

## Two new white-flowered *Codonoboea* species (Gesneriaceae) from Peninsular Malaysia

R. Kiew

Forest Research Institute Malaysia,  
52109 Kepong, Selangor, Malaysia  
ruth@frim.gov.my

**ABSTRACT.** Two new white-flowered *Codonoboea* species, *C. mentigiensis* Kiew and *C. tembatensis* Kiew (Gesneriaceae), are described from Peninsular Malaysia. Following the IUCN Criteria and Categories, *C. tembatensis* is Critically Endangered by clear-felling of forest prior to the area being flooded for an extension to a hydroelectric dam, while *C. mentigiensis*, that grows in lower montane forest within Permanent Protection Forest, is of Least Concern.

**Keywords.** *Codonoboea mentigiensis*, *Codonoboea tembatensis*, conservation status, Gesneriaceae, new species, Peninsular Malaysia

### Introduction

Currently, 77 named species of *Codonoboea* are recorded for Peninsular Malaysia (Kiew & Lim, 2011; Kiew, 2011; Kiew & Sam, 2012; Lim et al., 2013) and new species continue to be discovered. The first one described below was discovered at Cameron Highlands, Pahang, one of the best-collected localities in Peninsular Malaysia. It is unusual among *Codonoboea* species in its corolla being completely white; usually white-flowered species have contrastingly coloured (usually yellow) nectar guides. The second species was discovered during a botanical survey of an area in Hulu Terengganu designated for an extension to the Kenyir Hydroelectric Dam that will be clear-felled prior to flooding. This latter species is quite unlike other *Codonoboea* species, which have narrowly cylindrical fruits c. 1–1.5 mm wide, in its fruit being 3.5–5 mm thick and almost humped at the base and tapers to the tip.

### Taxonomy

#### *Codonoboea mentigiensis* Kiew, **sp. nov.**

*Codonoboea mentigiensis* is similar to *C. albomarginata* (Hemsl.) Kiew in its few-flowered pedunculate inflorescences and small flowers but it is different from *C. albomarginata* in its larger leaves, 10–14 × 5–8 cm, that are less than twice as long as wide (7.5–10 × 6.5 cm and 2.5–3 times longer than wide in *C. albomarginata*) and in its completely white flowers 18–19 mm long (those of *C. albomarginata* are 12 mm long, white with a pinkish tinge due to rosy purple hairs on the outer surface, the

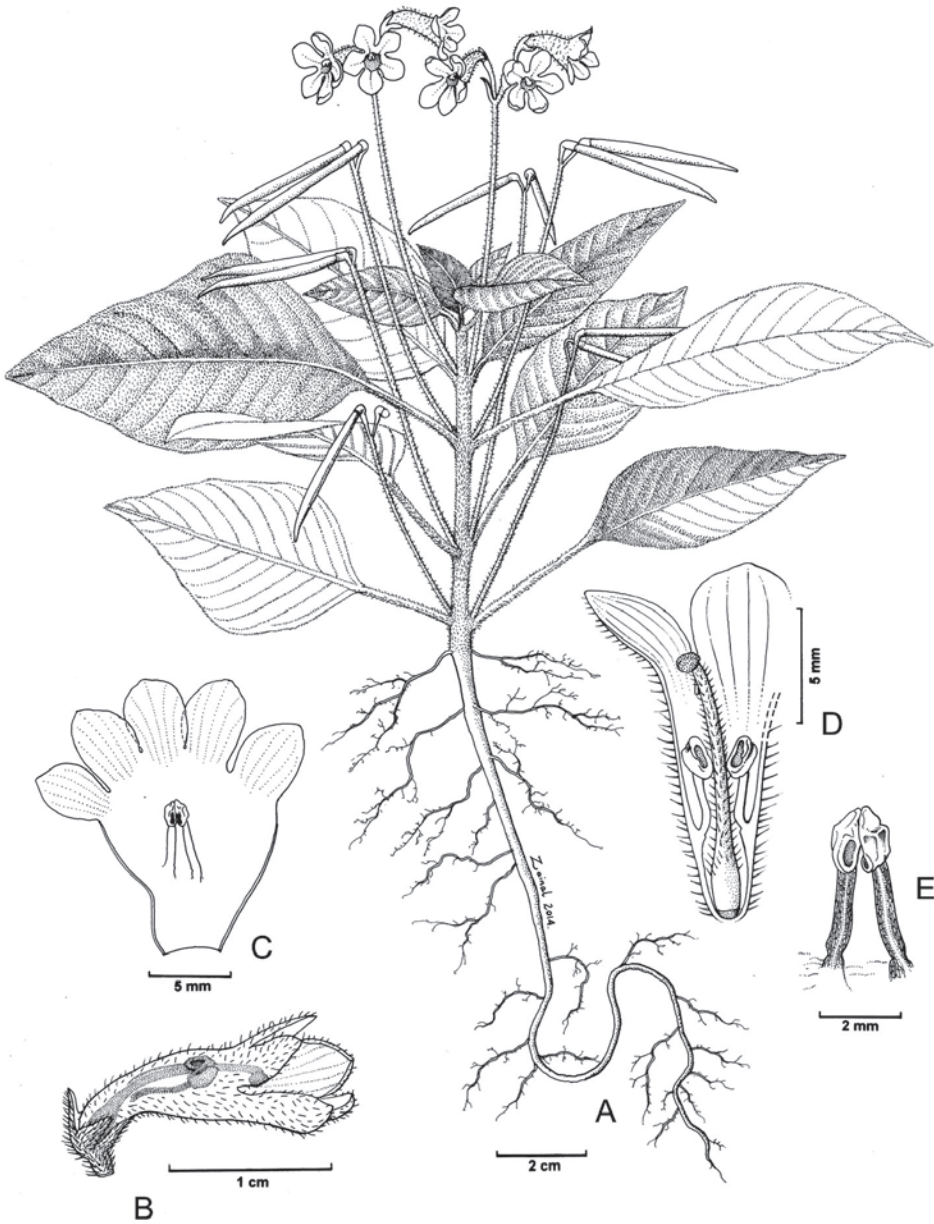
corolla lobes are yellow and the nectar guides are orange-brown), and in its longer fruit (3 cm not 2 cm as in *C. albomarginata*). Nor does *Codonoboea mentigiensis* have the purple stems, peduncles and rosy purple calyces of *C. albomarginata*. TYPE: Peninsular Malaysia, Pahang, Cameron Highlands, Mentigi Forest Reserve (FR), 4° 31' 48.40" N, 101° 22' 21.80" E, 18 November 2009, K. Imin FRI 68496 (holotype KEP; isotypes K, L, SING). (Fig. 1).

Small herb. **Stems** 8.5–15 cm tall, 9 mm thick, semi-woody at base, pale green, with densely appressed hairs, internodes 2–3.5 cm long; frequently with axillary shoots. **Leaves** in distant equal pairs; petioles slender, pale green with downy white hairs, 3.5–5 cm long, 3–4 mm thick, grooved above; laminas soft, pale green with a dense velvety layer of whitish non-glandular hairs, densely softly hirsute above and beneath especially on the midrib, margin and lower surface of veins, ovate to broadly oval, 10–14.5 × 5–8 cm, cuneate, margin entire, apex acute, lateral veins 8–11 pairs, slightly impressed above and slightly prominent and paler beneath, intercostal veins obscure. **Inflorescences** axillary, erect with a pair-flowered cyme held horizontally, peduncle 4.5–6.5 cm, pale green, silky with dense glandular hairs c. 0.75 mm long; bracts lanceolate, c. 4 × 1 mm. **Flowers** with pedicels 1.5–2 mm long; calyx mid-green and hispid with long non-glandular hairs, 5-lobed, divided almost to base, lobes narrowly acute, 3–4(–7) × 1–1.2 mm long, apex slightly recurved; corolla white, 18–19 mm long, with no markings in the throat, outside with dense long glandular translucent hairs, tube c. 13 mm long, glabrous inside, constricted at base and c. 3 mm wide, dilating to 5–7 mm wide at the mouth, upper lobes erect, oblong, c. 4 × 3 mm, side lobes rounded c. 4 × 4 mm, and the lower lobe rounded c. 5 × 4 mm; the side and lower lobes projecting 5 mm beyond the upper, with scattered minute uniseriate hairs, stamens and stigma positioned within the mouth; stamens 2, filaments c. 3 mm long, glabrous, straight, attached c. half-way up the corolla tube; anthers white, small, c. 1.2 mm long, joined side by side, staminodes 0; nectary annular, c. 0.5 mm high, rim slightly wavy; ovary white, c. 4 mm long, ovary and style densely hispid; style white, c. 8 mm long; stigma large, peltate, c. 1 mm across, white (not conspicuous). **Fruits** horizontal, short-stalked, stalk thickened, 5–7 mm long, capsules cylindrical, c. 30 mm long, c. 2 mm wide at base, slightly upcurved, splitting only along the top, brown when ripe.

**Distribution.** Peninsular Malaysia, endemic in Pahang, Cameron Highlands, Mentigi FR.

**Ecology.** Lower montane forest at c. 1800–2100 m, on shaded earth banks, common in places.

**Etymology.** It is named for its location, the Mentigi FR.



**Fig. 1.** *Codonoboea mengtigiensis* Kiew. **A.** Habit. **B.** Flower showing position of stamens and pistil inside. **C.** Corolla opened to show position of stamens. **D.** Corolla cut lengthwise to show stamens and pistil. **E.** Stamens showing coherence of anthers. (Drawn from *FRI* 68496 by Zainal Mustafa).

*Conservation Assessment.* Least Concern (LC). Following the IUCN Criteria & Categories (IUCN, 2001), although it is known from a single locality, the Mentigi FR at Cameron Highlands, and has an AOO less 20 km<sup>2</sup>, it is considered to be of Least Concern because it lies within a Permanent Protection Forest, being a steep upland area above 1000 m altitude and with no known threats.

*Other specimens examined.* PENINSULAR MALAYSIA: **Pahang:** Cameron Highlands, Mentigi FR, 4 Dec 1983, *Kiew RK 1263* (KEP); *ibidem*, 31 Aug 1990, *RK 3119* (KEP); *ibidem*, 7 July 1999, *RK 4730* (KEP).

***Codonoboea tembatensis* Kiew, sp. nov.**

Unique among Peninsular Malaysian species of *Codonoboea* by a combination of its subsessile inflorescences with 1–3 flowers and short capsules (15–18 mm long) that are unusually thick (3.5–5 mm thick) at the base. TYPE: Peninsular Malaysia, Terengganu, Hulu Terengganu, Tembat FR, 5°12.36' N, 102° 37.10' E, 31 July 2009, *Kamarul et al. FRI 67142* (holotype KEP; isotype SAN). (Fig. 2).

Unbranched, erect herb or branching at base and forming clumps. **Stems** 20–45 cm tall, 2–4 mm thick, purple with soft white glandular hairs, internodes 1.5–3.5 cm long, swollen and constricted at nodes. **Leaves** in distant pairs; petioles slender, lower petioles longer, 3–5.5 cm long, with soft white glandular hairs; laminae soft, narrowly to broadly lanceolate, 9–11 × 3.5–5.5 cm, softly hairy (hairs not glandular), dark green above, paler or white-green beneath, base rounded, slightly unequal and with an additional vein on the longer side, margin shallowly crenate especially in the upper half, apex attenuate, lateral veins (8–)9 pairs, slightly impressed above and prominent beneath. **Inflorescences** axillary, a subsessile cyme with 1–3 flowers; bracts lanceolate, 8–10 × 2–3 mm, apex rounded, midrib distinct, densely hairy. **Flowers** with pale green pedicels and calyx, pedicels (2–)3–4 mm long; calyx 5-lobed, 3–4(–7) mm long, divided almost to base, lobes narrowly acute, with long hairs; corolla white, c. 3 cm long, tube c. 20 mm long, c. 3 mm wide in the basal c. 4 mm, dilating to 13 mm wide at the mouth, upper lobes erect to reflexed, c. 7 × 9 mm, the side lobes c. 9 × 8 mm and lower lobe c. 9 × 7 mm; projecting beyond the upper, stamens and stigma positioned within the mouth, nectar guides in the lower part of the throat consisting of 2 rows of minute, lemon-yellow, glandular hairs; stamens 2, filaments c. 10 mm long, bowed, covered in minute, white glandular hairs, lower half of the filaments yellow, upper half of filaments and anthers white, anthers small, c. 1.5 mm long, joined side by side, staminodes 0; nectary large, white, annular, c. 0.75 mm high; ovary white or purple, narrowly ovoid, glabrous at base, c. 4 mm long, as long as calyx, style white with fine, long hairs, 13–15 mm long; stigma large, peltate, c. 1 mm across, white (not conspicuous). **Fruits** horizontal, short-stalked, stalk thickened, 5–7 mm long, capsules thick at base (= humped on the upper side), 15–18 mm long, 3.5–5 mm thick at base, tapered to apex, dull purple becoming brown.



**Fig. 2.** *Codonoboea tembatensis* Kiew. **A.** Habit. **B.** Flower. **C.** Corolla front view showing position of stamens and pistil. **D.** Calyx. **E.** Corolla cut lengthwise to show stamens and pistil. **F.** Fruit. (Drawn from *FRI 67142* by Zainal Mustafa).

*Distribution.* Peninsular Malaysia, endemic in Terengganu, Hulu Terengganu, Tembat FR.

*Ecology.* In lowland to hill mixed dipterocarp forest, in valleys on shaded slopes above streams or rivers at 200–815 m altitude. It grows as individual plants or forms clumps by branching at the base.

*Etymology.* It is named for its location, the Tembat FR.

*Conservation Assessment.* Critically Endangered, CRA3(c), B1ab(i,iii,iv,v). Following the IUCN Criteria & Categories (IUCN, 2001), this species is Critically Endangered being at extremely high risk of extinction in the wild as its habitat lies within the area that has been clear-felled prior to the area being flooded by the northern extension to the Kenyir hydroelectric dam. It apparently has a restricted occurrence (less 50 km<sup>2</sup>) as it has not been found in adjacent forests, such as the Telemong FR and the Chichir FR.

*Other specimens examined.* PENINSULAR MALAYSIA: **Terengganu:** Hulu Terengganu, Tembat FR—Gunung Tembat, 694 m, shady valley, 10 Apr 2008 [flower], Kiew *et al.* FRI 57034 (KEP); Ulu Sungai Terengganu Mati, 3 Apr 2009 [fruit], Siti Munirah *et al.* FRI 67904 (KEP, K, L, SAN, SING); Cultivated in Forest Research Institute Malaysia's nursery 15 Oct 2009 [flower], FRI 65159 (KEP, flowers in spirit).

*Notes.* The flower of *Codonoboea tembatensis* is unusual among Malaysian *Codonoboea* in that the two nectar guides in the throat of the corolla are composed of erect, lemon-yellow hairs (not plastids in the corolla tissues as is usual in other species). In addition, the lower part of the filament has the same lemon-yellow colour as the nectar guides. In most *Codonoboea* species the filament is uniformly white.

The fruit of *Codonoboea tembatensis* is relatively short (less than 2 cm long) and is especially thick (3.5–5 mm wide) for *Codonoboea* species. It sometimes appears humped at the base. Other species with fruits less than 2 cm long, like *Codonoboea floribunda* (M.R.Hend.) C.L.Lim and *C. reptans* (Jack) C.L.Lim, have fruits 1–1.5 mm at the base. Only *Codonoboea malayana* (Hook.f.) Kiew has fruits 2–3.5 mm wide but they are longer (2.5–5 cm long). However, this latter species is not at all similar to the new species because it has long peduncles, many-flowered inflorescences and much longer corollas (35–40 mm long).

**ACKNOWLEDGEMENTS.** This study was carried out as part of the Flora of Peninsular Malaysia Project funded by the Ministry of Science, Technology and Innovation through the National Council for Scientific Research and Development under Project No. 01-04-01-000 Khas 2 entitled “Safeguarding the Forest Plant Diversity of Peninsular Malaysia” and the 10<sup>th</sup> Malaysia Plan Development Project entitled “Dokumentasi dan Inventori Flora Malaysia”. Thanks are due to the KEP herbarium staff for their support in the field, to A.R. Ummul-Nazrah and M.Y. Siti-Munirah for organizing the expedition to the Tembat area, to Zainal Mustafa

(KLU) for the preparations of the botanical plates, and to the curators and staff of the BM, E, K, KLU, L and SING herbaria for permission to examine specimens in their care.

### References

- IUCN (2001). *Red List Categories and Criteria, version 3.1*. Switzerland, Gland & UK, Cambridge: IUCN Species Survival Commission, IUCN.
- Kiew, R. (2011). Two new species of Gesneriaceae from Gunung Padang, Terengganu, Malaysia. *Malayan Nat. J.* 63: 661–666.
- Kiew, R. & Sam, Y.Y. (2012). *Codonoboea personatiflora* (Gesneriaceae) a new species from Peninsular Malaysia. *PhytoKeys* 18: 61–66.
- Kiew, R. & Lim, C.L. (2011). Names and new combinations for Peninsular Malaysian species of *Codonoboea* Ridl. (Gesneriaceae). *Gard. Bull. Singapore* 62: 253–275.
- Lim, C.L., Kiew, R. & Haron, N.W. (2013). *Codonoboea oreophila* (Gesneriaceae), a new species from Peninsular Malaysia. *Blumea* 58: 68–70.

