

A revision of *Codonoboea* (Gesneriaceae: Didymocarpoideae) in Thailand

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ABSTRACT. The genus *Codonoboea* Ridl. (Gesneriaceae: Didymocarpoideae: Trichosporeae: Didymocarpinae) is revised for Thailand. Thirteen species are recognised, one of which, *Codonoboea poopathii* D.J.Middleton, is new to science and three of which, *C. dawnii* (Kiew) Kiew, *C. oreophila* Kiew ex C.L.Lim and *C. urticoides* (A.Weber) Kiew, are new records for Thailand. *Didymocarpus reptans* Jack is neotypified; *D. hispidus* Ridl. var. *selangorensis* Ridl., *D. inaequalis* Ridl., *D. rugosus* Ridl. and *D. urticifolius* Ridl. are lectotypified; and *D. hispidus* Ridl. is lectotypified in a second step. A key to the species is provided and all species are described.

Keywords. Conservation assessments, new species, Peninsular Thailand, typifications

Introduction

The genus *Codonoboea* Ridl. in the Gesneriaceae, subfamily Didymocarpoideae, tribe Trichosporeae, subtribe Didymocarpinae (Weber et al., 2013, 2020) includes over 120 species found in Peninsular Thailand and throughout Malesia but primarily in western Malesia (Middleton et al., 2013; Lim & Kiew, 2014). Given the extraordinarily high diversity of the genus in Peninsular Malaysia (Kiew & Lim, 2011) it is likely that many more undescribed species are present in Sumatra and Borneo given their much lower collection densities and relative lack of taxonomic attention compared to Peninsular Malaysia (Middleton et al., 2019).

The genus was described by Ridley (1923), initially with only three species. These species were mostly treated within the genus *Didymocarpus* Wall. by later authors until *Didymocarpus* was substantially remodelled by Weber & Burt (1998), after which *Codonoboea* and most Malesian *Didymocarpus* species were included in *Henckelia* Spreng. However, Möller et al. (2009) and Weber et al. (2011) found that *Henckelia*, as then defined, was not monophyletic and that the Malesian species belonged in two distinct groups, both quite separate from the type species of *Henckelia*. This led to the resurrection and expansion of *Codonoboea* and the resurrection of *Loxocarpus* R.Br., the latter in subtribe Loxocarpinae (Middleton et al., 2013; Weber et al., 2013, 2020; Puglisi et al., 2016). *Codonoboea* in this expanded definition (see Middleton et al., 2013) is still a morphologically rather heterogenous genus (Lim & Kiew, 2014) but is well supported by molecular data (Möller et al., 2009). Lim &

Kiew (2014) noted that the sections erected in *Didymocarpus* and *Henckelia* for the species now treated in *Codonoboea* are mostly not monophyletic and, consequently, combinations for these sections in *Codonoboea* have not been made. Lim & Kiew (2014) did state, however, that the sectional names could be useful informal labels with which to recognise some groups within the genus. A study to clarify relationships and possibly propose a new infrageneric classification is needed.

Peninsular Thailand is at the northern limit of the genus and there are far fewer species than in Peninsular Malaysia. *Codonoboea* diversity in Thailand is highest in Yala and Narathiwat where a number of Malaysian species reach their northern limits (e.g., *C. dawnii* (Kiew) Kiew, *C. hispida* (Ridl.) Kiew, *C. oreophila* Kiew ex C.L.Lim and *C. urticoides* (A. Weber) Kiew) and where it is possible that more species currently endemic to Peninsular Malaysia may be found, particularly with further exploration of the higher mountains. Barnett (1962) listed seven species of *Didymocarpus* for Thailand which would now be included in *Codonoboea*. Burt (2001) listed 10 species of *Henckelia* for Thailand which would likewise now be included in *Codonoboea*. Here I include 13 species for Thailand. *Codonoboea poopathii* D.J.Middleton is described as new to science and three species, *C. dawnii*, *C. oreophila* and *C. urticoides*, are new records for Thailand from the baseline data in Barnett (1962), Burt (2001) and Smitinand (2014). *Codonoboea flava* (Ridl.) Kiew, which was included for Thailand by Barnett (1962), Burt (2001) and Smitinand (2014) is not present in the country but has rather been misapplied to *C. porphyrea* (B.L.Burt) D.J.Middleton.

Codonoboea is the fifth largest genus of Gesneriaceae in Thailand after *Paraboea* (C.B.Clarke) Ridl. (> 70 species), *Microchirita* (C.B.Clarke) Yin Z.Wang (37 species), *Didymocarpus* (> 25 species) and *Aeschynanthus* Jack (20 species).

Materials and methods

This revision is based on field work throughout Peninsular Thailand and on a study of herbarium material from A, AAU, BK, BKF, BM, C, E, K, L, P, PSU, QBG and SING (herbarium codes follow Thiers, continuously updated). Additional material has been consulted from online resources and herbarium catalogues. The material has been studied using standard herbarium techniques and the taxa delimited based on discontinuities of morphological characters.

A taxonomically important character in the genus, and which is used in the key, is whether the leaves are opposite or alternate. When there are distinct internodes along the stem, this character is quite obvious. However, in several species the leaves are crowded at the apex of the stem and the leaf arrangement may not be very easily observed. If in these cases the phyllotaxy cannot be ascertained by whether the youngest leaves are of more or less equal size (implying opposite) or distinctly unequal (implying alternate), then, for the ambiguous species, when using the key assume that the leaves are opposite if the leaves are petiolate and not winged to the base and are alternate if the leaves are sessile or petiolate but with a deeply serrate wing down each side of the petiole.

Taxonomic treatment

Codonoboea Ridl., Fl. Malay Penins. 2: 533 (1923). – *Didymocarpus* sect. *Codonoboea* (Ridl.) Kiew, Blumea 35: 171 (1990). – TYPE: *Codonoboea leucocodon* (Ridl.) Ridl., lectotype designated by Ivanina (1967).

Didymocarpus sect. *Heteroboea* Benth. in Benth. & Hook.f., Gen. Pl. 2: 1022 (1876). – *Henckelia* sect. *Heteroboea* (Benth.) A.Weber & B.L.Burtt, Beitr. Biol. Pflanzen 70: 334 (1998 [‘1997’]). – TYPE: *Didymocarpus crinitus* Jack (= *Codonoboea crinita* (Jack) C.L.Lim).

Didymocarpus sect. *Didymanthus* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 82 (1883). – *Henckelia* sect. *Didymanthus* (C.B.Clarke) A.Weber & B.L.Burtt, Beitr. Biol. Pflanzen 70: 334 (1998 [‘1997’]). – TYPE: *Didymocarpus serratus* R.Br. (= *Codonoboea serrata* (R.Br.) A.Weber).

Didymocarpus sect. *Kompsoboea* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 87 (1883). – TYPE: *Didymocarpus kompsoboea* C.B.Clarke (= *Codonoboea kompsoboea* (C.B.Clarke) A.Weber).

Didymocarpus sect. *Salicini* Ridl., J. Linn. Soc. Bot. 32: 514 (1896). – TYPE: *Didymocarpus salicinus* Ridl. (= *Codonoboea salicina* (Ridl.) C.L.Lim).

Didymocarpus sect. *Reptantes* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 29 (1905). – TYPE: *Didymocarpus reptans* Jack (= *Codonoboea reptans* (Jack) C.L.Lim).

Paraboea sect. *Campanulatae* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 63 (1905). – TYPE: *Paraboea campanulata* Ridl. (= *Codonoboea hirta* (Ridl.) Kiew).

Didymocarpus sect. *Boeopsis* Ridl., J. Straits Branch Roy. Asiat. Soc. 49: 22 (1907). – TYPE: *Didymocarpus heterophyllus* Ridl. (= *Codonoboea heterophylla* (Ridl.) C.L.Lim).

Didymocarpus sect. *Pectinati* Ridl., Fl. Malay Penins. 2: 508 (1923). – TYPE: *Didymocarpus pectinatus* Oliv. (= *Codonoboea pectinata* (Oliv.) Kiew).

Platyadenia B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 31: 51 (1971). – TYPE: *Platyadenia descendens* B.L.Burtt (= *Codonoboea descendens* (B.L.Burtt) A.Weber).

Didymocarpus sect. *Venusti* Kiew, Malay. Nat. J. 48: 203 (1995), as ‘*Venustus*’. – TYPE: *Didymocarpus venustus* Ridl. (= *Codonoboea venusta* (Ridl.) Kiew).

Henckelia sect. *Glossadenia* A.Weber & B.L.Burtt, Beitr. Biol. Pflanzen 70: 335 (1998 [‘1997’]). – TYPE: *Henckelia flavobrunnea* (Ridl.) A.Weber (= *Codonoboea flavobrunnea* (Ridl.) Kiew).

Perennial herbs, caulescent or forming a rosette, occasionally decumbent or creeping; usually somewhat woody at base. **Leaves** opposite or alternate, often crowded at stem apex, petiolate or sessile, sometimes appearing sessile due to winged petiole. **Inflorescences** axillary, sometimes subterminal, one- to few- to many-flowered, pedunculate; flowers 5-merous. **Calyx** of 5 lobes divided to the base. **Corolla** consisting of a tube and 5 lobes, most commonly funnelform, 2-lipped, upper lip 2-lobed, lower lip 3-lobed. **Fertile stamens** 2, filaments long and narrow; anthers fused face to face, thecae divergent; staminodes usually 3, usually very small or seemingly absent but sometimes lateral staminodes larger. **Nectary** a flat-topped or lobed ring, sometimes only on ventral side. **Ovary** cylindrical, style narrower, stigma peltate to clavate. **Capsules** plagiocarpic, narrow and long, dehiscent dorsally to form a gutter. **Seeds** small, without appendages.

Distribution. A genus of 120–130 species from Peninsular Thailand to New Guinea with its highest known diversity in Peninsular Malaysia. In Thailand there are 13 species of which five are endemic.

Notes. Even though *Codonoboea* is a large genus, because its species have mostly been included in either *Didymocarpus* or *Henckelia*, it has rarely appeared under the name *Codonoboea* in the literature. In addition, the taxonomic history of *Codonoboea*, *Didymocarpus* and *Henckelia* is extremely complex (see Middleton et al., 2013). All three generic names are still in current use with delimitations that have varied hugely over time. To appreciate what was previously written on the *Codonoboea* species of Thailand, the literature on all three genera must be considered.

Key to the species

1. Leaves opposite, petiolate 2
1. Leaves alternate, petiolate or petiole winged so that the leaves appear sessile ... 10

2. Leaves with 12–25 secondary veins on each side of midrib, midrib deeply sunken above 3
2. Leaves with 4–12 secondary veins on each side of midrib, midrib not deeply sunken above 4

3. Leaf laminas 9–18 × 2.9–5.7 cm, with small slightly sunken sessile glands all over above; corolla 50–55 mm long 2. *C. dawnii*
3. Leaf laminas 3.5–8 × 1–2.2 cm, without slightly sunken sessile glands; corolla 30–36 mm long 9. *C. poopathii*

4. Leaf apex rounded to obtuse and often apiculate, base rounded to obtuse; corolla 16–17 mm long; found at > 1200 m elevation 7. *C. oreophila*

4. Leaf apex acuminate to acute, base cuneate to obtuse; corolla 13–46 mm long; found at a range of altitudes from sea level upwards 5
5. Corolla 13–15 mm long; plant creeping 11. *C. reptans*
5. Corolla > 18 mm long; plant creeping or not 6
6. Leaf midrib above with transverse ridges and protrusions 6. *C. kolokensis*
6. Leaf midrib above without transverse ridges and protrusions 7
7. Plant creeping; calyx lobes 6.5–9.5 mm long 3. *C. filicalyx*
7. Plant usually erect, occasionally decumbent; calyx lobes 2.5–7 mm long but if > 6 mm long, plants erect 8
8. Corolla 33–45 mm long, lobes predominantly purple with yellow lines on lower lip and tube 10. *C. porphyrea*
8. Corolla 18.5–28 mm long, lobes predominantly white or pale yellow with yellow and/or purple lines on lower lip and tube 9
9. Corolla c. 28 mm long, pure white with yellow and purple lines in throat, hairs on corolla usually white, occasionally reddish, upper lip c. 7 mm long 4. *C. hispida*
9. Corolla 18.5–24 mm long, white (see notes under *C. urticoides*) or pale yellow with yellow and purple lines in throat, hairs on corolla usually reddish, upper lip 2–3.5 mm long 13. *C. urticoides*
10. Erect herb with distinct internodes; leaves distinctly petiolate, petiole without a wing, leaf margin denticulate, secondary veins 8–11 on each side of midrib 5. *C. inaequalis*
10. Erect or decumbent herb with or without distinct internodes; leaves apparently sessile or petiole distinctly winged, leaf margin serrate at least towards base, secondary veins 11–57 on each side of midrib 11
11. Tertiary venation at least in lower half of leaf laminas scalariform and directly connecting between secondary veins, sometimes with few anastomosing tertiary veins in upper half of leaf 12. *C. rugosa*
11. Tertiary venation in leaf laminas reticulate or at least somewhat anastomosing between secondary veins throughout leaf, or tertiary venation not visible through thick hair covering 12
12. Indumentum of upper leaf surface of dense appressed hairs, lamina surface not or barely visible beneath hair covering; ovary mostly with gland-tipped hairs and occasional eglandular hairs 1. *C. appressipilosa*
12. Indumentum of upper leaf surface of spreading hairs or an untidy mixture of hair types, much less dense so that leaf lamina always visible

beneath hair covering; ovary mostly with eglandular hairs and occasional gland-tipped hairs 8. *C. platypus*

1. *Codonoboea appressipilosa* (B.L.Burtt) D.J.Middleton, Edinburgh J. Bot. 70: 388 (2013); Smitinand, Thai plant names 147 (2014). – *Henckelia appressipilosa* B.L.Burtt, Thai Forest Bull., Bot. 29: 98 (2001). – TYPE: Thailand, Narathiwat, Sungai Kolok, Nikhom Waeng, 2 March 1974, *Larsen & Larsen 32803* (holotype AAU). (Fig. 1)

Herb (or subshrub?) with woody base; stems densely appressed pubescent. *Leaves* alternate, spaced along stem to clustered at apex; petioles not easily distinguished from laminae due to being winged, 1–6 cm long, wings 3–11 mm wide, often widest at base of petiole where they are also often very lacinate and up to 20 mm wide; laminae elliptic to obovate, 11–21 × 3.7–7 cm, apex acuminate, base attenuate, margin denticulate, becoming serrate towards base and on petiole wings, 14–33 secondary veins on each side of midrib, tertiary venation anastomosing between secondary veins, midrib and veins flush with lamina or very slightly raised above, above with appressed hairs so dense that lamina surface not or barely visible beneath hair covering, beneath same but slightly less dense. *Inflorescences* 1–3-flowered, often several arising from a single axil, c. 7.5 cm long; peduncle/pedicel c. 3 cm long, densely covered in a mixture of gland-tipped and eglandular hairs. *Calyx* lobes narrowly triangular, 4–5.6 × 0.6–1.7 mm, densely eglandular pubescent. *Corolla* white with two yellow lines in throat, c. 47 mm long, narrowly funnelform, all lobes orbicular, apices rounded, outside with sparse gland-tipped hairs throughout, inside with small gland-tipped hairs at base of upper lobes, papillose in two rows in line with sinuses on lower lip almost to insertion of stamens in tube; tube to sinus between upper and lower lips c. 38 mm long; upper lip c. 8 mm long, lobes c. 5.5 × 7.5 mm; lower lip c. 10 mm long, lateral lobes c. 6 × 7.5 mm, central lobe c. 8 × 7.5 mm. *Stamens* inserted at c. 26 mm from corolla base; filaments (immature) c. 5 mm long, apex prolonged slightly beyond insertion to anthers; anthers (immature) c. 0.7 × 2.5 mm; lateral staminodes c. 8.5 mm long. *Nectary* irregularly annular, c. 1.7 mm long, margin crenate. *Pistil* c. 40.5 mm long, densely covered in long gland-tipped hairs and fewer eglandular hairs throughout; ovary c. 20.5 mm long; style c. 20 mm long. *Fruit* 8–9.5 cm long, 2–3 mm wide.

Distribution. Endemic to Thailand.

Habitat and ecology. In evergreen forest at c. 200 m.

Additional specimens examined. THAILAND: **Narathiwat:** Sukhirin, Hala-Bala Wildlife Sanctuary, Khao Ai Dang, 200 m, 26 Oct 2005, *Poopath 399* (BKF); Sungai Kolok, Nikom Waeng, 10 Sep 1966, *Prayad 378* (BK); Nikom Waeng, 1971, *Unknown 251* (BKF).

Notes. A species in the ‘Heteroboea group’ of species (see Lim & Kiew, 2014) but distinct from the other species in Thailand, *Codonoboea platypus* (C.B.Clarke) C.L.Lim and *C. rugosa* (Ridl.) C.L.Lim, by the dense appressed indumentum.



Fig. 1. *Codonoboea appressipilosa* (B.L.Burtt) D.J.Middleton. From *Poopath* 399. (Photo: Manop Poopath)

2. *Codonoboea dawnii* (Kiew) Kiew, Gard. Bull. Singapore 62: 259 (2011). – *Didymocarpus dawnii* Kiew, Malayan Nat. J. 48: 201 (1995). – *Henckelia dawnii* (Kiew) A.Weber, Beitr. Biol. Pflanzen 70: 343 (1998 [‘1997’]). – TYPE: Peninsular Malaysia, Perak, N of E-W Highway, 3 March 1995, *Davison D 6* (holotype KEP n.v.; isotype SING [SING0067443]).

Herb to 60 cm tall, with woody rootstock; stems with densely matted long hairs. **Leaves** opposite, congested at stem apex; petioles 1.5–2.5 cm long, with dense long, matted hairs; laminas elliptic, 9–18 × 2.9–5.7 cm, apex acuminate, base cuneate, margin serrate, 13–18 secondary veins on each side of midrib, tertiary venation reticulate, midrib deeply sunken above, veins more or less flush with lamina, above surface covered in slightly sunken solitary glands and with hairs along midrib, beneath midrib and veins densely long hispid. **Inflorescences** scapose, 2–4-flowered, 11–14 cm long; peduncle 8.5–11 cm long, with sparse long matted hairs; bracts ovate, to 12 × 6 mm, bases of each pair often overlapping across node, glabrous; pedicels 5–9 mm long, with sparse long matted hairs. **Calyx** lobes narrowly triangular, 3–3.5 × 0.8–1 mm, apex acute, with sparse long hairs. **Corolla** pendent, ‘blue or purple’ (violet in protologue), with 2 yellow stripes in throat, tube narrow at base and widening abruptly into upper tube and limb, 50–55 mm long, outside with few short hairs; upper lip with 2 oblong lobes, 5.5–13 × 4–9 mm, apices rounded, reflexed, lower lip with 3 oblong

lobes, lateral lobes 7–10 × 4.5–8 mm, central lobe 4–8 × 4–7 mm, apices rounded. **Stamens** attached at approximately middle of tube; filaments 10–11 mm long; anthers c. 3 × 2 mm. **Nectary** annular, c. 0.2 mm high. **Pistil** 21–25 mm long, with sparse mixed short acicular hairs and gland-tipped hairs, more gland-tipped on style; ovary c. 11 mm long; style 10–14 mm long. **Capsule** 4.5–7.5 cm long, 1–2 mm wide.

Distribution. Northern Perak, Malaysia, and Betong District, Yala, Thailand.

Habitat and ecology. On rocks and rocky soils in shady areas of evergreen forest at c. 300 m.

Additional specimens examined. THAILAND: **Yala:** Betong District, Ban Chantharat-Ban Hao Muang, 300 m, 11 Mar 2005, *Wai 159* (PSU).

Notes. The flowers are very firmly stuck down and in rather poor condition on the only known Thai specimen so the description above is augmented from the protologue (Kiew, 1995) and the isotype in SING. The flowers on the Thai material may be slightly smaller than given in the description. The leaf margin serration is much shallower in the Thai material than in the Malaysian material but otherwise matches the Malaysian material well.

3. *Codonoboea filicalyx* (B.L.Burtt) D.J.Middleton, *Edinburgh J. Bot.* 70: 390 (2013); Smitinand, *Thai plant names* 147 (2014). – *Henckelia filicalyx* B.L.Burtt, *Thai Forest Bull., Bot.* 29: 95 (2001). – TYPE: Thailand, Narathiwat, Nikhom Waeng, 4 March 1974, *Larsen & Larsen 32914* (holotype AAU; isotype E [E00050877]). (Fig. 2)

Didymocarpus pumilus auct. non Ridl.: Barnett, *Fl. Siam.* 3(3): 216 (1962).

Stems creeping then ascending, densely covered in pale appressed hairs. **Leaves** crowded at stem apex, opposite; petioles 2.2–6.3 cm long, densely covered in pale appressed hairs; laminae green with pale green to white stripe along midrib, ovate to elliptic, 2.8–13 × 1.2–5.8 cm, apex short acuminate to acute, base cuneate to obtuse, margin entire, 5–8 secondary veins on each side of midrib, midrib and veins flush with lamina or very slightly raised above, densely covered in pale appressed hairs above and beneath. **Inflorescences** 1–2-flowered, 6.5–9.5 cm long, all parts densely covered in long gland-tipped and eglandular hairs; bracts linear, 4–6 mm long; peduncle 6–7 mm long, rather persistent even after fruit dehiscence; pedicels 3.5–5 mm long. **Calyx** lobes narrowly triangular to linear, 6.5–9.5 × 0.7–1.4 mm, apex narrowly acute, often unequal in size, densely covered in a mixture of eglandular and gland-tipped appressed hairs. **Corolla** yellow with 2 darker yellow stripes in throat, 33.5–46 mm long, narrow in lower half, widening in upper half, lobes orbicular, apices rounded, outside sparsely pubescent with gland-tipped hairs throughout, inside with sessile or short stalked glands in throat and base of upper lobes and with small robust hairs in line with



Fig. 2. *Codonoboea filicalyx* (B.L.Burtt) D.J.Middleton. **A.** Habit and flower. **B.** Fruit. From *Poopath* 34.2. (Photos: Manop Poopath)

stamens deeper into tube; tube to sinus between upper and lower lips 28–37 mm long; upper lip c. 6 mm, lobes 4–5.5 × 4.2–6.5 mm; lower lip 9–11 mm long, lateral lobes 4–7.5 × 4–7.3 mm, central lobe 4–9 × 4.5–8.3 mm. **Stamens** inserted at 17–26 mm from corolla base; filaments curved, 7.5–10 mm long, glabrous, connective ending in 2 spurs; anthers 0.7–0.9 × 2.5–2.7 mm, glabrous; lateral staminodes 1.5–5 mm long; medial staminode c. 0.5 mm long. **Nectary** 1.5–2.7 mm long, margin crenate. **Pistil** 22–37 mm long; ovary 3.5–7 mm long, with sessile glands and densely pubescent with eglandular hairs; style 18.5–30 mm long, densely pubescent with gland-tipped and eglandular hairs. **Fruit** 3.7–4 cm long, 2–2.3 mm wide.

Distribution. Endemic to Thailand.

Habitat and ecology. In evergreen forest at 200–1000 m.

Additional specimens examined. THAILAND: **Yala:** Betong, Hala-Bala Wildlife Sanctuary, 550 m, 1 Feb 2015, *Poopath et al.* 870 (SING); Betong, Khao 818, 1000 m, 14 Feb 2001, *Puudjaa* 834 (BKF); Betong, *Kerr* 7468 (K); Betong, Khao Hua Nak, 700 m, 9 Apr 1999, *Niyomdham* 5682 (BKF). **Narathiwat:** Nikom Waeng, 19 Sep 1966, *Prayad* 207 (BK); Waeng, 200 m, 13 Jun 1970, *Smitinand* 10940 (BKF); Sukhirin, Phu Khao Tong, To Mo Cheak Dam, 300 m, 6 Jun 2004, *Poopath* 34.2 (BKF, E); Waeng, Hala-Bala Wildlife Sanctuary, Lo Jud, 600 m, 7 Jun 2004, *Poopath* 53 (BKF).

Notes. Most similar to *Codonoboea ascendens* (Ridl.) C.L.Lim from Perak in Peninsular Malaysia from which it differs primarily in the much less pubescent corolla and longer and narrower calyx lobes.

4. *Codonoboea hispida* (Ridl.) Kiew, Gard. Bull. Singapore 62: 263 (2011); Smitinand, Thai plant names 147 (2014), p.p. – *Didymocarpus hispidus* Ridl., J. Linn. Soc. 32: 507 (1896); Ridley, J. Straits Branch Roy. Asiat. Soc. 44: 35 (1905), as ‘*hispidulus*’; Ridley, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 750 (1908); Ridley, Fl. Malay Pen. 2: 511 (1923). – *Henckelia hispida* (Ridl.) A. Weber, Beitr. Biol. Pflanzen 70: 346 (1998 [‘1997’]). – TYPE: [Peninsular Malaysia], Perak, Gunong [Gunung] Hijau, 6000 ft [1829 m], September 1889, *Curtis* 2037 (lectotype SING [SING0043044], first step designated by Vitek et al. (2000), second step designated here; isolectotype SING [SING0043045]). (Fig. 3)

Didymocarpus hispidus Ridl. var. *selangorensis* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 36 (1905); Ridley, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 750 (1908); Ridley, Fl. Malay Pen. 2: 512 (1923). – TYPE: [Peninsular Malaysia], Selangor, Gunong Semangko [Gunung Semangkok], 3000–4000 ft [914–1219 m], May 1902, *Curtis* 3752 (lectotype SING [SING0043046], designated here; isolectotypes SING [SING0043047, SING0043048]).



Fig. 3. *Codonoboea hispida* (Ridl.) Kiew. From Middleton *et al.* 3658. (Photo: Rachun Pooma)

Didymocarpus albinellus Ridl., J. Fed. Malay States Mus. 4: 51 (1909); Ridley, Fl. Malay Penins. 2: 512 (1923); Henderson, Malay. Wild Flowers Dicot. 346 (1959). – TYPE: [Peninsular Malaysia], Pahang, Gunung Beremban [Berumban], November 1908, *Ridley 13679* (lectotype SING [SING0043049], designated by Kiew & Lim (2011); isolectotype K [K000858206]).

Staurogyne macrantha C.B. Clarke, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 642 (1908), nom. illeg.; Ridley, Fl. Malay Pen. 2: 563 (1923). – TYPE: Peninsular Malaysia, Perak, Larut, *King's Collector 2417* (holotype CAL).

Herb to 50 cm tall; stems densely covered in eglandular uniseriate hairs. **Leaves** opposite; petioles 1–2 cm long, densely covered in eglandular uniseriate hairs; laminae dark green above, paler beneath, elliptic, 6.5–12.7 × 3–4.8 cm, apex acuminate, base cuneate, margin denticulate, 8–12 secondary veins on each side of midrib, tertiary venation obscure or reticulate, midrib and veins flush with lamina or only very slightly raised or sunken above, above with scattered eglandular uniseriate hairs and minute (sub)sessile glands, beneath with dense eglandular uniseriate hairs on venation and scattered on lamina. **Inflorescences** 1–3-flowered, 6.5–11 cm long, with mixed shorter eglandular hair and longer gland-tipped hairs; bracts 2–3 mm long; peduncle 7–8 cm long; pedicels 12–17 mm long. **Calyx** lobes narrowly triangular, 5–7 × 0.8–0.9 mm, apex caudate, densely eglandular pubescent with few gland-tipped hairs at base. **Corolla** white with purple lines and yellow patch on lower lip, c. 28 mm long, funnelform, outside with sparse gland-tipped hairs throughout, inside with two lines of hairs from sinuses on lower lip down into tube; tube to sinus between upper and lower lips c. 20.5 mm; upper lip c. 7 mm long, lobes c. 6 × 5.5 mm; lower lip c. 8 mm long, lateral lobes c. 4.5 × 5.5 mm, central lobe c. 6.5 × 5.5 mm. **Stamens** inserted at c. 11 mm from corolla base; filaments filiform, c. 8 mm long, glabrous; anthers c. 0.9 ×

2.2 mm, glabrous; lateral staminodes not seen. *Nectary* c. 1.2 mm long, annular. *Pistil* 17–18 mm long; ovary 8–8.5 mm long, densely pubescent with mixed eglandular and gland-tipped hairs; style 8.5–10 mm long, with sparse short eglandular hairs. *Fruit* not seen.

Distribution. Peninsular Malaysia and Thailand.

Habitat and ecology. In montane forest at 830–1450 m in Thailand.

Additional specimens examined. THAILAND: **Yala:** Betong, Hala-Bala Wildlife Sanctuary, trail up unnamed ‘1490’ mountain reached from the shores of Bang Lang Reservoir, 1400 m, 24 May 2005, *Middleton et al.* 3658 (BKF, E); *ibidem*, 1450 m, 25 May 2005, *Poopath 301* (BKF); Betong, Ta Noh Ma Roh, 830 m, 23 Jul 2015, *Poopath et al.* 1301 (BKF).

Notes. The description above is only for the species as it is found in Thailand but for which there are few specimens available. In Peninsular Malaysia, where it is fairly widespread, it is known to be very variable (Ruth Kiew, pers. comm.).

In the field, *Codonoboea hispida*, *C. porphyrea* and *C. urticoides* are easily distinguished (see key and figures) but are less easily distinguished in the herbarium. Barnett (1962) did not include any material now included in *Codonoboea hispida* amongst the specimens she listed. Instead, all of the specimens she included in *Codonoboea hispida* have now been assigned to *C. porphyrea* or *C. urticoides*. Burt (2001) did not list any specimens under *Henckelia hispida* but material he identified as such is *Codonoboea porphyrea* or *C. urticoides* and none of the now-known material of *Codonoboea hispida* was collected before 2001.

I have included *Poopath et al.* 1301 in *Codonoboea hispida* with some hesitation as the inflorescences are more delicate than usual for the species and are 1-flowered, which is rare in *C. hispida*.

Vitek et al. (2000) designated a Curtis specimen at SING as the lectotype but there are two duplicates in SING which were not further distinguished. SING0043044 is designated here as the lectotype in a second step.

Although Ridley described *Didymocarpus hispidus* Ridl. var. *selangorensis* Ridl. from a single collection, he did not distinguish a holotype. Kiew & Lim (2011) gave the type as ‘holotype SING’ but there are three duplicates of the type collection, *Curtis* 3752, in SING. The duplicate SING0043046 is designated here as the lectotype.

5. *Codonoboea inaequalis* (Ridl.) Kiew, Gard. Bull. Singapore 62: 263 (2011); Smitinand, Thai plant names 147 (2014). – *Didymocarpus inaequalis* Ridl., J. Linn. Soc. 32: 506 (1896); Ridley, J. Straits Branch Roy. Asiat. Soc. 44: 41 (1905); Ridley, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 753 (1908). – *Henckelia inaequalis* (Ridl.) A. Weber, Beitr. Biol. Pflanzen 70: 347 (1998 [‘1997’]). – TYPE: [Peninsular Malaysia], Kedah, Langkawi, Gunong Chinchang [Gunung Machinchang], September 1890, *Curtis* 2568 (lectotype SING [SING0043050], designated here; isolectotype SING [SING0043051]). (Fig. 4)



Fig. 4. *Codonoboea inaequalis* (Ridl.) Kiew. **A.** Inflorescence. **B.** Infructescence. From Middleton *et al.* 5500. (Photos: Thammarat Phutthai)

Erect herb to 100 cm tall; stems densely appressed pubescent, with distinct internodes. **Leaves** alternate; petioles 0.4–2.1 cm long, densely appressed pubescent; laminae elliptic to slightly obovate, sometimes slightly falcate, 2.7–16 × 0.9–3.9 cm, apex acuminate, base cuneate, margin denticulate, 8–11 secondary veins on each side of midrib, midrib and veins flush with lamina or only very slightly raised or sunken above, covered in appressed eglandular hairs above and beneath, denser beneath and on venation. **Inflorescences** 8–12 cm long, 4–8-flowered, sparsely to densely eglandular pubescent with hairs of various lengths throughout; peduncle 5–8 cm long; pedicels 3–4 mm long, reddish green. **Calyx** green, tinged reddish or purple, lobes narrowly ovate, 2.5–5 × 0.8–1 mm, apex long caudate, densely eglandular pubescent. **Corolla** white, often tinged mauve, with yellow lines ventrally in throat, 36–52 mm long, narrow for about half of tube and then gradually flaring to throat, all lobes orbicular, apices rounded, outside sparsely pubescent with short eglandular and gland-tipped hairs, inside eglandular pubescent in upper half of tube dorsally and on upper lip, glabrous ventrally in tube and on lower lip; tube to sinus between upper and lower lips 26–36 mm long; upper lip 6.5–10 mm long, lobes 6.5–9.5 × 7.5–11 mm; lower lip 10–14 mm long, lateral lobes 5.5–8 × 6–10 mm, medial lobe 6.5–9.4 × 8–9.6 mm. **Stamens** inserted at 16–25 mm from corolla base; filaments 10–11.5 mm long, glabrous, with a short flattened projection beyond the end of the filament at the connection to anthers; anthers 0.8–1.1 × 3–3.8 mm, glabrous; staminodes not seen. **Nectary** 2.2–2.8 mm long, a ventral lobe, 3-lobed at apex. **Pistil** 25–35 mm long; ovary 11–13 mm long, densely short eglandular pubescent; style 14–22 mm long, densely pubescent with short gland-tipped and eglandular hairs. **Fruit** 2.5–4.7 cm long, 1.5–2.2 mm wide.

Distribution. Peninsular Malaysia and Thailand.

Habitat and ecology. In shade on rocky ground and cliffs in secondary or primary evergreen or heath forest, on quartzite or granite soils, often along streams. At 50–870 m.

Additional specimens examined. THAILAND: **Songkhla:** Hat Yai, Ko Hong Hill, 400 m, 14 Apr 1984, *Sirirugsa* 770 (PSU); *ibidem*, 50 m, 31 Dec 1985, *Maxwell* 85-1184 (BKF, PSU); Nathawee District, 19 Oct 2004, *Unknown* KKU 11008 (BKF); Nathawi, Khao Nam Khang National Park, hilltop 4 km S of park headquarters, 300 m, 28 Jan 2006, *Gardner* ST 2269 (BKF, K); Nathawi, Khao Nam Khang National Park, Na Thawee, S of Chana, 100 m, 13 Jun 1992, *Larsen et al.* 42863 (BKF); Klong Samong, 100 m, 21 Jul 1928, *Kerr* 15867 (K); Sadao, Khao Nam Kang, 90 m, 21 Sep 2010, *Middleton et al.* 5500 (BKF, E, K); Sadao, Khao Nam Kang, 100 m, 20 Oct 1991, *Larsen et al.* 42429 (BKF, P); Hat Yai, Summit of Ko Hong Hill, 400 m, 23 Sep 1984, *Maxwell* 84-249 (PSU); Hat Yai, 16 Apr 1963, *Pradit* 287 (BK). **Yala:** Than To, Mae Wat, trail to Khao Hin Yok peak, 500 m, 16 Dec 2015, *Poopath* 1419 (SING); Than To, Ban Chulaphon Phatthana 7 area, Khao Hin Yok, 415 m, 11 Feb 2004, *Middleton et al.* 2928 (A, BKF); Than To, Ban Chulaphon Phatthana 7 area, Khao Hin Yok, 600 m, 20 Oct 2003, *Poopath* 330 (BKF, E); Than To, Mae Wad, Churaphorn Phattana 7 project nature trail, 500 m, 5 May 2004, *Poopath* 28 (BKF); Than To, Khao Choh Tong, 800 m, 29 Apr 2001, *Puudjaa* 912 (BKF); Than To, Khao 870 m, Wong Sai ranger unit, 870 m, 18 Jul 2004, *Poopath*

109 (BKF); Betong, Ban Ko Mo 21, 300 m, 8 Aug 2009, *Wai 1121* (PSU); Bannang Sata, Tailing Chan, 400 m, 1 Aug 2000, *Niyomdham et al. 6340* (BKF).

Notes. This is one of the most distinctive species in Thailand due to its alternate petiolate leaves, long internodes, and the ventral, apically trilobed nectary. It is the only species in the informal ‘Glossadenia group’ (Lim & Kiew, 2014) in Thailand. The specimen *Smitinand 11026* (E) from Kue Long in Yala differs from other material of *Codonoboea inaequalis* in having more distinctly serrate leaf margins. Also, the leaves are generally on the small side for *Codonoboea inaequalis* although not outside the known range of variation of the species. The inflorescence and flower characters are within the known variation of the species. Further collections of this plant are needed to assess whether the unusual leaf characters of this one specimen indicate otherwise unknown *Codonoboea* diversity in Thailand.

Kiew & Lim (2011) listed this name as having a holotype in SING. However, there is no holotype and instead one of the two duplicates in SING is designated here as the lectotype.

6. *Codonoboea kolokensis* (B.L.Burtt) D.J.Middleton, *Edinburgh J. Bot.* 70: 390 (2013); Smitinand, *Thai plant names* 147 (2014). – *Henckelia kolokensis* B.L.Burtt, *Thai Forest Bull., Bot.* 29: 95 (2001). – TYPE: Thailand, Narathiwat, Nikhom Waeng, Sungai Kolok, 300–500 m, 4 March 1974, *Larsen & Larsen 32913* (holotype AAU; isotype E [E00050921]). (Fig. 5)

Erect herb to 50 cm tall; stems densely appressed pubescent, with distinct internodes. **Leaves** opposite; petioles 1.2–2 cm long, densely appressed pubescent; laminas elliptic to oblong, sometimes slightly falcate, 11.5–16 × 2.4–3.7 cm, apex acuminate, base cuneate, margin denticulate, 10–12 secondary veins on each side of midrib, midrib more or less flush with lamina, with transverse ridges and irregular lumps above and beneath, glabrous above, sparsely appressed pubescent beneath, primarily on venation. **Inflorescences** 2–5-flowered, 7.5–10 cm long, sparsely eglandular pubescent throughout; peduncle filiform, 6–8 cm long; bracts linear, to 5 mm long, densely appressed pubescent; pedicels 2–3 mm long. **Calyx** lobes narrowly triangular, 3.5–3.9 × 0.6–1.5 mm, apex acute, appressed pubescent. **Corolla** dark purple, lobes cream inside, c. 29 mm long, narrowly funnelform, all lobes orbicular, apices rounded, outside with gland-tipped hairs, inside densely pubescent in two rows in line with sinuses on lower lip, the hairs almost to the base of the corolla tube; tube to sinus between upper and lower lips c. 20 mm long; upper lip c. 5 mm long, lobes c. 5 × 5.2 mm; lower lip 6.8–9 mm long, lateral lobes 1.8–4.7 × 2.8–5.7 mm, central lobe 3–5 × 3.3–7.5 mm. **Stamens** inserted at c. 8 mm from corolla base; filaments filiform, c. 6.5 mm long, glabrous; anthers c. 1.2 × 2.5 mm, glabrous; staminodes 0.3–2 mm long. **Nectary** irregularly annular, 1.2–1.5 mm long, margin crenate. **Pistil** c. 16 mm long; ovary c. 8 mm long, densely pubescent with minute eglandular hairs, these sometimes so small as to appear papillose; style c. 8 mm long, densely eglandular pubescent. **Fruit** not seen.



Fig. 5. *Codonoboea kolokensis* (B.L.Burtt) D.J.Middleton. (Photo: Manop Poopath)

Distribution. Endemic to Thailand.

Habitat and ecology. Evergreen forest at 225–500 m.

Additional specimens examined. THAILAND: **Narathiwat:** Sukhirin, Phu Khao Tong, To Mo Cheak Dam, 300 m, 8 Sep 2004, *Poopath 163* (BKF, E); *ibidem*, 225 m, 6 Jun 2004, *Poopath 35* (BKF, E).

7. *Codonoboea oreophila* Kiew ex C.L.Lim, *Blumea* 58: 68 (2013). – TYPE: Peninsular Malaysia, Kelantan, Gunung Stong State Park, Gunung Stong, 1231 m, 26 July 2008, *Lim et al. FRI 56646* (holotype KEP n.v.; isotypes E [E00854638], K [K001392795], L [L.4313924], SING [SING0370320]). (Fig. 6)

Rosette herb with a woody rootstock, occasional side branches possibly forming runners; stem densely hispid with long fine uniseriate hairs. **Leaves** densely congested, phyllotaxy obscure; petioles 1.5–5 cm long, densely hispid; laminas dark dull green above, pale green beneath, elliptic to slightly obovate, 4.8–8.2 × 3–5 cm, apex rounded to obtuse, often apiculate, base rounded to obtuse, margin serrate to crenate, 8–9 secondary veins on each side of midrib, midrib and veins more or less flush with lamina, tertiary venation mostly obscure, densely long hispid above and



Fig. 6. *Codonoboea oreophila* Kiew ex C.L.Lim. From *Poopath* 366. (Photo: Manop Poopath)

beneath. **Inflorescences** scapose, 1-flowered, axes purple, 11–13 cm long, densely short pubescent throughout with the occasional longer gland-tipped hair; bracts linear, 1.5–2 mm long, towards apex of peduncle, these caducous before fruiting. **Calyx** green tinged purple, lobes narrowly triangular, $2.3\text{--}2.6 \times 0.8\text{--}0.9$ mm, with eglandular hairs of various lengths. **Corolla** white tinged purple, white inside, 16–17 mm long, narrow at base, upper part campanulate, slightly pouched ventrally, all lobe apices rounded, outside with sparse hairs throughout, denser towards base of tube, inside with eglandular hairs on all lobes and sparsely at top of tube, few small robust hairs behind stamens; tube to sinus between upper and lower lips 9–10 mm long; upper lip 4.5–6.5 mm long, lobes squarish, $4\text{--}5 \times 3.2\text{--}5.5$ mm; lower lip 9–10 mm long, lateral lobes orbicular, $3.5\text{--}5.5 \times 3.8\text{--}5$ mm, central lobe orbicular, $5\text{--}5.5 \times 3.3\text{--}5.5$ mm. **Stamens** inserted at c. 3.5 mm from corolla base; filaments straight, c. 4.5 mm long, glabrous; anthers c. 1.4×2.5 mm, glabrous, very slightly spurred at connective; staminodes c. 2 mm long. **Nectary** irregularly annular, c. 0.5 mm long, margin crenate. **Pistil** c. 11.5 mm long; ovary c. 5.5 mm long, densely pubescent with minute eglandular hairs; style c. 6 mm long, densely eglandular pubescent. **Fruit** 3.1–4.7 cm long, 1.5–2 mm wide.

Distribution. Peninsular Malaysia and Peninsular Thailand.

Habitat and ecology. In Thailand known from lower montane forest at 1350–1420 m.

Additional specimens examined. THAILAND: **Yala:** Khao Han Kut, 1350 m, 27 Mar 1998, Niyomdham 5373 (BKF); Betong, Hala-Bala Wildlife Sanctuary, Near the summit of unnamed

'1490' mountain reached from the shores of Bang Lang Reservoir, 1420 m, 4 Sep 2005, *Poopath 366* (BKF, E).

Notes. Only known from Gunong Stong in Kelantan, Malaysia, and Betong District of Yala, Thailand but is likely to occur on other mountains of sufficient height in Kelantan, Perak, Yala and Narathiwat. It is very distinctive among the Thai *Codonoboea* species by its leaf shape.

8. *Codonoboea platypus* (C.B.Clarke) C.L.Lim, Gard. Bull. Singapore 62: 267 (2011); Smitinand, Thai plant names 147 (2014). – *Didymocarpus platypus* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 94 (1883); Ridley, J. Straits Branch Roy. Asiat. Soc. 33: 120 (1900); Ridley, J. Straits Branch Roy. Asiat. Soc. 44: 46 (1905); Ridley, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74(4): 757 (1909); Ridley, Fl. Malay Pen. 2: 517 (1923); Barnett, Fl. Siam 3(3): 213 (1962), p.p.; Kiew, Malay Nat. J. 41: 220 (1987); Lindsay et al., Gard. Bull. Singapore 74(suppl. 1): 372 (2022). – *Henckelia platypus* (C.B.Clarke) A.Weber, Beitr. Pflanz. 70: 352 (1998 ['1997']). – TYPE: [Peninsular Malaysia], Malacca [Melaka], *Griffith 3825* (lectotype K [K000858232], designated by Kiew & Lim (2011)). (Fig. 7)

Didymocarpus crinitus auct. non Jack: Barnett, Fl. Siam 3(3): 213 (1962).

Codonoboea crinita auct. non (Jack) C.L.Lim: Smitinand, Thai plant names 147 (2014).

Decumbent or erect herb to 100 cm tall; stems densely covered in short acicular hairs and much longer eglandular uniseriate hairs. **Leaves** alternate, densely clustered towards stem apex, occasionally more widely spaced; petioles winged so not easily defined, 0.5–2 cm long, wing 2–8 mm on either side, reaching base or not, sometimes widest at base and more deeply serrate than lamina; laminae dark green above, paler green beneath, sometimes tinged purple, elliptic to obovate, (4.5–)9–27 × 4–6.5 cm, apex acuminate, base attenuate to cuneate, margin serrate or doubly serrate, 11–25 secondary veins on each side of midrib, tertiary venation anastomosing between secondary veins, midrib and veins flush with lamina or only very slightly raised or sunken above, above densely long pubescent with hairs with a bulbous base, beneath a mixture of dense short hairs along with dense much longer eglandular uniseriate hairs all over. **Inflorescences** 1–2-flowered, often several arising from a single leaf axil, 7–10 cm long, densely pubescent with a mix of long and short hairs; peduncle/pedicele 2.5–5 cm long. **Calyx** lobes narrowly triangular, 3–4 × 1.3–1.7 mm, densely eglandular pubescent. **Corolla** white to pale lilac, often white throughout except for lilac corolla lobe margins, with 2 yellow lines in throat, 31–55 mm long, narrowly funnelform, all lobes orbicular, apices rounded, outside with sparse short gland-tipped hairs throughout, denser towards lobes, inside with short-stalked glands at bases of lobes, denser and slightly larger at base of dorsal lobes, robust hairs in line with sinuses



Fig. 7. *Codonoboea platypus* (C.B.Clarke) C.L.Lim. (Photo: Manop Poopath)

of lower lip down into tube almost to insertion of stamens; tube to sinus between upper and lower lips 17–35 mm long; upper lip 7–13 mm long, lobes 6–7 × c. 8 mm; lower lip 11.5–15 mm long, lateral lobes 7–8.5 × 6.5–7.5 mm, central lobe 9–10 × c. 8 mm.

Stamens inserted at 11.5–28 mm from corolla base; filaments 6–9 mm long, glabrous, with spurs or a short flap at the insertion into anthers; anthers 0.8–0.9 × 2.4–2.5 mm; lateral staminodes c. 8.5 mm long. **Nectary** irregularly annular, 0.7–1.1 mm long, margin crenate. **Pistil** 17.5–36 mm long, densely covered in long eglandular hairs throughout, with or without the occasional gland-tipped hair; ovary 10–22 mm long; style 10–17.5 mm long. **Fruit** 4.5–8 cm long, 1.8–2.5 mm wide.

Distribution. Thailand, Peninsular Malaysia, Sumatra.

Habitat and ecology. In shade or more open areas in wet or dry primary or secondary evergreen forest at 30–1000 m.

Additional specimens examined. THAILAND: **Nakhon Si Thammarat:** Khiriwong, 400 m, 15 May 1968, *Van Beusekom & Phengkklai* 759 (BKF, E, K, P); Khao Luang, 625 m, 3 Feb 1966, *Hennipman* 3827 (BKF, K, P); *ibidem*, 200 m, 21 Aug 1967, *Iwatsuki et al.* T-14520 (BKF); *ibidem*, 600 m, 7 Nov 1951, *Smitinand* 1045 (BKF, E); *ibidem*, 600 m, 7 Aug 1951, *Smitinand* 917 (BKF, E); Khao Luang, Middle elevation, 680 m, 18 Jan 1966, *Tagawa et al.* T-4638 (BKF, E); *ibidem*, 680 m, 19 Jan 1966, *Tagawa et al.* T-4661 (BKF). **Phatthalung:** Khao Soi Dao, 29 Apr 1930, *Kerr* 19230 (K). **Trang:** Khao Chong, 14 Apr 1928, *Kerr* 15196 (BM, K); *ibidem*, 15 Nov 1959, *Smitinand & Abbe* 6150 (BKF, K). **Pattani:** Bukit, 25 Jan 1931, *Put* 3638 (K); *ibidem*, 7 Jun 1930, *Kiah* 24252 (K, P, SING); Bulait, 100 m, 8 Jul 1923, *Kerr* 7115 (BM, K). **Yala:** Betong, Than Num Thip, trail behind Sa Ho Dam, 370 m, 21 Jul 2015, *Poopath et al.* 1258 (SING); Khao Pok Yok, 1000 m, 10 Oct 1991, *Larsen et al.* 42281 (BKF, P); Nikom Kua Long, 150 m, 23 Dec 1972, *Santisuk* 490 (BKF); Bannang Sata, Khuean Bang Lang, Churaphorn Phattana 7th Project, Khao Chalong Chai, 600 m, 14 Jul 2005, *Poopath* 324 (BKF); Than To, Ban Chulaphon Phatthana 7 area, 200 m, 31 Oct 2001, *Pooma et al.* 3192 (BKF); Than To, Ban Chulaphon Phatthana 7 area, Along Tomo River, 160 m, 20 May 2005, *Middleton et al.* 3498 (BKF, E); Than To, Ban Chulaphon Phatthana 7 area, Khao Hin Yok, 660 m, 11 Feb 2004, *Middleton et al.* 2967 (A, BKF); Than To, Mae Wad, Churaphorn Phattana 7 project nature trail, 200 m, 15 Jul 2004, *Poopath* 100 (BKF); *ibidem*, 250 m, 27 Oct 2005, *Poopath* 400 (BKF, E); *ibidem*, 180 m, 14 Jun 2004, *Poopath* 86 (BKF). **Narathiwat:** s.l. *Winit s.n.* (BKF); Ban Bala, S of Waeng, 200 m, 16 Aug 1995, *Larsen et al.* 45673 (K, SING); Sungei Kolok, Nikom Waeng, 2 Mar 1974, *Larsen & Larsen* KL 32846 (AAU, BKF, E); *ibidem*, 25 Sep 1966, *Sangkhachand* 428 (BK); Nikom Waeng, 25 Sep 1966, *Prayad* 428 (BK); Waeng, 20 Aug 1966, *Sangkhachand & Nimanong* 1246 (BKF, P); *ibidem*, 30 Jun 1972, *Nitrasirirak* 203 (BKF, E); Waeng, Bala-Hala Wildlife Sanctuary, 24 Jan 1998, *Puudjaa* 461 (BKF); *ibidem*, Lo Jud, 80 m, 23 Oct 2005, *Poopath* 382 (BKF, E); Sukhirin, Phu Khao Tong, To Mo Cheak Dam, 185 m, 6 Jun 2004, *Poopath* 38 (BKF, E); *ibidem*, 185 m, 6 Jun 2004, *Poopath* 39 (BKF); Sukhirin, Khao Ai Kapok, 20 Oct 1996, *Niyomdham* 4826 (BKF); Sukhirin, To Mo, Ban Kabibi, 150 m, 23 Apr 1931, *Lakshnakara* 771 (BM, K); Sungei Padi, Chatwarin Falls, 14 Mar 1986, *Smitinand s.n.* (BKF); *ibidem*, 200 m, 22 Apr 1995, *Niyomdham* 4054 (BKF); Sungei Padi, Chatwarin, 100 m, 8 Oct 1991, *Larsen et al.* 42217 (BKF, P).

Notes. This is one of three species in the ‘Heteroboaea group’ (see Lim & Kiew, 2014) in Thailand, the others being *Codonoboaea rugosa* and *C. appressipilosa*. *Codonoboaea platypus* is close to *C. crinita* (Jack) C.L.Lim from Peninsular Malaysia and the distinction between the two species is far from satisfactory. Both Barnett (1962) and

Burt (2001) discussed the two species, Burt also bringing in the related *Codonoboea rugosa*. Barnett (1962), under the genus *Didymocarpus*, included both *Codonoboea platypus* and *C. crinita* for Thailand and suggested they could be distinguished on the pubescence of the leaves but also noted several specimens intermediate between the two species. Most of her concept of *Codonoboea platypus* is here treated as *C. rugosa* and all of the material she treated as intermediate is here treated as *C. platypus*. Burt (2001), under the genus *Henckelia*, suggested that true *Codonoboea crinita* was not to be found in Thailand but agreed with Barnett that there were specimens intermediate between *C. crinita* and *C. platypus* 'in the direction of *H. platypus* [*C. platypus*]'. He went on to note that the distinction between *Codonoboea platypus* and *C. rugosus* was also difficult and that there were also intermediates between these two species. I include almost all of the material treated by Burt as *Codonoboea platypus* and material he suggested was intermediate between it and both *C. crinita* and *C. rugosa* under *C. platypus*. *Codonoboea platypus* in Thailand is consequently very variable, particularly in the indumentum characters that have often been used to distinguish the species in the past. My concept of true *Codonoboea rugosa* matches that of Burt (2001).

I present here a pragmatic solution to a rather intractable problem that requires an in-depth morphological and molecular study of the *Heteroboea* group in both Thailand and Peninsular Malaysia. In Peninsular Malaysia the problems are even greater as there are other similar species in the group (e.g., *Codonoboea quinquevulnera* (Ridl.) C.L.Lim and *C. curtisii* (Ridl.) C.L.Lim) but a solution to the problems in Thailand cannot be reached without also understanding the Malaysian species. It is possible that the intermediates noted by Barnett (1962) and Burt (2001) are due to hybridisation. It is also to be noted, however, that the flowers in this group are fairly large and delicate and there are very few specimens that have good enough flowers to study satisfactorily. Field studies and pickled flowers from a range of populations may lead to characters not yet identified as diagnostic for taxa in the group.

I am unsure of the placement of two collections, *Pooma et al.* 5128 and *Santisuk & B.N.* 490, both from Yala, which have a particularly fine and dense indumentum that is similar to the indumentum of *Codonoboea crinita* but are here placed in *C. platypus* pending further studies.

9. *Codonoboea poopathii* D.J.Middleton, **sp. nov.**

Most similar to *Codonoboea craspedodroma* (Kiew) Kiew in the deeply sunken secondary veins which end in the sinus between the teeth of the leaf lamina margin but it differs in the shorter leaf laminas (3.5–8 cm vs 9–16 cm), smaller marginal teeth, and longer corolla (30–36 mm vs c. 12 mm). It differs from all other species in the 'Pectinati group' in *Codonoboea* in the generally smaller leaves and secondary veins ending in the sinuses between the teeth (the veins in the other species in the group fork before reaching the sinus or the leaf lamina is deeply divided and hence the lateral veins are very short). – TYPE: Narathiwat, Sukhirin, Hala-Bala WS, Khao Ai Dang, 600 m, 24 October 2005, *Poopath 384* (holotype BKF [SN194025]). (Fig. 8)



Fig. 8. *Codonoboea poopathii* D.J.Middleton. From *Poopath* 384. (Photo: Manop Poopath)

Perennial herb to 25 cm tall; short stem woody, to 18 mm diam. including old and persistent leaf bases, with long pale brown (when dried) hairs throughout. **Leaves** opposite but this partly obscured by being densely clustered at stem apex; petioles 0.8–2 cm long, densely covered in long hairs; laminas oblong, narrowly elliptic or narrowly obovate, 3.5–8 × 1–2.2 cm, apex short acuminate, base cuneate, margin serrate to crenate, 15–25 secondary veins on each side of midrib, deeply sunken above and strongly raised beneath giving the lamina a corrugated appearance, veins mostly reaching to the sinus between the marginal teeth and then more weakly extending

submarginally towards sinus of next tooth, occasionally forking before margin in sinuses towards base, with long hairs on midrib above and beneath, more sparsely so on secondary veins beneath, papillose all over beneath. **Inflorescences** several per plant, scapose, 1–3-flowered, 14–18 cm long; peduncles 7–14 cm long, with sessile glands, sparse short acicular hairs and occasional much longer hairs; bracts $4\text{--}5.5 \times 1.7\text{--}2.5$ mm, glabrous or with occasional long hair; pedicels 3–20 mm long, indumentum as on peduncle but more densely so; flowers nodding. **Calyx** lobes triangular, $2\text{--}3 \times 0.6\text{--}1$ mm, indumentum as on pedicels. **Corolla** bluish pink to lilac, with two pale yellow stripes ventrally in tube, 30–36 mm long, narrowly funnellform, all lobes orbicular, apices rounded, outside sparsely pubescent with gland-tipped hairs, inside with few robust gland-tipped hairs behind stamens; tube to sinus between upper and lower lips 18–24 mm long; upper lip 3.5–5 mm long, lobes $3.5\text{--}5 \times 3\text{--}6$ mm; lower lip 7.5–10.5 mm long, lateral lobes $2.4\text{--}5 \times 3.4\text{--}6$ mm, central lobe $3.2\text{--}6.5 \times 2.8\text{--}5.5$ mm. **Stamens** inserted at 6–13 mm from corolla base; filaments filiform, 7–17 mm long, glabrous; anthers $0.8\text{--}1.1 \times c. 2$ mm, glabrous; staminodes 0.3–2 mm long. **Nectary** annular, 0.7–1.2 mm long, margin crenate. **Pistil** 18–22 mm long; ovary c. 11 mm long, densely pubescent with minute eglandular hairs and occasional gland-tipped hairs towards apex; style 7–11 mm long, densely pubescent with gland-tipped hairs. **Fruit** not seen.

Distribution. This species has only been recorded from Khao Ai Dang in Hala-Bala Wildlife Sanctuary.

Habitat and ecology. In shade in moist evergreen forest on quartzite rock at 500–600 m.

Etymology. This new species is named after Mr Manop Poopath of the Bangkok Forest Herbarium who has collected many interesting Gesneriaceae in Thailand, including material of this new species.

Additional specimens examined. THAILAND: **Narathiwat:** Sukirin, Khao Ai Dang Noi, 12 Apr 1997, Niyomdham & Puudjaa 5004 (BKF); Bala-Hala [Hala-Bala], Khao Ai Daang [Khao Ai Dang], 500 m, 21 Aug 1998, Niyomdham & Puudjaa 5543 (BKF).

Notes. *Codonoboea poopathii* D.J.Middleton belongs in the ‘Pectinati group’ of species (Kiew, 1987; Lim & Kiew, 2014) in which the secondary veins are deeply sunken above and strongly raised beneath. Kiew (1987) notes that the venation pattern at the margin is characteristic for some species in this group. The pattern in *Codonoboea poopathii* is most similar to that in *Codonoboea craspedodroma* (Kiew) Kiew whereby the deeply sunken secondary veins reach directly to the sinus between the teeth of the margin in most cases (sometimes forking before margin in veins towards lamina base).

10. *Codonoboea porphyrea* (B.L.Burtt) D.J.Middleton, Edinburgh J. Bot. 70: 392 (2013); Smitinand, Thai plant names 147 (2014). – *Henckelia porphyrea* B.L.Burtt,

Thai Forest Bull., Bot. 29: 96 (2001). – TYPE: Thailand, Ranong, Khao Pota Luang Kaeo, 700–900 m, 22 June 1974, *Geesink et al.* 7417 (holotype BKF; isotypes AAU, K [K000858270], L [L0281658], P [P04060375]). (Fig. 9)

Didymocarpus flavus auct. non Ridl.: Barnett, Fl. Siam. 3(3): 214 (1962).

Henckelia flava auct. non (Ridl.) A. Weber: Burt, Thai For. Bull. (Bot.) 29: 95 (2001).

Codonoboa flava auct. non (Ridl.) Kiew: Smitinand, Thai plant names 147 (2014).

Didymocarpus hispidus auct. non Ridl.: Barnett, Fl. Siam. 3(3): 214 (1962), p.p.

Henckelia hispida auct. non (Ridl.) A. Weber: Burt, Thai Forest Bull., Bot. 29: 95 (2001), p.p.

Erect herb to 100 cm tall; stems densely pubescent with appressed hairs, slightly glabrescent with age. **Leaves** spaced along stems, opposite; petioles 0.4–2.6 cm long, delicate, densely short pubescent with appressed hairs; laminae thin, elliptic, 2.5–12.5 × 0.6–4 cm, apex acuminate, base cuneate, margin denticulate to crenulate, 6–9 secondary veins on each side of midrib, midrib and veins flush with lamina or only very slightly raised or sunken above, with occasional short hairs on midrib and infrequently on secondary veins above, more densely so on midrib and secondary veins and near margin beneath. **Inflorescences** axillary, 5.5–9.5 cm long, 1–2(–6)-flowered; peduncle 2.7–5.7 cm long, densely covered in short eglandular hairs and longer gland-tipped hairs; bracts linear, indumentum as on peduncle; pedicels reddish or purple, 5–37 mm long, with dense mixture of eglandular and gland-tipped hairs. **Calyx** reddish or purple, lobes narrowly ovate, 2.2–5.5 × 0.6–1.2 mm, sparsely to densely pubescent with a mix of eglandular and longer gland-tipped hairs. **Corolla** pendent, pale purple at very base, otherwise mid purple with darker purple hairs, upper lip pale purple, lower lip dark or pinkish purple with two yellow stripes ventrally on lower lip and in tube, 33–45 mm long, somewhat sinuate, tube narrow at base, then flaring gradually, slightly dorso-ventrally compressed, upper lip reflexed, lower lip prominent, all lobes orbicular, apices rounded, outside sparsely pubescent with gland-tipped hairs, inside with sparse short-stalked gland-tipped hairs on lower lip; tube to sinus between upper and lower lips 22–32 mm long; upper lip 5.5–10 mm long, lobes 3.5–4.5 × 5–5.5 mm; lower lip 12–13 mm long, lateral lobes 4–5 × 4.8–5 mm, central lobe c. 5.5 × 7 mm. **Stamens** inserted at 12–18 mm from corolla base; filaments filiform, 9–11 mm long, glabrous; anthers 1.2–1.4 × 2.2–2.7 mm, glabrous; lateral staminodes c. 3.5 mm long, medial staminode c. 1.5 mm long. **Nectary** oblique annular, 1.4–2 mm long, margin crenate. **Pistil** 25–28 mm long; ovary 14–15 mm long, sparsely to densely pubescent with minute eglandular hairs and longer gland-tipped hairs, the relative mix of eglandular and gland-tipped hairs very variable; style 11–13 mm long, sparsely pubescent with minute eglandular hairs and occasional gland-tipped hair. **Fruit** 5–5.2 cm long, 1.5–2 mm wide, sparsely and minutely puberulent.



Fig. 9. *Codonoboea porphyrea* (B.L.Burtt) D.J.Middleton. **A.** Inflorescence. **B.** Flower, side view. A from *Williams et al. 1304*; B from *Middleton et al. 4388*. (Photos: A, Rachun Pooma; B, D.J. Middleton)

Distribution. Endemic to Thailand.

Habitat and ecology. In shade in evergreen forest and montane forest on sandy to clay soils at 100–1600 m.

Additional specimens examined. THAILAND: **Chumphon:** Langsuan, Kao Nom Sao, 300 m, 20 Feb 1927, *Kerr 12020* (BM). **Ranong:** Kapoe, Kampon, 150 m, 20 Nov 1973, *Santisuk 630* (BKF); Khao Pota Luang Kaeo, 500 m, 29 Nov 1973, *Santisuk 709* (BKF); Khao Paw Ta Luang Keo, 700–1300 m, 29 Apr 1974, *Larsen & Larsen KL 33476* (E); Kra Buri, Thungraya Nasak Wildlife Sanctuary, Along Bok Krai River, 200 m, 28 Aug 2002, *Middleton et al. 1435* (BKF); La-Un, Rawi, 14 Jun 2002, *Maknoi 248* (QBG). **Surat Thani:** Bandon, 366 m, *Robinson 5783* (K); Khao Nong, 1000 m, 10 Aug 1927, *Kerr 13263* (K). **Phang Nga:** Khao Katalawam, 700 m, 7 Mar 1930, *Kerr 19358* (BM); Klong Hin Poeng, 600 m, 27 Mar 2000, *Suksathan 2493* (QBG). **Krabi:** Khao Phanom District, Khao Phanom Bencha National Park, Trail from Ban San to top of Khao Phanom Bencha, 600 m, 18 Jun 2006, *Williams et al. 1865* (BKF). **Nakhon Si Thammarat:** Khao Luang, 1200 m, 21 Jan 1966, *Tagawa et al. T-4856* (BKF, E); *ibidem*, 1400 m, 21 Jul 1999, *Watthana et al. 455* (E, QBG); *ibidem*, 1600 m, 25 Jun 1953, *Plernchit 582* (BKF, E); *ibidem*, 25 Jan 1966, *Hansen & Smitinand 12061* (BKF, E, SING); *ibidem*, 28

Jan 1966, *Sakol 857* (BK); *ibidem*, 600 m, 26 Apr 1953, *Phloenchit 572* (BKF); *ibidem*, 600 m, 31 Aug 1953, *Phloenchit 419* (BKF, E); *ibidem*, 600 m, 5 Aug 1951, *Smitinand 861* (BKF); *ibidem*, 720 m, 22 Aug 1967, *Iwatsuki et al. T-8328* (BKF); *ibidem*, 950 m, 23 Aug 1967, *Iwatsuki et al. T-8407* (BKF); *ibidem*, 976 m, 18 Mar 2010, *Chamchumroon et al. 3659* (BKF, SING); *ibidem*, 18 May 1968, *Van Beusekom & Phengkklai 844* (BK, E, K, P); *ibidem*, 900 m, 29 Apr 1928, *Kerr 15468* (ABD, K); *ibidem*, 700 m, 24 Aug 1995, *Larsen et al. 45954* (BKF, SING); Na Bon, Nam Tok Yong National Park, Khao Maen, 106 m, 9 Feb 2005, *Williams et al. 1304* (BKF, E, K); Ron Phibun, Namtok Yong National Park, Khao Ram Rom, 934 m, 17 Dec 2009, *Chamchumroon et al. 3474* (BKF); *ibidem*, 850 m, 9 Sep 2008, *Middleton et al. 4388* (BKF, E, SING).

Notes. This species was first highlighted by Barnett (1962) as differing from *Didymocarpus hispidus* (= *Codonoboea hispida*) in having fewer flowers in the inflorescence and a larger corolla although she did not describe it due to lack of suitable material. She also included other material in her concept of *Didymocarpus hispidus*, followed later by Burt (2001) under the name *Henckelia hispida*, that I here also include in *Codonoboea porphyrea*, restricting *Codonoboea hispida* in Thailand only to a few specimens from Yala. They are most easily distinguished when fresh by the intensely purple lower lip of *Codonoboea porphyrea* with two distinct yellow lines from the lip down into the tube (white with several thin purple lines in *C. hispida*) and the larger corolla in *C. porphyrea* (33–45 mm long vs c. 28 mm long). Although the inflorescence tends to be 1-flowered in *Codonoboea porphyrea* and mostly not 1-flowered in *C. hispida*, the inflorescence in *C. porphyrea* can be up to 6-flowered and that of *C. hispida* can be 1-flowered. The flowers of *Codonoboea porphyrea* are also more pendent than those of *C. hispida*.

The record of *Didymocarpus flavus* Ridl. and its homotypic synonym *Henckelia flava* (Ridl.) A. Weber for Thailand is based on a single collection, *Robinson 5783* (K) from Bandon, Surat Thani. This specimen is here identified as *Codonoboea porphyrea*.

11. *Codonoboea reptans* (Jack) C.L.Lim, Gard. Bull. Singapore 62: 269 (2011); Smitinand, Thai plant names 147 (2014). – *Didymocarpus reptans* Jack, Malayan Misc. 1(5): 3 (1820); Ridley, J. Straits Branch Roy. Asiat. Soc. 44: 42 (1905); Ridley, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 754 (1908); Ridley, Fl. Malay Pen. 2: 515 (1923). – *Henckelia reptans* (Jack) Spreng., Syst. Veg. ed. 16, 4(2): 14 (1827). – TYPE: [Peninsular Malaysia], Pulo Pinang [Penang], 1822, *G. Porter EIC 787* (neotype K-W [K001111898], designated here – see notes below).

Didymocarpus reptans var. *monticola* Ridl., J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 755 (1908); Barnett, Fl. Siam. 3(3): 217 (1962). – *Henckelia reptans* var. *monticola* (Ridl.) A. Weber, Beitr. Biol. Pflanzen 70: 354 (1998 [‘1997’]). – *Codonoboea reptans* var. *monticola* (Ridl.) C.L.Lim, Gard. Bull. Singapore 62: 270 (2011). – TYPE: [Peninsular Malaysia], Perak, Larut Hills, 1892, *Ridley 2913* (lectotype BM, designated by Kiew & Lim (2011)).

Creeping herb; stems densely covered in short to long purple (always?) uniseriate hairs to 7 mm long, with distinct internodes. **Leaves** opposite; petioles 0.7–2.3 cm long, with dense long uniseriate hairs; laminae elliptic to very slightly obovate, sometimes slightly asymmetrical, apex acuminate, base cuneate, 1.7–8 × 0.9–2.8 cm, margin entire, long-ciliate, 4–5 secondary veins on each side of midrib, tertiary venation reticulate, midrib and veins flush with lamina or only very slightly raised or sunken above, sparsely covered with long uniseriate hairs to 4 mm long above and below, denser on venation and margin. **Inflorescences** 1-flowered, 2.5–2.8 cm long; peduncle/pedicel 11–13 mm long, with a mixture of short eglandular and gland-tipped hairs and occasional long uniseriate hair. **Calyx** lobes narrowly ovate, 2–3 × 0.3–0.7 mm, covered with long uniseriate hairs. **Corolla** white with 2 yellow stripes ventrally in throat, 13–15 mm long, tube gradually flaring from base, lobes oblong, apices rounded, outside with sparse small gland-tipped hairs, inside with sparse short gland-tipped hairs on lobes and eglandular hairs from base of lower lip to base of tube; tube to sinus between upper and lower lips 8.2–8.5 mm long; upper lip 4–5 mm long, lobes 3.7–4 × 3–3.2 mm; lower lip 6–7.5 mm long, lateral lobes 4.5–4.7 × 2.9–3.5 mm, central lobe 4.5–5.5 × c. 3.7 mm. **Stamens** inserted at c. 5 mm from corolla base; filaments c. 4 mm long, slightly sinuous, glabrous, connective to anthers with a bulbous knob; anthers c. 0.6 × 1.5 mm; lateral staminodes c. 1 mm long, medial staminode c. 0.3 mm long. **Nectary** only on ventral side, c. 1 mm long, 3-dentate at apex. **Pistil** c. 12.5 mm long, with dense short eglandular hairs throughout; ovary c. 8 mm long; style c. 4.5 mm long. **Fruit** 19–21 mm long, 1.3–1.7 mm wide, short eglandular pubescent.

Distribution. Thailand, Myanmar, Peninsular Malaysia. In Thailand only known from Betong District.

Habitat and ecology. In shade in evergreen forest at 200–900 m.

Additional specimens examined. THAILAND: **Yala:** Betong, Gunong Ina, 900 m, 10 Aug 1923, *Kerr 7537* (BM, K); Betong, 200 m, 13 Aug 1923, *Kerr 7620* (BM, K); Betong, Hala-Bala Wildlife Sanctuary, 22 Jun 1999, *Niyomdham & Puudjaa 5709* (BKF); Betong, Ta Noh Ma Roh, 850 m, 2 Feb 2016, *Poopath et al. 893* (SING); Betong, Ban Ko Mo 21, 300 m, 8 Aug 2009, *Wai 1120* (PSU).

Notes. Kiew & Lim (2011) listed the type of *Codonoboea reptans* thus: ‘Peninsular Malaysia, Pulau Pinang [Penang], 1830, *Wallich 1830* (neotype K)’. The collection in the East India Company herbarium with the number 1830 is a specimen of *Callicarpa nudiflora* Hook. & Arn. in the Lamiaceae and is therefore in serious conflict with the protologue and can be overturned (Art. 9.19 – Turland et al., 2018). A specimen collected in 1822, *EIC 787* (K-W), is a suitable candidate for neotype and is designated here.

Based on two specimens from Yala, Barnett (1962) recognised *Didymocarpus reptans* var. *monticola* as occurring in Thailand. These specimens, along with the type of the variety from Perak in Malaysia, are insufficiently distinct from the type

variety to recognise as a separate taxon. I have not examined the other varieties of *Codonoboea reptans*, which have not been recorded for Thailand, and therefore make no suggestions as to whether they be considered synonyms or not. However, Kiew & Lim (2011) noted that these varieties were even less distinct from the type variety than *Codonoboea reptans* var. *monticola*.

12. *Codonoboea rugosa* (Ridl.) C.L.Lim, Gard. Bull. Singapore 62: 271 (2011); Smitinand, Thai plant names 147 (2014). – *Didymocarpus rugosus* Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 45 (1905); Ridley, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74: 756 (1908); Ridley, Fl. Malay Pen. 2: 517 (1923). – *Henckelia rugosa* (Ridl.) A. Weber, Beitr. Biol. Pflanzen 70: 355 (1998 [‘1997’]). – TYPE: [Peninsular Malaysia], Kelantan, Kuala Lebir, *Gimlette s.n.* (lectotype SING [SING0043068], designated here). (Fig. 10)

Didymocarpus platypus auct. non C.B. Clarke: Barnett, Fl. Siam 3(3): 213 (1962).

Decumbent or erect herb to 100 cm tall; stems densely long pubescent. **Leaves** alternate, crowded towards stem apex, more rarely spaced along stem; petiole 0.5–2.5 cm long, winged to base; lamina elliptic to obovate, often bullate above, (6.5–)9.5–35 × 2.8–8 cm, apex acuminate, base attenuate, margin serrate, more deeply so on petiole wing, 27–57 secondary veins on each side of midrib, tertiary venation scalariform directly linking the secondary veins, at least in lower half of leaf, sometimes barely anastomosing between secondary veins in upper half of leaf, midrib and veins flush with lamina or only very slightly raised or sunken above, above with sparse long hairs on midrib and on lamina, usually only 1 or 2 hairs per areole, rarely more, beneath with short acicular hairs on all venation plus longer uniseriate hairs on midrib and secondary veins. **Inflorescences** 1-flowered, 7–17 cm long, densely pubescent throughout with hairs eglandular or gland-tipped and of varying lengths; bracts linear, to 4.5 mm long; peduncle/pedicel 5–14 cm long. **Calyx** lobes narrowly triangular, 3–4.6 × 1.2–1.5 mm, apices acute, densely eglandular pubescent. **Corolla** white to pale blue or a combination of both, sometimes tinged pink, with two yellow lines in throat, 36–43 mm long, narrowly funnelform, all lobes orbicular, apices rounded, outside with sparse eglandular hairs throughout, inside with short-stalked glands at bases of lobes, denser and slightly larger at base of dorsal lobes, sparse hairs in line with sinuses of lower lip down into tube; tube 19–27 mm long; upper lip 7–9 mm long, lobes 6–7.5 × 8–9.5 mm; lower lip 11–16 mm long, lateral lobes 7–8.5 × 9–10 mm, central lobe 9–9.5 × 8.5–9.5 mm. **Stamens** inserted at 11–14 mm from corolla base; filaments stout, 7–14 mm long, glabrous, with two short spurs at connection to anthers; anthers 1.1–1.6 × 2.8–3.5 mm, glabrous; lateral staminodes 3.5–4 mm long, medial staminode c. 0.5 mm long. **Nectary** 0.8–2 mm long, margin crenate. **Pistil** 20–26 mm long, with dense short eglandular and/or longer gland-tipped hairs throughout; ovary 10–15 mm long; style 8–12 mm long. **Fruit** 3.5–6.7 cm long, 1.5–2.5 mm wide.



Fig. 10. *Codonoboea rugosa* (Ridl.) C.L.Lim. (Photo: Thammarat Phutthai)

Distribution. Thailand, Peninsular Malaysia.

Habitat and ecology. In shade or more open areas in a wide variety of forest types from primary evergreen forest to seasonal forest to open scrub. Also, on a variety of rocky terrains and soil types from limestone outcrops to sandy soil with thin peat layer, at 10–1360 m.

Additional specimens examined. THAILAND: **Surat Thani:** Khao Nong, 600 m, 9 Aug 1927, *Kerr 13241* (BM, K); Phanom, Khao Sok National Park, Trail to Sip Et Chan Waterfall, 10 m, 28 Mar 1993, *Chantharanothai et al. 1485* (K); Phanom, Khao Sok National Park, 100 m, 25 Oct 1990, *Larsen et al. 40900* (BKF, P); ibidem, 200 m, 15 Apr 1991, *Woodgyer 3* (K). **Phang Nga:** Khao Katalawam, 800 m, 8 Mar 1930, *Kerr 18436* (K); Khao Rami, 27 Apr 1967, *Suthasorn 2448* (BK); Ta Kua Thung, 23 Mar 2008, *Chamchumroon et al. 2515* (BKF); Takua Thung, Raman Fall Forest Park, 50 m, 29 Aug 2007, *Wongprasert 078-70* (BKF); Toong Rha Suung, 600 m, 27 Mar 2000, *Suksathan 2545* (QBG). **Nakhon Si Thammarat:** Ron Phibun, Namtok Yong National Park, Khao Ram Rom, 25 Dec 2007, *Chamchumroon 2385* (BKF); ibidem, 850 m, 9 Sep 2008, *Middleton et al. 4390* (BKF, E, P, SING); Khao Luang National Park, Ban Khi Ri Wong, 864 m, 17 Mar 2010, *Chamchumroon et al. 3635* (BKF, SING); Khao Luang National Park, 5 km NE of Nuea Fa substation, NW side, 990 m, 3 Mar 2006, *Gardner ST 2439* (BKF, E, K); Khao Luang, 600 m, 7 Nov 1951, *Smitinand 1045* (E); ibidem, 800 m, 21 Jul 1999, *Wattana et al. 468* (QBG). **Trang:** Khao Chong, 300 m, 9 Sep 1932, *Put 227* (BKF); Nayong, Khao Banthat Mountains, Phu Pha Mek, 1300 m, 17 Mar 2006,

Chamchumroon 2255 (PSU); Nayong, Khao Banthat Mountains, Summit of Phu Pha Mek, 1240 m, 7 Apr 2003, *Middleton et al.* 1994 (BKF, E). **Satun:** Kao Keo Range, 600 m, 12 Mar 1928, *Kerr* 14514 (ABD, BM, K); Khuan Kalong, Thung Nui, Near Nam Rah Village, 300 m, 6 Jan 1985, *Maxwell* 85-40 (BKF, P). **Songkhla:** Ton Nga Chang, 700 m, 21 Aug 1992, *Niyomdham & Puudjaa* 3140 (BKF). **Yala:** Bannang Sata, Khuean Bang Lang, Churaphorn Phattana 7th Project, Route to Khao Chalong Chai, 1000 m, 15 Jun 2004, *Poopath* 98 (BKF, E); Betong, Muang Bala, 1120 m, 11 Mar 2007, *Niyomdham & Puudjaa* 7959 (BKF); *ibidem*, 1360 m, 23 Feb 2000, *Niyomdham et al.* 6039 (BKF); Khao Pok Yok, 1050 m, 8 Mar 2000, *Suksathan* 2466 (QBG). **Narathiwat:** Ja Mai, Ban Ku Moong, 17 Mar 1985, *Niyomdham* 870 (BKF, K, P); Sukhirin, To Mo, Kao Cha Moi, 210 m, 27 Apr 1931, *Lakshnakara* 814 (BM, K); Sukhirin, Tomo, 100 m, 16 Apr 1996, *Niyomdham & Puudjaa* 4690 (BKF); Sukhirin, Phu Khao Tong, Khao Muang Thong, 300 m, 21 Jul 2004, *Poopath* 118 (BKF, E).

Notes. See notes under *Codonoboea platypus*.

Codonoboea rugosa appears to be particularly variable in the presence or absence of gland-tipped hairs on the inflorescence axes and pistil. On the pistil, the indumentum can vary from consisting of almost exclusively shorter eglandular hairs to densely covered with longer gland-tipped hairs but with many intermediate densities of gland-tipped hairs between the extremes.

Kiew & Lim (2011) recognised as a holotype the same specimen as I designate here as the lectotype. As Ridley (1905) included two collections in the protologue without distinguishing one specimen as the type, there is no holotype.

13. *Codonoboea urticoides* (A. Weber) Kiew, Gard. Bull. Singapore 62: 272 (2011). – *Didymocarpus urticifolius* Ridl., Fl. Malay Pen. 2: 511 (1923), nom. illeg. – *Henckelia urticoides* A. Weber, Beitr. Biol. Pflanzen 70: 358 (1998 [‘1997’]). – TYPE: [Peninsular Malaysia], Perak, Temango [Temengor], July 1909, *Ridley* 14277 (lectotype K [K000820859], designated here). (Fig. 11)

Didymocarpus hispidus auct. non Ridl.: Barnett, Fl. Siam. 3(3): 214 (1962), p.p.

Henckelia hispida auct. non (Ridl.) A. Weber: Burt, Thai Forest Bull., Bot. 29: 95 (2001), p.p.

Decumbent herb with erect stems to 30(–70) cm tall; stems with short stiff eglandular uniseriate purple (always?) hairs, with distinct internodes. **Leaves** opposite; petiole 0.7–2.6 cm long, densely pubescent; laminae dark green above, pale green or purple-red beneath, elliptic, 2.9–11.5 × 1–4.5 cm, apex acuminate, base cuneate, margin denticulate, 5–9 secondary veins on each side of midrib, midrib and veins flush with lamina or very slightly raised above, slightly raised beneath, above glabrous or with hairs on midrib, with scattered minute (sub)sessile glands, these often very small and so sparse as to be easily overlooked, margin ciliate, beneath with sparse short stiff eglandular hairs, denser on midrib and venation. **Inflorescences** from axils of upper leaves, 2–3-flowered, 4.3–9.5 cm long, with mixed eglandular and longer gland-tipped



Fig. 11. *Codonoboea urticoides* (A.Weber) Kiew. **A.** Inflorescence. **B.** Infructescence. From *Poopath* 325. (Photos: Manop Poopath)

hairs; peduncle 3.2–7 cm long; bracts linear, to 2.5 mm long; pedicels 1.3–8.5 mm long. **Calyx** green to dark purple, lobes narrowly triangular, 2.8–4.7 × 0.6–1 mm, apex acuminate, with a mix of long eglandular and gland-tipped hairs. **Corolla** white, pale yellow or greenish, with pink or purple hairs, with purple lines and yellow patch on lower lip, 18.5–24 mm long, narrowly funnellform, lobes usually reflexed, outside with sparse gland-tipped hairs throughout, inside with two lines of hairs from sinuses on lower lip down into tube; tube to sinus between upper and lower lips 14–17.5 mm long; upper lip 2–3.5 mm long, lobes 2–3 × 2.5–3.2 mm; lower lip 5.5–6.2 mm long, lateral lobes c. 2.5 × 4–4.2 mm, central lobe 2.5–4 × 3.6–4 mm. **Stamens** inserted at 6–7.5 mm from corolla base; filaments filiform, 5–6.5 mm long, glabrous; anthers 0.7–0.9 × 1.7–2.5 mm, glabrous; lateral staminodes 1–2.5 mm long, medial staminode c. 0.3 mm long. **Nectary** 0.7–1.2 mm long, only on ventral side or almost annular but much shorter dorsally. **Pistil** 11–13 mm long, densely eglandular pubescent throughout, these sometimes so small as to appear papillose, with or without a very occasional gland-tipped hair; ovary 5–7.5 mm long; style 4.5–7.5 mm long. **Fruit** 3.1–4 cm long, 1.5–2.5 mm wide.

Distribution. Thailand, Peninsular Malaysia.

Habitat and ecology. In shade in evergreen forest, on river banks, at 145–1400 m.

Additional specimens examined. THAILAND: **Yala:** Betong, 8 Aug 1923, *Kerr 7502* (K); Betong, Hala-Bala Wildlife Sanctuary, Trail up unnamed '1490' mountain reached from the shores of Bang Lang Reservoir, 1400 m, 4 Sep 2005, *Poopath 362* (BKF); Bannang Sata, Khuean Bang Lang, Churaphorn Phattana 7th Project, Route to Khao Chalong Chai, 630 m, 15 Jun 2004, *Poopath 91* (BKF, E); Khao Pok Yok, 1000 m, 10 Oct 1991, *Larsen et al. 42287* (BKF); *ibidem*, 950 m, 16 Jun 1992, *Larsen et al. 42932* (BKF, P); Than To, Ban Chulaphon Phatthana 7 area, 145 m, 9 Feb 2004, *Middleton et al. 2854* (A, BKF); Than To, Ban Chulaphon Phatthana 10, 500 m, 21 Apr 2005, *Pooma et al. 5056* (BKF); Than To, Khao 870 m, Wong Sai ranger unit, 800 m, 18 Jul 2004, *Poopath 108* (BKF); Than To, Mae Wad, Churaphorn Phattana 7 project nature trail, 200 m, 15 Jul 2005, *Poopath 325* (BKF); *ibidem*, 200 m, 21 Oct 2003, *Poopath 331* (BKF); Than To, Bang Lang National Park, 500 m, 19 Jul 2004, *Poopath 332* (BKF); Than To, Ban Chulaphon Phatthana 10, 550 m, 1 Feb 2015, *Poopath et al. 871* (BKF, SING); *ibidem*, 550 m, 9 Aug 2009, *Wai 1141* (PSU). **Narathiwat:** Sukhirin, Klong Prachin checkdam, Ban Soy Prachin, 180 m, 25 Aug 2006, *Poopath et al. 146* (E).

Notes. See notes under *Codonoboea hispida*.

This species was first published as *Didymocarpus urticifolius* Ridl. but that name is a later homonym of *Didymocarpus urticifolius* (Buch.-Ham. ex D. Don) Wonsch. A new name, *Henckelia urticoides* A. Weber, was adopted in Weber & Burt (1998) which serves as the basionym of the current name. Kiew & Lim (2011) noted that this name had not yet been typified but said they could not find the original material listed by Vitek et al. (2000) in either K or SING. Specimens of both collections cited in the protologue have now been found at Kew and one of them is here designated as the lectotype.

Although some labels say the corolla is white, it is possible that this has been recorded in a generic sense and may include cream-coloured and pale yellow. It is possible that the corolla in this species is always actually at least cream or pale yellow in contrast to the pure white background corolla colour of *Codonoboea hispida*.

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