

A synopsis of Thai *Apocopis* Nees (Poaceae, Panicoideae)

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ABSTRACT. A synopsis of the genus *Apocopis* occurring in Thailand is presented, including a key to the species, correct nomenclature, descriptions and illustrations. Six species are recognised, of which four species are lectotypified.

KEY WORDS: Panicoideae, *Apocopis*, Thailand.

INTRODUCTION

The genus *Apocopis* Nees (Poaceae, Panicoideae) consists of about 15 species, chiefly distributed in India, China, Southeast Asia to Polynesia (Clayton and Renvoize, 1986; Watson and Dallwitz, 1992; Clayton et al., 2006). *Apocopis* was originally described by Nees von Esenbeck (1841) to include *A. royleanus* (now *Apocopis paleacea* (Trin.) Hochr.), using the specimen of Dr J. F. Royle, from India. It is characterised by an inflorescence which is composed of spike-like racemes consisting of a fragile rhachis that bears the imbricate fertile sessile spikelets with broadly truncate lower glumes and pedicelled spikelets which are normally suppressed (Bor, 1952, Clayton and Renvoize, 1986). In this paper, we present a detailed account of all Thai six *Apocopis* species. We also provide descriptions, a key to species and miscellaneous information for each species including typification notes.

APOCOPIS

Nees., Proc. Linn. Soc. 1: 93. 1841; Hack. in A.DC. & C.DC., Monogr. Phan. 6: 256. 1889; Hook.f., Fl. Brit. India 7: 142. 1897, in Trimen, Fl. Ceylon 5:

222. 1900; E.G.Camus & A.Camus in H.Lecomte, Fl. Indo-Chine 7: 291. 1922; Bor, Kew Bull. 1: 102. 1952; Schmid, Fl. Agrostologique de l'Indochine 13(1): 179. 1958; Bor, Grasses Burma, Ceyl., Ind. & Pakist.: 94. 1960; Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 324. 1960; Lazarides, The Tropical Grasses of Southeast Asia: 19. 1980; Clayton & Renvoize, Kew Bull. Add. Ser. 13: 316. 1986; Gould in Dassanayake, Fosberg and Clayton, Rev. Handb. Fl. Ceylon 8: 37. 1994; S.L.Chen & S.M.Phillips, Fl. China 22: 598. 2006.—*Amblyachyrum* Hochst., Flora 39: 25. 1856.

Annual or perennial, tufted or shortly rhizomatous. Culms slender, erect or short ascending or prostate; nodes glabrous to hirsute. Leaf-blades lanceolate to linear-lanceolate or linear, usually hairy with tubercle-based hairs, rarely glabrous, margins thick. Ligule an eciliate membrane or a ciliate membrane. Inflorescence of (1–) 2 (–4) digitate racemes, rhachis internodes fragile, hairy at apex, margins hirsute. Spikelets in pairs, heteromorphous, basal pairs almost barren, dorsally compressed; florets 2, without rachilla extension. Sessile spikelets usually fertile (sterile in *A. intermedius*); spikelet callus obtuse, attached

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transversely, hairy; lower glumes chartaceous to coriaceous, oblong-obovate, glabrous to hairy, truncate or emarginate, (5–)7–9-nerved, parallel or arched, free or united in various patterns; upper glumes chartaceous, truncate or obtuse or emarginate, upper margin ciliate, 3-nerved, the two outer flaps folded round the florets; lower florets male; lower lemmas hyaline, truncate or obtuse or emarginate to bifid, upper margin ciliate, nerves obscure or 1-nerved; lower paleas hyaline, truncate or obtuse or bifid, upper margin ciliate, nerveless; upper florets barren or male or female or hermaphrodite; upper lemmas narrowly oblong, nerves obscure or

1-nerved, awned from entire or bifid apex, awns geniculate with brown twisted columns, scaberulous; upper paleas hyaline, upper margin ciliate; lodicules absent; stamens 2; styles 2, stigmas plumose. Caryopsis with adherent pericarp, oblong, hilum punctiform. Pedicelled spikelets normally suppressed (developed in *A. intermedium*); pedicels usually hirsute, partly adnate to the margin of the lower glume of sessile spikelet.

About 15 species, distributed in temperate and tropical Asia. Six species are found in Thailand of which one is endemic: *A. siamensis* A.Camus.

KEY TO SPECIES OF THAI *APOCOPIS*

| | |
|--|------------------------------|
| 1. Peduncles hirsute in uppermost part | 3. <i>A. intermedium</i> |
| 2. Pedicelled spikelets present. Sessile spikelets 6–9 mm long | 5. <i>A. siamensis</i> |
| 2. Pedicelled spikelet absent. Sessile spikelets to 5 mm long | 3. <i>A. intermedium</i> |
| 1. Peduncles glabrous in uppermost part | 1. <i>A. collinus</i> |
| 3. Pedicelled spikelets present | 2. <i>A. courtallumensis</i> |
| 3. Pedicelled spikelets absent | 4. <i>A. mangalorensis</i> |
| 4. Spikelets awnless or awned, awns less than 10 mm long | 6. <i>A. wrightii</i> |
| 4. Spikelets awned; awns longer than 10 mm long | |
| 5. Median nerve or side nerves reaching the upper margin of the lower glumes and produced as a small point | |
| 5. All nerves ending below the upper margin of the lower glumes | |
| 6. Annual. Spikelets to 3–4 mm long | |
| 6. Perennial. Spikelets 4.5–6 mm long | |

1. ***Apocoris collinus*** Balansa, Morot, Journ. de Bot. 4: 84. 1890, as ‘*collina*’; E.G.Camus & A.Camus in H.Lecomte, Fl. Indo-Chine 7: 295. 1922, as ‘*collina*’; Bor, Kew Bull. 1: 114. 1952; Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 326. 1960; Lazarides, The Tropical Grasses of Southeast Asia: 20. 1980. Type: Cambodia, Pursat (Mont de Pursat), Godefroy 389 in Herb. Balansa [holotype L (digital image L 43625!)].— *A. borneensis* Ridl., Bot. Jahrb. Syst. 44: 519. 1910. Type: Indonesia, Kalimantan (Borneo), Martapura, 1908, Winkler 3392 (lectotype K! K290140, selected here; isolectotype L digital image L43626!).— *A. paleacea* (Trin.) Hochr. var. *collinus* (Balansa) Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 327. 1960, as ‘*paleaceus*’. Fig. 1A.

Perennial, tufted. Culms 20–40(–50) cm tall, erect; nodes glabrous. Leaf sheaths 2–5 cm long, glabrous to pilose with tubercle-based hairs

especially on the upper part. Ligule a ciliate membrane, 0.5–1 mm long. Leaf blades linear, 5–9 by 0.2–0.4 cm, pubescent or pilose with tubercle-based hairs on both surfaces, rarely glabrous, margins thick, scabrous. Racemes 1–2, 2–4 cm long, slightly swollen below the racemes; joints of rhachis 1.5–2 mm long; peduncles 6–15 cm long, glabrous. Sessile spikelet fertile except the lowest, greenish red or purplish with narrow brownish apex; oblong-obovate, 5–5.5 by 1.8–3 mm; spikelet callus hairy, hairs to 1.5 mm long; lower glumes oblong-obovate, 5–5.5 by 1.8–3.5 mm, glabrous or granular on dorsal surface, round or truncate, upper margin ciliolate, 7-nerved, anastomosing, nerves not reaching upper margin; upper glumes oblong-lanceolate, 5–5.5 by ca 1 mm, glabrous to pubescent on upper part, truncate; lower lemmas oblong to ovate-lanceolate, 4.5–5 mm long, truncate, 1-nerved; lower paleas lanceolate, 4.5–5 mm long, margins ciliolate, truncate; anthers purple, 2–3 mm

long; upper florets female or hermaphrodite; upper lemmas oblong-lanceolate, 4.5–5 mm long, truncate, upper margin ciliate, awns to 7 mm long, short geniculate, nerves obscure or 1-nerved; upper paleas oblong-lanceolate, 3.5–4 mm long, truncate; styles 2, stigmas purple, ca 3.5 mm long. Pedicelled spikelets suppressed; pedicels 1.5–2 mm long. Caryopsis not seen.

Thailand.— NORTHEASTERN: Udon Thani [Nong Han, 26 Feb. 1924, Kerr 8584 (**BM**, **K**)]; EASTERN: Roi Et [Thung Kula Rong Hai, 22 June 1969, Smitinand 10756 (**BKF**)]; Ubon Ratchathani [Khong Chiam, 22 May 2001, Greijmans 60 (**BKF**)]; SOUTH-EASTERN: Sa Kaeo [Aranyapratet, 10 Aug. 1930, Kerr 19624 (**BM**, 2 sheets **K**)]; Ta Phraya, 8 July 2001, Teerawatananon s.n. (**THNHM**); Watthana Nakhon, 11 Nov. 2006, Teerawatananon & Kritsanachandee 977 (**TCD**)].

Distribution.— Tropical Asia: Indochina and Malesia.

Ecology.— Open grassy and wet areas, fire prone deciduous dipterocarp forests, 50–200 m altitude.

Notes.— The specimens of Kerr 19624 housed in **BM** and **K** have lemmas with short awns or are awnless. Among the cited specimens examined, the Borneo specimens (*Lugas* 586 and *Forster* F23) have pedicelled spikelets and the lower glumes of the sessile spikelets are hirsute. The specimens of Kerr 8584 (**BM**, **K**) were misidentified as *Apocopis royleana* Nees (now *A. paleacea*).

Typification notes.— When Ridley (1910) first published *Apocopis borneensis*, he cited *Winkler* 3392 collected from Borneo as the type specimen but he did not indicate where it was kept. According to Stafleu and Cowan (1988), *Winkler*'s herbarium is deposited in **B**, **BM**, **C**, **G**, **K**, **L**, **MO**, **NY**, **P**, **PC**, **PRE**, **WRSL** and **Z**. We have found two sheets of *Winkler* 3392, one is kept in **K** (K 290140) and another is kept in **L** (L 43626). Therefore, we hereby designate *Winkler* 3392 in **K** as the lectotype, because of its high quality condition and regard the remaining duplicate as an islectotype.

2. *Apocopis courtallumensis* (Steud.) Henrard, Blumea 4: 524. 1941; Bor, Kew Bull. 1: 114. 1952,

Grasses Burma, Ceyl., Ind. & Pakist.: 95. 1960; Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 326. 1960; Lazarides, The Tropical Grasses of Southeast Asia: 20. 1980.— *Andropogon courtallumensis* Steud., Syn. Pl. Glumac. 1: 377. 1854. Type: India, Tamil Nadu, Kuttalam (Courtallum), Aug. 1835, *Wight* s.n. (lectotype **K!** K 433914, fide Bor (1952)).— *Apocopis wightii* Nees ex Steud., Syn. Pl. Glumac. 1: 377. 1854. nom. inval. pro syn. *Andropogon courtallumensis* Steud.— *Apocopis wightii* Nees ex Hack. in A.DC. & C.DC., Monogr. Phan. 6: 258. 1889. nom. inval. Fig. 1B.

Perennial. Culms to 80 cm tall, erect or short ascending, branched; nodes glabrous. Leaf sheaths 5–11 cm long, densely pilose with tubercle-based hairs, margins scarious. Ligule a lacerate membrane or a ciliate membrane, to 2 mm long. Leaf blades linear-lanceolate, 5–15 by 0.5–0.6 cm, pilose with tubercle-based hairs on both surfaces, margins thick, scabrous and pilose with tubercle-based hairs. Racemes 2, 3–6 cm long; joints of rhachis 1.5–2 mm long; peduncles 10–15 cm long, glabrous. Sessile spikelet fertile, brownish-green to brown with reddish band across apex, oblong-obovate, 5–6 by 3–3.5 mm; spikelet callus hairy, hairs to 3 mm long; lower glumes oblong-obovate, 4.5–5 by 3–3.5 mm, almost glabrous, slightly emarginate, upper margin ciliate, margins sometimes hirsute, 7(–9)-nerved, nerves anastomosing, the median nerve reaching the upper margin and exserted as a small point, sometimes the two intramarginal nerves almost reaching the upper margin; upper glumes lanceolate-oblong, 4.5–5 by 1–2 mm, sparsely pubescent on the dorsal surface, truncate to slightly emarginate, the two outer flaps folded round the florets; lower lemmas lanceolate-oblong, 4.5–5 mm long, almost glabrous, obtuse, nerveless; lower paleas lanceolate-oblong, 4–4.5 mm long, bifid; anthers yellow to purple or reddish pink or greyish purple, 3–3.8 mm long; upper florets hermaphrodite or female; upper lemmas lanceolate-oblong, 4.5–5 mm long, pubescent along the margins, awns 1.8–2.5 cm long, columns 0.8–1.3 cm; upper paleas ovate-oblong, 3–3.5 mm long, slightly emarginate; styles 2, stigmas creamy white to old-rose colour, 4–5.5 mm long. Pedicelled spikelets suppressed; pedicels 1.8–2.5 mm long. Caryopsis oblong, 1.3–1.5 mm long.

Thailand.— NORTHERN: Chiang Mai [Doi Suthep, 10 Oct. 1909, *Kerr* 823 (**BM**, **E**, 2 sheet **K**); 11 Nov. 1911, *Kerr* 2229 (**ABD**, **BM**, **E**, **K**, **L**); 21 Oct. 1987, *Maxwell* 87-1234 (**BKF**, **L**); Mae Hong Son [Mae Ngao National Park, 15 Nov. 2005, *Teerawatananon & Sungkaew* 724 (**TCD**, **THNHM**)]; Phitsanulok [Thung Salaeng Luang National Park, 12 Oct. 2000, *Teerawatananon* 121000-25 (**TCD**, **THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 926 (**TCD**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 927 (**TCD**, **THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 928 (**K**, **THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 929 (**K**, **THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 930 (**TCD**, **THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 931 (**THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 935 (**TCD**, **THNHM**); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 936 (**TCD**, **THNHM**)]; SOUTHEASTERN: Sa Kaeo [Aranyaprathet, 16 Oct. 1928, *Put* 1982 (**BKF**, **BM**, **K**, **L**)].

Distribution.— Tropical Asia from India to Indochina.

Ecology. — Open areas or partly shady places, deciduous dipterocarp-oak forests, tropical grasslands, 500–600 m altitude.

Vernacular. — Ya Khon Bung (យាកុងបុង) (Forest Herbarium, 2001).

3. *Apocoris intermedius* (A.Camus) Chai-Anan, Thai Forest Bull. (Bot.) 6: 46. 1972; Lazarides, The Tropical Grasses of Southeast Asia: 20. 1980; S.L.Chen, Fl. China 22: 599. 2006.— *Lophopogon intermedius* A.Camus, Bull. Mus. Hist. Nat. Paris 25: 285. 1919; E.G.Camus & A.Camus in H.Lecomte, Fl. Indo-Chine 7: 285, figs. 34/1-4. 1922; Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 327. 1960. Type: Vietnam (Tonkin), Ouonbi, *Balansa* 394 (lectotype **K! K 433917, selected here; isolectotypes **L** digital images **L** 43628!, **L** 43629!, **L** 43630!).— *Sclerandrium intermedium* (A.Camus) C.E.Hubb. in Hook., Ic. Pl. 33 (sub tab. 3262): 2. 1935. in adnot.— *Apocoris tridentatus* (Roxb.) Benth var. *intermedius* (A.Camus) Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 328. 1960. Fig. 1C.**

Perennial, shortly rhizomatous. Culms to 50 cm tall, erect; nodes glabrous. Leaf sheaths 1–3 cm long, glabrous to densely hirsute. Ligule a ciliate membrane, 1–1.5 mm long, with a dense row of hairs behind ligule. Leaf blades linear-lanceolate, 5–20 by 0.3–0.5 cm, pilose to densely hirsute with tubercle-based hairs on both surfaces, margins thick, pilose with tubercle-based hairs. Racemes 2, 4–6.5 cm long; joints of rhachis 2–2.5 mm long; peduncles 5–20 cm long, usually glabrous, sometimes hirsute at uppermost part. Sessile spikelets male, yellowish green to pale yellow with red or brown band across apex, oblong, 6–9 by 2.5–3 mm; spikelet callus hairy, hairs 2.5–3 mm long; lower glumes oblong-obovate, 6–8 mm long, ca 3 mm wide, glabrous to densely hirsute on the dorsal surface, truncate to slightly emarginate, upper margin ciliate, (5–)7-nerved, all nerves ending below the apex; upper glumes oblong, 7–9 by 1–1.5 mm, pubescent on the dorsal surface, truncate; lower lemmas lanceolate-oblong, 6–8 mm long, truncate to obtuse, 1-nerved; lower paleas lanceolate-oblong, 6–8 mm long, truncate to obtuse; anthers brownish yellow, 3.5–5 mm long; upper florets usually barren or male and hermaphrodite if pedicelled spikelet wanting; upper lemmas narrowly oblong, 5–7 mm long, awns to 3.5 cm long, columns 0.6–1.5 cm; upper paleas ovate-oblong, 4–5 mm long, obtuse; styles 2, stigmas purple, 4–5 mm long. Pedicelled spikelets usually present, female, lanceolate, 4.5–5.5 mm long, ca 1 mm wide, caducous; pedicels 1.5–3.5 mm long; spikelet callus hairy, hairs to 2 mm long; lower glumes lanceolate-oblong, 5–5.5 by 0.8–1 mm, hirsute, obtuse, upper margin ciliate, 3-nerved; upper glumes lanceolate-oblong, 4.5–5 by 0.5–0.8 mm, hirsute, truncate to obtuse, upper margin ciliate, 3-nerved; lower florets suppressed; upper lemmas linear, 3.5–4 mm long, awned, awns to 3 cm long, columns 6–1.5 cm long; upper paleas oblong, 3.5–4 mm long, obtuse, upper margin ciliate; styles 2, stigmas purple, to 10 mm long. Caryopsis oblong, 2.5–3 mm long.

Thailand.— NORTHERN: Phitsanulok [Thung Salaeng Luang National Park, 12 Aug. 2003, *Chantaranothai* et al. s.n. (**KKU**); 30 Nov. 2005, *Teerawatananon & Sungkaew* 850 (**TCD**, **THNHM**); 26 March 2006, *Teerawatananon & Sungkaew* 905 (**TCD**); 26 March 2006, *Teerawatananon & Sungkaew* 908 (**THNHM**); 7 Nov. 2006, *Teerawatananon &*

Kritsanachandee 932 (TCD, THNHM); 7 Nov. 2006, *Teerawatananon & Kritsanachandee* 934 (TCD, THNHM); SOUTHEASTERN: Chanthaburi [Makham, 25 Oct. 1956, *Smitinand* 3599 (BKF, K)]. PENINSULAR: Pattani [8 Sept. 1928, *Kerr* 7735 (BM, 2 sheets K, L, TCD)]; Songkhla [Khlong

Hoi Khong, 12 June 1985, *Maxwell* 85-591 (L)].

Distribution.— Temperate and tropical Asia from China to Indochina.

Ecology.— Open sandy areas, tropical grasslands; 0–500 m altitude.

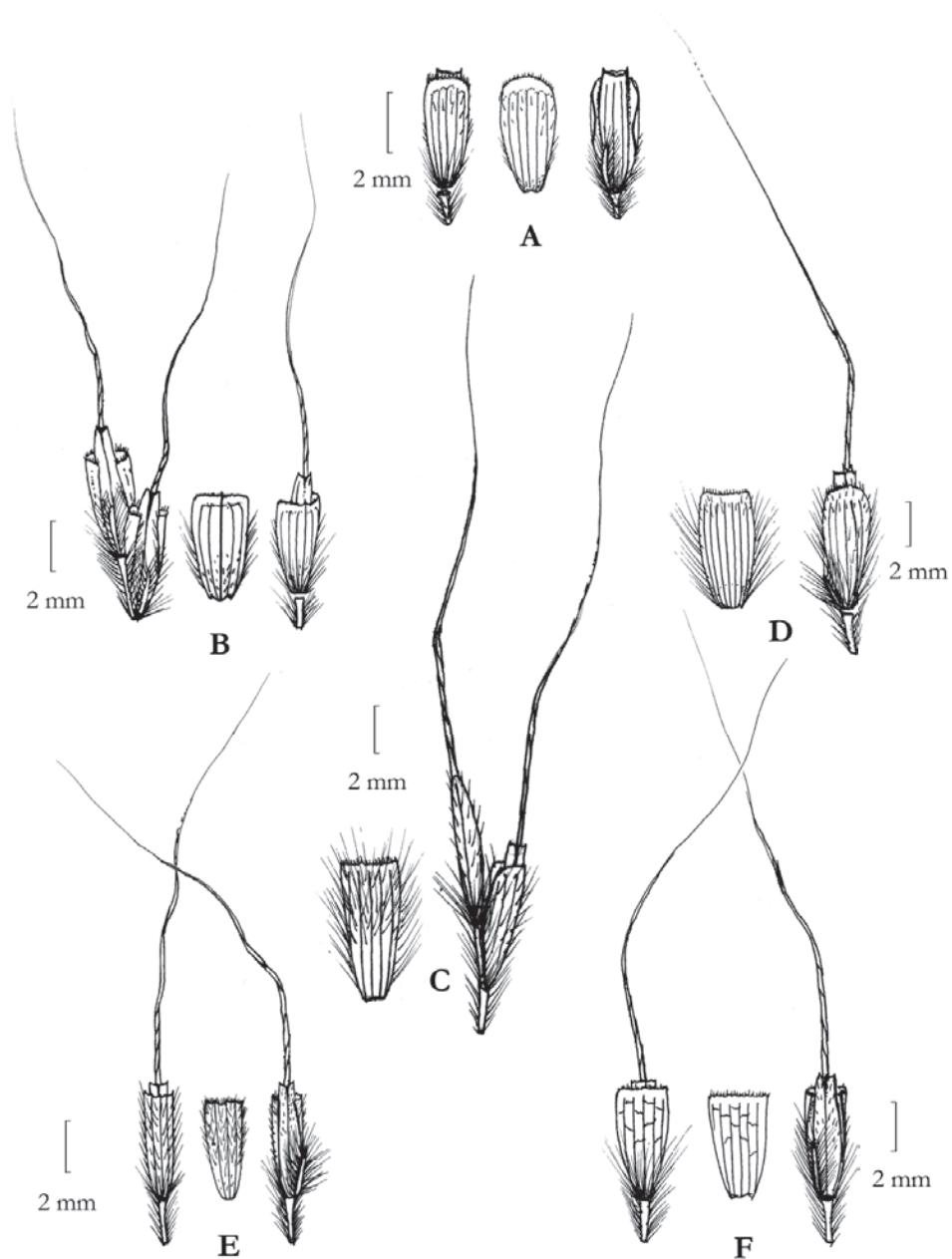


Figure 1. *Apocoris* spikelet-silhouettes: A. *A. collinus*; B. *A. courtallumensis*; C. *A. intermedius*; D. *A. mangalorensis*; E. *A. siamensis*; F. *A. wrightii*.

Typification notes.— When Camus (1919) published *Lophopogon intermedius*, she cited *Balansa* 394, *Mouret* 542 and *Godefroy* 935 from Vietnam (Tonkin), as the type specimens. After that, Roberty (1960) transferred *L. intermedius* to *Apocoris* as *A. tridentatus* var. *intermedius*. He cited the specimen of *Balansa* 394 as the holotype, but did not mention where it was kept. This species was later transferred to *Apocoris intermedius* by Chai-Anan (1972). According to Roberty (1960), his citation of *Balansa* 394 as the holotype did have the effect of establishing that specimen as the lectotype of *A. intermedius*. However, we have found four sheets of *Balansa* 394 kept in **K** and **L**. Therefore to ensure that the type is easily accessed, *Balansa* 394 in **K** (K 433917) is selected as the lectotype and the remaining duplicates are regarded as isolectotypes.

4. *Apocoris mangalorensis* (Hochst.) Henrard, *Blumea* 4: 523. 1941; *Bor*, *Kew Bull.* 1: 110. 1952; *Grasses Burma, Ceyl., Ind. & Pakist.*: 96. 1960; *Roberty*, *Monogr. Syst. Andropog. du Globe*. (*Theses Fac. Sci. Toulouse*): 326. 1960; *Gould* in *Dassanayake, Fosberg and Clayton, Rev. Handb. Fl. Ceylon* 8: 37. 1994.— *Amblyachyrum mangalorensis* Hochst., *Flora* 39: 25. 1856. non Steud. 1854.— *Apocoris wightii* Steud. subsp. *mangalorensis* (Hochst.) Hack. in A.DC. & C.DC., *Monogr. Phan.* 6: 259. 1889; *Hook.f.* in *Trim.*, *Fl. Ceylon* 5: 223. 1900.— *Apocoris paleaceus* (Trin.) Hochr. var. *mangalorensis* (Hochst.) Roberty, *Monogr. Syst. Andropog. du Globe*. (*Theses Fac. Sci. Toulouse*): 327. 1960. Type: India (Indiae Or.), Karnataka (Terr. Canara), Mangalore (Mangalor), 1837, *Hohenacker* 131a [holotype, not found]. Figs. 1D, 2.

Annual. Culms usually less than 30 cm tall, slender, short ascending, often prostrate, branched; nodes glabrous. Leaf sheaths 1–3 cm long, inflated, slipping from the culm, glabrous to pilose with tubercle based hairs at the upper part. Ligule an eciliate membrane, ca 0.5 mm long. Leaf blades lanceolate, 1–3(–4) by to 0.4 cm, pilose to densely hirsute with tubercle-based hairs on both surfaces, margins thick, pilose with tubercle-based hairs. Racemes 2, 4–6.5 cm long; joints of rhachis 1–1.5 mm long; peduncles to 10 cm long, glabrous. Sessile spikelet fertile, oblong, 3–4 by ca 3 mm;

spikelet callus hairy, hairs to 2 mm long; lower glumes oblong-ovate, 3–4 by 2–3 mm, truncate to slightly emarginate, upper margin ciliate, hyaline and often reddish, 7-nerved, all nerves not reaching the top of the glume; upper glumes lanceolate-oblong, ca 4 by ca 1 mm, with two lateral flaps folded round the florets, pubescent on the dorsal surface, truncate; lower lemmas lanceolate-oblong, 3–4 mm long, emarginate to bifid, nerveless; lower paleas lanceolate-oblong, 3–4 mm long, bifid; anthers 2–2.2 mm long; upper florets female; upper lemmas narrowly oblong, 3.5–4.5 mm long, awns 1.5–2 cm long, columns 0.6–0.8 cm; upper paleas oblong, 2.5–3 mm long, acutely 2-lobed; styles 2, stigmas 3–3.5 mm long. Pedicelled spikelets suppressed; pedicels 1.5–2 mm long. Caryopsis not seen.

Thailand.— NORTHERN: Chiang Mai [Doi Suthep, 21 Oct. 1912, *Kerr* 2745 (**BM** 2 sheets, **K**)].

Distribution.— Asia from India to Indochina.

Ecology.— Open gravel slopes, ca 335 m altitude.

Notes.— Three sheets of *Kerr* 2745, which are housed in **K** and **BM**, were identified as *Apocoris cochinchinensis* A.Camus and as *Apocoris wightii* Nees [now *Apocoris courtallumensis* (Steud.) Henrard], respectively. We have carefully examined all of them and found that they actually are *Apocoris mangalorensis*.

Apocoris mangalorensis differs from *A. cochinchinensis* in having a prostrate culm and differs from *A. courtallumensis* in having an annual habit and geniculate culms often prostrate at base. It also differs from both species in having lower glumes with no nerves reaching the upper margins. Among the cited specimens examined, the Indian specimens are more hairy than Kerr's specimens. However, according to *Bor* (1952), the lower glumes can be glabrous and hairy.

5. *Apocoris siamensis* A.Camus in H.Lecomte, *Not. Syst.* 3: 83. 1914; *E.G.Camus & A.Camus* in *H.Lecomte*, *Fl. Indo-Chine* 7: 293, figs. 13–15. 1922; *Bor*, *Kew Bull.* 1: 104. 1952; *Schmid*, *Fl. Agrostologique de l'Indochine* 13(1): 180. 1958; *Bor*, *Grasses Burma, Ceyl., Ind. & Pakist.*: 96.

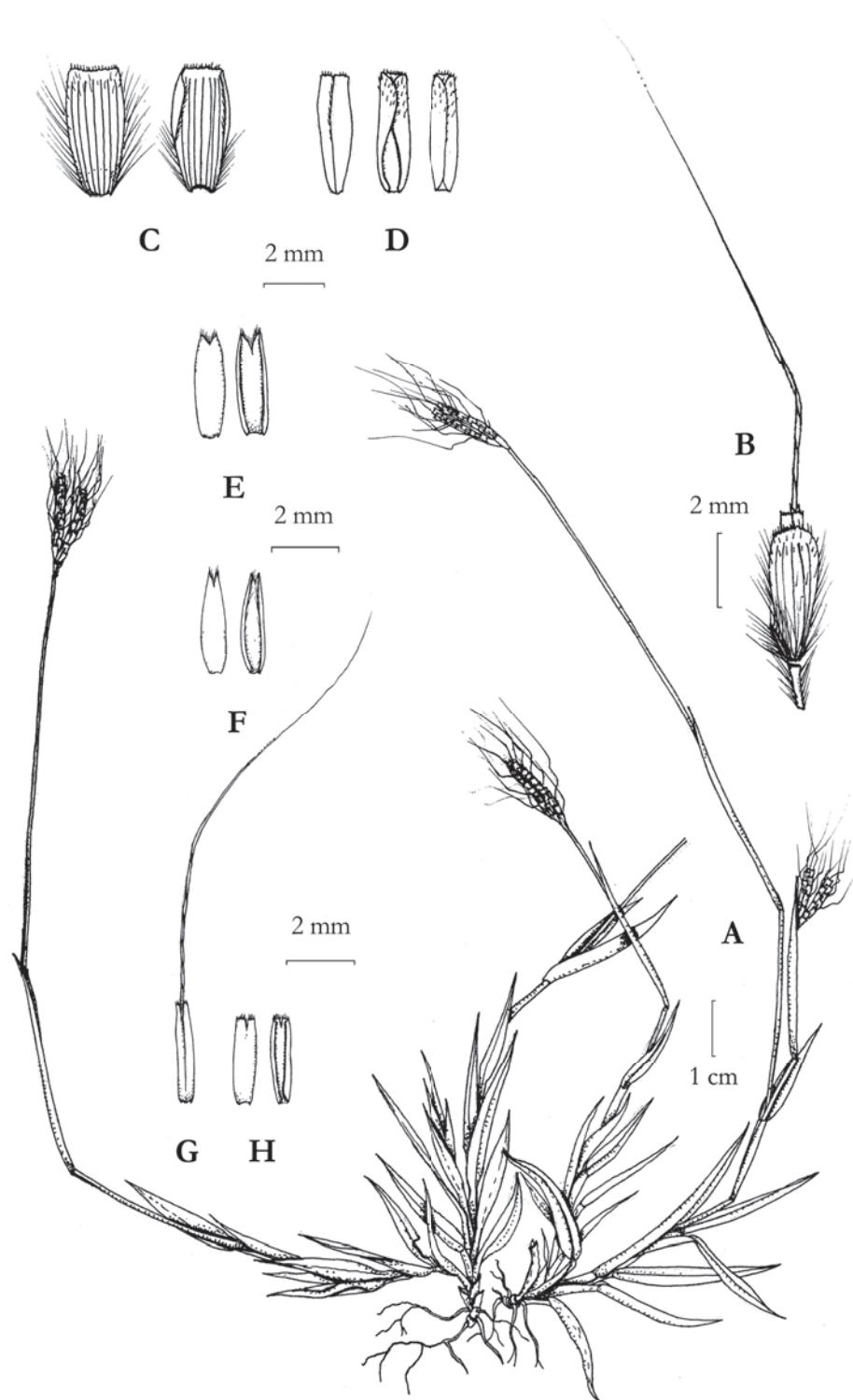


Figure 3. *Apocoris mangalorensis* (Hochst.) Henrard: A. habit; B. spikelets; C. lower glumes of sessile spikelets; D. upper glumes of the same; E. lower lemmas of the same; F. lower paleas of the same; G. upper lemma of the same; H. upper paleas of the same. All drawn from Kerr 2745 by A. Teerawatananon.

1960; Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 326. 1960; Lazarides, The Tropical Grasses of Southeast Asia: 20. 1980. Type: Thailand (Siam), Wang Chao (Wang Djao), 14 Oct. 1904, *Hosseus* 145 (lectotype **K!** K 290134, selected here; isolectotypes **C!**, **K!** K 290135, K 290136, **L!** L 43627, **US** USNH 1125870, USNH 2117589). Fig. 1E.

Annual, tufted. Culms slender, to 45 cm tall, erect; nodes usually glabrous, sometimes 1–2 nodes at uppermost part hairy below the nodes. Leaf sheaths 1–3 cm long, upper part pilose with tubercle-based hairs. Ligule an eciliate membrane, 0.5–0.8 mm long. Leaf blades linear-lanceolate, 3–5 by 0.2–0.3 cm, pilose with tubercle-based hairs on both surfaces, margins thick, scabrous and pilose with tubercle-based hairs. Racemes 2, 2–4 cm long; joints of rhachis 1.5–1.8 mm long; peduncles 8–10 cm long, hirsute at uppermost part. Sessile spikelets fertile, brownish green, oblong, 4.5–5 by 1–1.8 mm; spikelet callus hairy, hairs 1–1.5 mm long; lower glumes oblong or slightly wider upwards, 3.5–4.3 by 1–1.8 mm, scabrous on the dorsal surface, dentate, upper margin ciliolate, 5–7-nerved, nerves reaching the upper margin and exserted as small points; upper glumes oblong, 4–4.5 by 0.8–1 mm, with two lateral flaps wrapped round the florets, scabrous on the dorsal surface, truncate to slightly emarginate; lower lemmas narrowly oblong, 3.8–4 mm long, obtuse, nerveless; lower paleas narrowly oblong, 3.5–3.8 mm long, obtuse; anthers yellow to purple, 2–2.5 mm long; upper florets female or hermaphrodite; upper lemmas narrowly oblong, 4(–5.3) mm long, awns 2.5–3 cm long, columns 1–1.4 cm; upper paleas ovate-oblong, 2.8–3.3 mm long, truncate; styles 2, stigmas white or creamy, to 4 mm long. Pedicelled spikelets suppressed; pedicels 1.3–1.5 mm long. Caryopsis not seen.

Thailand.— NORTHERN: Tak [Rahaeng (Raheng), 8 Jan. 1904 *Lindhard* 20 (**C**); Wang Chao, 14 Oct. 1904, *Hosseus* 145 (3 sheets **K**, **L**)]; SOUTHWESTERN: Prachuap Khiri Khan [Hua Hin, 8 Nov. 1927, *Kerr* 13499 (**BM**, 2 sheets **K**)]; Ratchaburi [Thung Luang, 8 Nov. 1931, *Kerr* 20583 (**BM**, 2 sheets **K**)]; SOUTHEASTERN: Chon Buri [Siracha, 22 Nov. 1975, *Maxwell* 75-1091 (**L**)]; Sa Kaeo [Watthana Nakhon, 11 Nov. 2006, *Teerawatananon & Kritsanachandee* 974 (**TCD**,

THNHM); 11 Nov. 2006, *Teerawatananon & Kritsanachandee* 975 (**TCD, THNHM**)].

Distribution.— Endemic to Thailand.

Ecology.— Open moist sandy areas, deciduous dipterocarp forests, 5–50 m altitude.

Typification notes.— When Camus (1914) described *Apocopis siamensis* A.Camus, she cited *Hosseus* s.n. collected from Thailand as the type specimen, but she did not mention where it was kept. Later, Bor (1952) stated that *Hosseus* 145 was the type specimen of *A. siamensis*. Thus, *Hosseus* 145 must be considered as the lectotype. We have found six sheets of *Hosseus* 145 housed in **K**, **L** and **US**. According to Stafleu and Mennega (1993), Bor was then the assistant director at Kew during 1948–1959, so, it is possible that he had used *Hosseus* 145 in **K** as the type specimen when he published his work. However, there are three sheets of *Hosseus* 145 in **K**: K 290134, K 290135 and K 290136. Therefore, we hereby designate *Hosseus* 145 (K 290134) as lectotype due to its high quality condition and regard the remaining duplicates as isolectotypes.

6. *Apocopis wrightii* Munro, Proc. Amer. Acad. Arts 4: 363. 1860; Bor, Kew Bull. 1: 115. 1952; Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 326. 1960; Lazarides, The Tropical Grasses of Southeast Asia: 20. 1980; S.L.Chen, Fl. China 22: 598. 2006.— *Apocopis wrightii* Steud. subsp. *wrightii* (Munro) Hack. in A.DC. & C.DC., Monogr. Phan. 6: 259. 1889.— *Apocopis paleaceus* (Trin.) Hochr. var. *wrightii* (Munro) Roberty, Monogr. Syst. Andropog. du Globe. (Theses Fac. Sci. Toulouse): 327. 1960. Type: China, Hong Kong, Cum-sing-moon, U.S. North Pacific Exploring Expedition, 1853–1856, *Wright* s.n. lectotype **GH** digital image HUH 23071!, selected here; isolectotypes **NY!** NY 345818, **K!** K 433910. Fig. 1F.

Perennial, tufted. Culms to 100 cm tall, erect, branched; nodes glabrous to hirsute with white hairs. Leaf sheaths 6–9 cm long, glabrous to densely hirsute, margins scarious. Ligule a ciliate membrane, to 1 mm long. Leaf blades linear-lanceolate, 10–20 by 0.3–0.7 cm, pilose to densely hirsute with tubercle-based hairs on both surfaces, uppermost much reduced, margins thick, pilose

with tubercle-based hairs. Racemes 2, 2–4.5 cm long; joints of rhachis 1.5–2 mm long; peduncles 8–15 cm long, glabrous. Sessile spikelet fertile, oblong, 4.5–6 by ca 3 mm; spikelet callus hairy, hairs to 3 mm long; lower glumes oblong-obovate, 4.5–5.5 by 2.5–3 mm, almost glabrous, truncate to slightly emarginate, upper margin ciliate, 7–9-nerved, all nerves not reaching the upper margin; upper glumes lanceolate-oblong, 4.5–6 by 1.3–1.8 mm, pubescent on the dorsal surface, truncate to slightly emarginate; lower lemmas lanceolate-oblong, 4–6 mm long, pubescent on dorsal surface, acute to bifid, 1-nerved; lower paleas lanceolate-oblong, 4–5 mm long, truncate to obtuse; anthers 2.5–3 mm long; upper florets hermaphrodite; upper lemmas lanceolate-oblong, 4.5–5.5 mm long, pubescent along the margins, awns 2–3 cm long, columns 1–1.5 cm; upper paleas ovate-oblong, 3–5 mm long, obtuse; styles 2, stigmas ca 4 mm long. Pedicelled spikelets suppressed; pedicels 1.5–2.5 mm long. Caryopsis not seen.

Thailand.— NORTHEASTERN: Nong Khai [Si Chiang Mai, 18 Aug. 1972, *Smitinand* 11640 (K, L)]; SOUTHWESTERN: Kanchanaburi [Ku Jae, 20 July 1946, *Kostermans* s.n. (GH, K, 2 sheets L, US)].

Distribution.— Temperate and tropical Asia from China to Indochina.

Ecology. — Open areas, gravelly places, deciduous dipterocarp forests, 100–180 m altitude.

Notes.— Among the specimens of *Kostermans* 1281, only the one in GH seems different from the others in having a few lower glumes with median nerve reaching the apex.

Typification notes.— When Munro (1860) published *Apocoris wrightii*, he cited *Wright* s.n. collected from Cum-sing-moon, Hong Kong, as the type specimen, but he did not mention where it was kept. According to Stafleu & Cowan (1988), corresponding general collections of Wright were kept in GH. However, we have found three duplicates of *Wright* s.n. specimens housed in GH, K and NY, all of which were labelled by Munro as “*Apocoris wrightii* n. sp. Munro”. However, only the specimen in GH bears a label with Munro’s handwriting indicating the reason why he recognised this plant as a new species. Therefore, we

select *Wright* s.n. housed in GH (UHU 23071), as the lectotype and regard the remaining duplicates as isolectotypes.

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REFERENCES

Bor, N.L. (1952). Notes on Asiatic grasses: II. The genus *Apocoris* Nees. Kew Bulletin 1: 101–116.

Camus, A. (1914). Un Nouvel *Apocoris* de l’asie Meridionale. Notulae Systematicae (Paris). 3: 83.

_____. (1919). Graminées nouvelles de l’Asie orientale. Bulletin du Muséum national d’Histoire Naturelle (Paris) 25: 202–204.

Chai-Anan, C. (1972). A revision of *Germainia* Balansa & Poitrasson (Gramineae). Thai Forest Bulletin (Botany) 6: 29–59.

Clayton W.D. & Renvoize S.A. (1986). Genera Gramineum, Grasses of the World. Kew Bull., Additional Series 13: 1–389.

Clayton, W.D., Harman, K.T. & Williamson, H. (2006 onwards). Grass Base, the online world grass flora. <http://www.kew.org/data/grasses-db.html>. [accessed 02 March 2010; 08:00 GMT]

Forest Herbarium. (2001). Thai Plant Names, Tem Smitinand (Revised edition). Royal Forest Department, Bangkok, Thailand.

Munro, W. (1860). Characters of some new grasses collected at Hong Kong and vicinity by Charles Wright in the North Pacific Exploring Expedition. Proceedings of the American Academy of Arts & Sciences 4: 262–263.

Nees von Esenbeck, C. G. (1841). A descriptive catalogue of the Gramineae herbarium of Dr. Royle. Journal of the Proceedings of the Linnean Society 1: 93.

Ridley, H.N. (1910). *Apocopis*. Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie 44: 519.

Robert, G. (1960). Monographie systematique des Andropogonees du globe. Boissiera 9: 1–455.

Stafleu, F.A. & Cowan, R.S. (1988). Taxonomic Literature vol. 7: W-Z. ed. 2. Regnum Vegetabile vol. 116. Bohn, Scheltema and Holkema, Utrecht.

Stafleu, F.A. & Mennega, E.A. (1993). Taxonomic Literature Supplement 2: Be-Bo. Regnum Vegetabile vol. 130. Koeltz Scientific Books, Königstein, Germany.

Watson, L. and Dallwitz, M.J. (1992 onwards). The grass genera of the world: descriptions, illustrations, identification, and information retrieval; including synonyms, morphology, anatomy, physiology, phytochemistry, cytology, classification, pathogens, world and local distribution, and references. <http://delta-intkey.com>. [accessed 02 March 2010; 08:00 GMT].