowly elliptic, 3–10.5 cm long, covered with dense and prominent black glandular-dots on both surfaces; inflorescence unbranched…….**Ardisia ledangensis sp.nov.**

4.Inflorescences much branched, peduncle longer (1.5–)5 cm long…….....**Ardisia polysticta** Miq. (Miquel 1861: 576)
- Inflorescences usually unbranched, and if only 1–2 with peduncle(s), then these are less than 1.5 cm long 5

5. Leaf apex obtuse, sometimes acute, secondary veins closely spaced …..... **Ardisia crenata**
- Leaf apex long acuminate to acuminate-caudate, secondary veins laxly spaced ..... **Ardisia ridleyi** King & Gamble (1906: 146)

6. Inflorescence strictly lateral (axillary) on main stem 7
- Inflorescence lateral (axillary) and/or terminal on main stem or lateral branches …….....8

7. Lamina oblong-lanceolate, subcoriaceous, apex usually shortly acuminate rarely long and slightly caudate, 0.5–1(–2) cm long; pedicels longer and slender ..... **Ardisia sphenobasis** Scheff. (Scheffer 1867: 65)

- Lamina elliptic, coriaceous, apex long acuminate-caudate, 2–2.5 cm long; pedicels shorter and thicker ..... **Ardisia minor**

8. Inflorescence lateral (axillary) and terminal on lateral branches 9
- Inflorescence lateral (axillary) on main stem and/or terminal on lateral branches …….....10

9. Leaf margin with vascularized glandulars without pustule-like structures along the crenations; corolla lobes spreading……..……..……. **Ardisia lankawiensis**
- Leaf margin with vascularized glandulars and pustule-like structures along the crenations; corolla lobes recurved downward…….……**Ardisia recurvipetala**

10. Lamina oblanceolate-elliptic, apex acuminate, densely, villous-pilose hairs on both surfaces; inflorescences terminal on lateral branches; hairs white ..... **Ardisia villosa**
- Lamina narrowly elliptic to oblong-elliptic, apex acuminate-caudate, lamina soon glabrescent except the midrib; inflorescences lateral (axillary) on main stem and terminal on short lateral branch; hairs rust coloured .....**Ardisia recurvisepala**

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DECLARATIONS

Research permit(s). This study was conducted with approval from the Johor National Parks Corporation [Research Permit Ref. no: Penyelidikan/INV/2022/00005].
Ethical approval/statement. Not applicable.
Generative AI use. We declare that generative AI was not used in this study nor in the writing of this article.

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