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Flora of Singapore precursors, 42: Notes on Rosaceae in Singapore

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ABSTRACT. An outline of the native and naturalised members of the Rosaceae occurring in Singapore is presented including synonymy and typification. Lectotypes are designated for 16 names.

Keywords. Lectotype, *Potentilla*, *Prunus*, *Rubus*

Introduction

The Rosaceae are one of the world's most prominent plant families. With more than 5000 species in over 100 genera, the family is large and ecologically important. Economically, the Rosaceae are immensely valuable, providing apples, pears, plums, peaches, cherries, strawberries and many other highly prized, and often highly priced, fruits, as well as almonds, and roses, the mainstay of floriculture. However, in the lowlands of the wet tropics the family is much less prominent. This is true in Singapore with five Rosaceae species growing wild, four native and one naturalised. They represent three of the large genera of the Rosaceae: *Potentilla* L., *Prunus* L. and *Rubus* L.

The purpose of this paper is to outline the taxonomy, nomenclature and typification of the Singapore species in order to provide the foundations for the family account for the *Flora of Singapore*. Taxonomically, the works of Kalkman (1965, 1969, 1984, 1993) have generally been followed.

Materials and methods

The study was based on the herbarium material collected in Singapore largely from SING, but also K and BM. Specimens from outside Singapore were also studied at K. Type material from other herbaria was largely consulted via online sources including institutional websites and JSTOR Global Plants. Enquiries were made to various herbaria when types could not be found directly and in some cases images were made

available. When no type material could be located, synonym status was based on the published description and earlier revisionary work.

Nomenclatural synopsis

1. *Potentilla* L., Sp. Pl. 495 (1753), nom. cons. prop. – *Quinquefolium* Ség., Pl. Veron. 3: 217 (1754), nom. illeg. superfl. – *Pentaphylloides* Duhamel, Traité Arbr. Arbust. 2: 99 (1755), nom. illeg. superfl. – TYPE: *Potentilla reptans* L. (lectotype designated by Rydberg, N. Amer. Fl. 22: 293 (1908)) [*Potentilla argentea* L., typ. cons. prop., Kechaykin et al., Taxon 70: 680 (2021)].

Tormentilla L., Sp. Pl. 500 (1753). – *Potentilla* sect. *Tormentilla* (L.) Tausch, Hort. Canal. (1): t. 10 (1823). – TYPE: *Tormentilla erecta* L. (lectotype designated by Green, Nom. Prop. Brit. Bot. 159 (1929)) (= *Potentilla erecta* (L.) Raeusch.).

Pentaphyllum Hill, Brit. Herb. 3 (1756). – TYPE: *Potentilla reptans* L. (lectotype designated here).

Fragariastrum Heist. ex Fabr., Enum. 64 (1759). – *Potentilla* subg. *Fragariastrum* (Heist. ex Fabr.) Rchb., Consp. Regn. Veg. 167 (1828). – TYPE: *Fragariastrum sterile* (L.) Schur (lectotype designated by Panigrahi & Dikshit, Taxon 35: 350 (1986)) (= *Potentilla sterilis* (L.) Garcke).

Pentaphyllum Gaertn., Fruct. Sem. Pl. 1: 349 (1788), nom. illeg. non Hill (1756). – TYPE: *Pentaphyllum norvegicum* (L.) Gaertn. (= *Potentilla norvegica* L.).

Duchesnea Sm., Trans. Linn. Soc. London 10: 372 (1811). – *Potentilla* sect. *Duchesnea* (Sm.) Panigrahi & Dikshit, Bull. Bot. Surv. India 27: 181 (1985). – *Potentilla* subg. *Duchesnea* (Sm.) Shah & Wilcock, Edinburgh J. Bot. 50: 176 (1993). – TYPE: *Duchesnea fragiformis* Sm., nom. illeg. superfl. (= *Potentilla indica* (Andrews) Th.Wolf).

Fraga Lapeyr., Hist. Pl. Pyrénées 287 (1813). – TYPE: *Fraga sterilis* (L.) Lapeyr. (lectotype designated by Eriksson et al., Taxon 71: 497 (2022)) (= *Potentilla sterilis* (L.) Garcke).

Trichothalamus Spreng., Anleit. Kenntn. Gew., ed. 2, 2(2): 864 (1818). – *Potentilla* subg. *Trichothalamus* (Spreng.) Rchb., Consp. Regn. Veg. 167 (1828). – TYPE: *Trichothalamus caulescens* (L.) Spreng. (lectotype designated by Eriksson et al., Taxon 71: 497 (2022)) (= *Potentilla caulescens* L.).

Potentilla sect. *Fragariastrum* Ser. in DC., Prodr. 2: 583 (1825). – *Fragariastrum* (Ser.) Schur, Verh. Mitth. Siebenbürg. Vereins Naturwiss. Hermannstadt 4(Anhang): 23 (1853), nom. illeg. non Heist. ex Fabr. (1759). – TYPE: non designatus.

Horkelia Cham. & Schltdl., Linnaea 2: 26 (1827). – *Potentilla* sect. *Horkelia* (Cham. & Schltdl.) Baill., Hist. Pl. 1(6): 372 (1869). – *Potentilla* subg. *Horkelia* (Cham. & Schltdl.) Jeps., Man. Fl. Pl. Calif. 484 (1925). – TYPE: *Horkelia californica* Cham. & Schltdl. (= *Potentilla californica* (Cham. & Schltdl.) Greene).

Dryadanthe Endl., Gen. Pl. 1242 (1840). – TYPE: *Sibbaldia tetrandra* Bunge (= *Potentilla tetrandra* (Bunge) Hook.f.).

Potentillopsis Opiz, Lotos 7: 30 (1857). – TYPE: *Potentillopsis engelmanniana* Opiz, nom. illeg. superfl. (= *Potentilla pentandra* Engelm.).

Ivesia Torr. & A.Gray, Pacif. Railr. Rep. Williamson & Abbot, Bot. 6(3; 2): 72 (1858). – *Potentilla* sect. *Ivesia* (Torr. & A.Gray) Baill., Hist. Pl. 1(6): 372 (1869). – *Horkelia* subg. *Ivesia* (Torr. & A.Gray) Rydb., Mem. Dept. Bot. Columbia Coll. 2: 120 (1898). – *Potentilla* subg. *Ivesia* (Torr. & A.Gray) Jeps., Man. Fl. Pl. Calif. 484 (1925). – TYPE: *Ivesia gordonii* (Hook.) Torr. & A.Gray (lectotype designated by Rydberg, N. Amer. Fl. 22: 283 (1908)) (= *Potentilla gordonii* (Hook.) Greene).

Potentilla L. sect. *Stellariopsis* Baill., Hist. Pl. 1: 372 (1869). – *Stellariopsis* (Baill.) Rydb., Mem. Dept. Bot. Columbia Coll. 2: 19, 155 (1898). – *Ivesia* Torr. & A.Gray sect. *Stellariopsis* (Baill.) Ertter & Reveal, Novon 17(3): 317 (2007). – TYPE: *Stellariopsis santolinoides* (A.Gray) Rydb. (= *Potentilla santolinoides* (A.Gray) Greene).

Comarella Rydb., Mem. Dept. Bot. Columbia Coll. 2: 156 (1898). – TYPE: *Comarella multifoliolata* (Torr.) Rydb. (lectotype designated by Rydberg, N. Amer. Fl. 22: 283 (1908)) (= *Potentilla multifoliolata* (Torr.) Kearney & Peebles).

Horkelia subg. *Horkeliella* Rydb., Mem. Dept. Bot. Columbia Coll. 2: 120 (1898). – *Horkeliella* (Rydb.) Rydb. in Britton et al. (eds), N. Amer. Fl. 222: 282 (1908). – TYPE: *Horkeliella purpurascens* (S.Watson) Rydb. (= *Potentilla purpurascens* (S.Watson) Greene).

Purpusia Brandegee, Bot. Gaz. 27: 446 (1899). – *Potentilla* subg. *Purpusia* (Brandegee) J.T.Howell, Leafl. W. Bot. 4(6): 172 (1945). – TYPE: *Purpusia saxosa* Brandegee (= *Potentilla osterhoutii* var. *saxosa* (Brandegee) J.T.Howell).

Callionia Greene, Leafl. Bot. Observ. Crit. 1: 238 (1906). – TYPE: *Callionia canadensis* (L.) Greene, (lectotype designated by Rydberg, Bull. Torrey Bot. Club 37: 376 (1910)) (= *Potentilla canadensis* L.).

Tridophyllum Neck. ex Greene, Leafl. Bot. Observ. Crit. 1: 188 (1906). – TYPE: *Tridophyllum monspeliense* (L.) Neck. ex Greene (= *Potentilla monspeliensis* L.).

Notes. I follow Eriksson et al. (2022) in recognising an intermediate-sized *Potentilla*. The *Potentilla* tribe of the Rosaceae, the Potentilleae, has been considered to consist of anything from one all-inclusive genus (*Potentilla*) (Christenhusz & Väre, 2012) to more than 20 genera (Kechaykin & Shmakov, 2016). The classification of Eriksson et al. (2022) recognises 14 genera in the Potentilleae.

1.1 *Potentilla indica* (Andrews) Th.Wolf in Ascherson & Graebner, Syn. Mitteleur. Fl. 6(1): 661 (1904). – *Fragaria indica* Andrews, Bot. Repos. 7: t. 479 (1807). – *Duchesnea fragiformis* Sm., Trans. Linn. Soc. London 10: 373 (1811), nom. illeg. superfl. (often mis-cited as '*D. fragarioides*'). – *Duchesnea indica* (Andrews) Teschem., Hort. Reg. & Gard. Mag. 1(12): 460 (1835). – TYPE: [Published illustration] Andrews, Bot. Repos. 7: t. 479 (1807) (lectotype designated by Vidal, Fl. Cambodge, Laos, Vietnam 6: 114 (1968)).

Potentilla denticulosa Ser. in DC., Prodr. 2: 573 (1825). – TYPE: Napaul [Nepal], 1821, *N. Wallich s.n.* (lectotype G-DC [G00654149], designated by Dikshit & Panigrahi, Fam. Rosac. India 4: 133 (1998)).

Potentilla wallichiana Ser. in DC., Prodr. 2: 574 (1825). – *Fragaria indica* var. *wallichii* Franch. & Sav., Enum. Pl. Jap. 1: 129 (1873). – *Potentilla indica* var. *wallichii* (Franch. & Sav.) Th.Wolf, Biblioth. Bot. 16: 666 (1908). – TYPE: Napaul [Nepal], 1821, *N. Wallich s.n.* (lectotype G-DC [G00654148], designated by Dikshit & Panigrahi, Fam. Rosac. India 4: 133 (1998)).

Fragaria indica Roxb., Fl. Ind. 2: 520 (1832), nom. illeg. non Andrews (1807). – *Fragaria roxburghii* Wight & Arn. ex Voigt, Hort. Suburb. Calcut. 196 (1845). – TYPE: [Unpublished illustration] Icones Roxburghianae 1445 (lectotype K, designated here).

Fragaria malayana Roxb., Fl. Ind. 2: 520 (1832). – TYPE: Locality unknown, *W. Roxburgh s.n.* [EIC 1236E] (lectotype K-W [K001112470], designated here).

Fragaria nilagirica Zenker, Pl. Ind. 1: 7, t. IX (1835). – TYPE: [Published illustration] '*Fragaria nilagirica* Zenk.', Zenker, Pl. Ind. 1: t. IX (1835) (lectotype designated here).

Potentilla durandii Torr. & A.Gray, Fl. N. Amer. 1: 444 (1840). – TYPE: USA, Georgia, Savannah, *E. Durand s.n.* (lectotype PH [PH00021417], designated here).

Potentilla trifida Lehm., Neue Allg. Deutsche Garten- Blumenzeitung 7: 263 (1851). – TYPE: Cult. in Hamburg Botanic Garden (not traced).

Potentilla reptans var. *trifoliata* Hook.f., Fl. Brit. India 2: 356 (1878). – TYPE: Locality unknown, 6 May 1848, *T. Thomson s.n.* (lectotype K [K000762511], designated here).

Potentilla indica var. *serrulata* Th.Wolf, Biblioth. Bot. 16(71): 666 (1908). – TYPE: India, Assam, *W. Griffith s.n.* (lectotype DR [DR078147], designated here).

Duchesnea indica var. *major* Makino, Bot. Mag. (Tokyo) 28: 184 (1914). – *Duchesnea major* (Makino) Makino, J. Jap. Bot. 2(5): 19 (1921). – TYPE: non designatus.

Duchesnea indica var. *microphylla* T.T.Yu & T.C.Ku, Acta Phytotax. Sin. 18: 500 (1980). – *Potentilla indica* var. *microphylla* (T.T.Yu & T.C.Ku) H.Ohashi, J. Jap. Bot. 83: 60 (2008). – TYPE: China, Xizang, Bomi Xian, 2 May 1965, *T.S. Ying & D.Y. Hong 650023* (lectotype PE [PE00934254], designated here; isolectotypes PE [PE00934255, PE00934256]).

Notes. Potentilla indica has occasionally been found growing wild in Singapore. It is sometimes cultivated, particularly in hanging baskets, for its yellow flowers and bright red fruits reminiscent of miniature strawberries. The fruits are edible but tasteless. Plants with white fruits (*Potentilla indica* forma *albocaput* (Naruh.) H.Ohashi) are known, but have not been recorded from Singapore.

2. *Prunus* L., Sp. Pl. 473 (1753). – TYPE: *Prunus domestica* L. (lectotype designated by Britton & Brown, Ill. Fl. N. U.S., ed. 2, 2: 322 (1913)).

Amygdalus L., Sp. Pl. 472 (1753). – *Prunus* sect. *Amygdalus* (L.) Benth. & Hook.f., Gen. Pl. 1: 610 (1865). – *Prunus* subg. *Amygdalus* (L.) Focke in Engler & Prantl, Pflanzenfam. 3(3): 53 (1891). – TYPE: *Amygdalus communis* L. (lectotype designated by Green in Sprague et al., Nom. Prop. Brit. Bot. 158 (1929)) (= *Prunus amygdalus* Batsch).

Armeniaca Scop., Meth. Pl. 15 (1754). – *Prunus* sect. *Armeniaca* (Scop.) Koch, Syn. Fl. Germ. Helv. 1: 205 (1837). – *Prunus* subg. *Armeniaca* (Scop.) Peterm., Deutschl. Fl. 159 (1846). – *Prunus* subg. *Armeniaca* (Scop.) Nakai, Fl. Silv. Kor. 5: 38 (1915). – TYPE: *Armeniaca vulgaris* Lam. (lectotype designated by Greuter et al., Regnum Veg. 129: 83 (1993)) (= *Prunus armeniaca* L.).

Cerasus Mill., Gard. Dict. Abr. ed. 4., 1: [unpaginated] (1754). – *Prunus* sect. *Cerasus* (Mill.) Ser. in DC., Prodr. 2: 535 (1825). – *Prunus* subg. *Cerasus* (Mill.) Peterm., Deutschl. Fl. 159 (1846). – TYPE: *Cerasus vulgaris* Mill. (lectotype designated by Greuter et al., Regnum Veg. 129: 201 (1993)) (= *Prunus cerasus* L.).

Padus Mill., Gard. Dict. Abr. ed. 4, 3: [unpaginated] (1754). – *Cerasus* sect. *Padus* (Mill.) Torr. & A.Gray, Fl. N. Amer. 1: 410 (1840). – *Prunus* subg. *Padus* (Mill.) Peterm., Deutschl. Fl. 159 (1846). – *Prunus* sect. *Padus* (Mill.) Ledeb., Fl. Ross. 2: 8 (1844). – TYPE: *Padus avium* Mill. (lectotype designated by Britton & Brown, Ill. Fl. N. U.S., ed. 2, 2: 328 (1913)) (= *Prunus padus* L.).

Persica Mill., Gard. Dict. Abr. ed. 4, 3: [unpaginated] (1754). – *Amygdalus* subg. *Persica* (Mill.) Pers., Syn. Pl. 2: 33 (1806). – *Prunus* sect. *Persica* (Mill.) Nakai, Fl. Sylv. Kor. 5: 32 (1916). – TYPE: *Prunus persica* (L.) Batsch (lectotype designated here).

Lauro-cerasus Duhamel, Traité Arbr. Arbust. 1: 345 (1755). – *Cerasus* sect. *Lauro-cerasus* (Duhamel) G.Don, Gen. Hist. 2: 514 (1832). – *Cerasus* subg. *Lauro-cerasus* (Duhamel) Rchb., Nomencl. 177 (1841). – *Prunus* sect. *Lauro-cerasus* (Duhamel) Miq., Fl. Ned. Ind. 1(1): 365 (1855). – *Prunus* subsect. *Lauro-cerasus* (Duhamel) Koehne, Verh. Bot. Vereins Prov. Brandenburg 52: 107 (1911). – *Prunus* subg. *Lauro-cerasus* (Duhamel) Rehder, Man. Cult. Trees & Shrubs 478 (1927). – TYPE: *Prunus laurocerasus* L. (lectotype designated by Kalkman, Blumea 13: 25 (1965)).

Pygeum Gaertn., Fruct. Sem. Pl. 1: 218 (1788). – TYPE: *Pygeum zeylanicum* Gaertn. (= *Prunus ceylanica* (Wight) Miq.).

Chimanthus Raf., Fl. Ludov. 26 (1817). – TYPE: *Chimanthus amygdalinus* Raf. (= *Prunus caroliniana* (Mill.) Aiton).

Polydontia Blume, Bijdr. Fl. Ned. Ind. 1104 (1826). – *Polystorthia* Blume, Fl. Javae, Praef.: viii (1828), nom. illeg. superfl. – TYPE: *Polydontia arborea* Blume (= *Prunus arborea* (Blume) Kalkman).

Ceraseidos Siebold & Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3(3): 743 (1843). – TYPE: *Ceraseidos apetala* Siebold et Zucc. (= *Prunus apetala* (Siebold & Zucc.) Franch. & Sav.).

Amygdalopsis M.Roem., Fam. Nat. Syn. Monogr. 3: 15 (1847). – TYPE: non designatus.

Microcerasus Webb & Berthel., Hist. Nat. Iles Canaries 3(2, 2): 19 (1842). – *Cerasus* subg. *Microcerasus* (Webb & Berthel.) Spach, Ann. Sci. Nat. sér. 2, 19: 125 (1843). – *Prunus* sect. *Microcerasus* (Webb & Berthel.) Boiss., Fl. Orient. 2: 646 (1872). – *Prunus* subg. *Microcerasus* (Webb & Berthel.) Focke in Engler & Prantl, Pflanzenfam. 3(3): 54 (1891). – TYPE: *Microcerasus prostrata* (Labill.) M.Roem. (lectotype designated by Pfeiffer, Nom. 2: 303 (1873)) (= *Prunus prostrata* Labill.).

Emplectocladus Torr., Proc. Amer. Assoc. Advancem. Sci. 4: 192 (1851). – *Prunus* sect. *Emplectocladus* (Torr.) A.Gray, Proc. Amer. Acad. Arts 10: 70 (1874). – TYPE: *Emplectocladus fasciculatus* Torr. (= *Prunus fasciculata* (Torr.) A.Gray).

Germaria C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 221 (1851), nom. illeg. non C.Presl (1838) [fossil]. – TYPE: *Germaria latifolia* C.Presl (= *Prunus grisea* (Blume ex Müll.Berol.) Kalkman).

Maddenia Hook.f. & Thomson, Hooker's J. Bot. Kew Gard. Misc. 6: 381 (1854). – TYPE: *Maddenia himalaica* Hook.f. & Thomson (= *Prunus himalayana* J.Wen).

Tubopadus Pomel, Matér. Fl. Atlantique 8 (1860). – TYPE: *Tubopadus prostratus* (Labill.) Pomel (= *Prunus prostrata* Labill.).

Digaster Miq., Fl. Ned. Ind., Eerste Bijv. 329 (1861). – TYPE: *Digaster sumatranus* Miq. (= *Prunus arborea* (Blume) Kalkman).

Amygdalopsis Carrière, Rev. Hort. [Paris] 1862: 91 (1862), nom. illeg. non M.Roem. (1847). – *Louiseania* Carrière, Rev. Hort. [Paris] 44: 34 (1872). – *Prunopsis* André, Rev. Hort. 55: 369 (1883), nom. illeg. superfl. – TYPE: *Amygdalopsis lindleyi* Carrière, nom. illeg. superfl. (= *Prunus triloba* Lindl.).

Aflatunia Vassilcz., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 17: 261 (1955). – TYPE: *Aflatunia ulmifolia* (Franch.) Vassilcz. (= *Prunus ulmifolia* Franch.).

Padellus Vassilcz., Novosti Sist. Vyssh. Rast. 10: 185 (1973). – TYPE: *Padellus mahaleb* (L.) Vassilcz. (= *Prunus mahaleb* L.).

Notes. The circumscription of the genus *Prunus* has varied considerably over the years. There has been a persistent tendency to split the group so that each of the economically important plants has its own genus (almond = *Amygdalus*, apricot = *Armeniaca*, cherry = *Cerasus*, peach = *Persica* etc.) (Walters, 1986). Molecular approaches have confirmed that *Prunus* sensu lato is monophyletic (Bortiri et al., 2001; Shi et al., 2013; Hodel et al., 2021). Various clades are supported within *Prunus*, but the lack of a full resolution and a sound morphological basis has led some recent treatments to avoid infrageneric taxa altogether (Rohrer, 2014).

The Singapore species were formerly considered to belong in the genus *Pygeum*. Kalkman (1965) reduced *Pygeum* to *Prunus* subg. *Lauro-cerasus*. This treatment for the Singapore species follows that of Kalkman. It should be noted that Zhao et al. (2018) found evidence from molecular analyses of cryptic species within both *Prunus arborea* and *P. grisea*. A full revision of this group is beyond the scope of the current work.

2.1 *Prunus arborea* (Blume) Kalkman, Blumea 13: 90 (1965). – *Polydontia arborea* Blume, Bijdr. Fl. Ned. Ind. 1105 (1826). – *Polystorthia arboreum* (Blume) Hassk., Tijdschr. Natuurl. Gesch. Physiol. 11: 226 (1844). – *Pygeum arboreum* (Blume) Endl. ex Müll.Berol. in Walpers, Ann. Bot. Syst. 4: 642 (1858). – *Pygeum blumei* Teijsm. & Binn., Cat. Hort. Bot. Bogor. 252 (1866), nom. illeg. superfl. – TYPE: Java, Salak, *C.L. Blume 654* (lectotype L [L0019541], designated by Kalkman, Blumea 13: 93 (1965)).

Pygeum parviflorum Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 2: 309 (1851). – TYPE: Java, *J.E. Teijsmann & S. Binnendijk s.n.* (lectotype L [L0019540], designated by Kalkman, Blumea 13(1): 93 (1965)).

Digaster sumatranus Miq., Fl. Ned. Ind., Eerste Bijv. (2): 330 (1861). – *Pygeum sumatranum* (Miq.) Miq., Fl. Ned. Ind., Eerste Bijv. (3): 618 (1861). – TYPE: Sumatra, Palembang, Keboer Lahat, *J.E. Teijsmann H.B. 3968* (lectotype U [U0005868], designated by Kalkman, Blumea 13(1): 93 (1965); isolectotypes A, GH [GH00026463], BO, CAL, L [L0019536]).

Pygeum persimile Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 306 (1872). – TYPE: Malacca, *W. Griffith s.n.* (lectotype CAL [CAL0000011599], designated by Kalkman, Blumea 13(1): 93 (1965)).

Pygeum intermedium King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 288 (1897). – TYPE: Perak, Larut, January 1883, *King's Collector 3791* (lectotype CAL [CAL0000011601], designated by Kalkman, Blumea 13(1): 95 (1965); isolectotypes BM [BM000622071], K [K000737286, K000737287], SING [SING0068704]).

Pygeum parviflorum var. *lanceolatum* Koord. & Valeton, Bijdr. Boomsoort. Java 5: 355 (1900). – TYPE: Java, Gunong Slamat, *S.H. Koorders 6417β* (not traced).

Pygeum blumei var. *amplificatum* Koehne, Bot. Jahrb. Syst. 51: 201 (1913). – TYPE: Locality unknown, *C.L. Blume 654* (lectotype L [L0019542 p.p.], designated here including only the upper shoot with Koehne's label annotated 'sic ramus = var. *amplificatum* Koehne E.K.').

Pygeum floribundum Koehne, Bot. Jahrb. Syst. 51: 190 (1913). – TYPE: Malaya, *A.C. Maingay s.n.* [Kew distribution no. 626] (lectotype L [L0019534], designated by Kalkman, Blumea 13(1): 95 (1965); possible isolectotypes A, BM, CAL, K).

Pygeum junghuhnii Koehne, Bot. Jahrb. Syst. 51: 193 (1913). – TYPE: Sumatra, Hochankola, *F.W. Junghuhn s.n.* (lectotype L [L0019537], designated by Kalkman, Blumea 13(1): 95 (1965)).

Pygeum merrillianum Koehne, Bot. Jahrb. Syst. 51: 206 (1913). – TYPE: Philippines, Mindoro, March–April 1907, *M.L. Merritt FB 6784* (lectotype US [US00623899], designated by Kalkman, Blumea 13(1): 95 (1965)).

Pygeum sericeum var. *denudatum* Koehne, Bot. Jahrb. Syst. 51: 189, 191 (1913). – TYPE: Sumatra, Mt Singalan, June–July 1878, *O. Beccari P.S. 358* (lectotype L [L0019538], designated by Kalkman, Blumea 13(1): 95 (1965); isolectotypes BM [BM000622069], FI-B, K [K000737319]).

Pygeum diospyrophyllum Koehne, Bot. Jahrb. Syst. 52: 343 (1915). – TYPE: Deutsch-Neuguinea [Papua New Guinea], Sepikgebiet, Station Etappenberg, 30 October 1912, *C.L. Ledermann 9569* (lectotype L [L0019543], designated by Kalkman, Blumea 13(1): 95 (1965); isolectotype K [K000737358]).

Pygeum euphlebium Merr., Philipp. J. Sci., C 10: 311 (1915). – TYPE: Philippines, Mindanao, District of Lanao, May 1913, *D. Miranda F.B. 20619* (lectotype US [US00107910], designated by Kalkman, Blumea 13(1): 95 (1965)).

Pygeum pilinospermum Koehne, Bot. Jahrb. Syst. 52: 342 (1915). – TYPE: Kaiser Wilhelmsland [Papua New Guinea], Sepik, *C.L. Ledermann 6718* (lectotype K [K000737357], designated by Kalkman, Blumea 13(1): 95 (1965); isolectotypes E [E00010523], SING [SING0068724]).

Parinari euadenia Kosterm., Bot. Tidsskr. 67: 321, f. 3 (1973). – TYPE: Thailand, Chiengmai, Doi Sutep, 15 October 1958, *T. Sørensen et al. 5687* (holotype C [C10017914]).

2.1.1 ***Prunus arborea*** var. ***arborea***

Notes. Kalkman (1993) recognised six varieties within *Prunus arborea*. Two of these are recorded from Singapore. The two varieties native to Singapore, *Prunus arborea* var. *arborea* and var. *stipulacea*, are readily distinguished and might warrant recognition at the rank of species. However, confirming this would really require a full revision of the '*Prunus arborea* complex' and similar species, beyond the scope of the current work. As Kalkman's treatment has been followed in all the recent works on the Singapore flora, it seems best to continue following it until a new revision of Southeast Asian *Prunus* is available.

2.1.2 *Prunus arborea* var. ***stipulacea*** (King) Kalkman, Blumea 13: 98 (1965). – *Pygeum stipulaceum* King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 287 (1897). – TYPE: Perak, Ulu Bubong, September 1886, *King's Collector 11020* (lectotype K [K000737262], designated by Kalkman, Blumea 13(1): 98 (1965); isolectotype CAL [CAL0000010073]).

Pygeum ellipticum Merr., J. Straits Branch Roy. Asiat. Soc. 76: 83 (1917). – TYPE: Malaysia, Sarawak, Mt Pueh, *Jee Koo s.n.* (holotype PNH destroyed).

Pygeum pachyphyllum Merr., J. Straits Branch Roy. Asiat. Soc. 76: 82 (1917). – TYPE: British North Borneo, Mount Bungal, 9–10 September 1915, *M.S. Clemens 11200* (lectotype A [A00032463], designated by Kalkman, Blumea 13(1): 98 (1965); isolectotypes BO, US [US00107920]).

2.2 *Prunus grisea* (Blume) Kalkman, Blumea 13: 56 (1965). – *Pygeum griseum* Blume, Mélanges Bot. 2: 11 (1855). – TYPE: Java, *H. Kuhl & J.C. van Hasselt s.n.* (lectotype L [L0019599], designated by Kalkman, Blumea 13(1): 58 (1965)).

2.2.1 *Prunus grisea* var. ***tomentosa*** (Koord. & Valeton) Kalkman, Blumea 13: 60 (1965). – *Pygeum latifolium* var. *tomentosum* Koord. & Valeton, Meded. Lands Plantentuin 33: 358 (1900), as '*tomentosa*'. – *Pygeum latifolium* f. *tomentosum* Koord. & Valeton, Meded. Lands Plantentuin 33: 360 (1900), as '*tomentosa*'. – *Pygeum koordersianum* Koehne, Bot. Jahrb. Syst. 51: 194 (1913). – TYPE: Java, *S.H. Koorders 22255β* (lectotype BO [BO-1898027], designated by Kalkman, Blumea 13(1): 61 (1965); isolectotypes CAL [CAL0000011635], K [K000737313], L [L0019631], WAG [WAG0002935]).

Pygeum maingayi Hook.f., Fl. Brit. India 2: 319 (1878). – *Pygeum lanceolatum* var. *maingayi* (Hook.f.) Ridl., Fl. Malay Penins. 1: 674 (1922). – TYPE: Malacca, 9 October 1867 or 1868, *A.C. Maingay s.n.* [Kew distribution no. 625] (lectotype K [K000737271], designated by Kalkman, Blumea 13(1): 61 (1965); isolectotypes CAL [CAL0000011644], L [L0019630]).

Pygeum hookerianum King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66: 293 (1897). – TYPE: Perak, plains Laroot, April 1890, *L. Wray 3969* (lectotype CAL [CAL0000011636], first step designated by Kalkman, Blumea 13(1): 61 (1965), second step designated here; isolectotypes BM [BM000622049], CAL [CAL0000011637], K [K000737276], SING [SING0068705, SING0068706]).

Pygeum latifolium f. *lanceolatum* Koord. & Valeton, Meded. Lands Plantentuin 33: 359 (1900). – TYPE: not traced.

Pygeum membranaceum Koehne, Bot. Jahrb. Syst. 51: 195 (1913). – TYPE: Java, *F.W. Junghuhn pl. ined. 311* (lectotype L [L0019632], designated by Kalkman, Blumea 13(1): 61 (1965)).

Pygeum microphyllum Elmer, Leafl. Philipp. Bot. 5: 1626 (1913). – TYPE: Philippines, Palawan, Puerto Princesa (Mount Pulgar), May 1911, *A.D.E. Elmer 13198* (lectotype BM [BM000622051], designated here; isolectotypes BO, E [E00010511], F [F0068347F], HBG [HBG511159], L [L0019638], MO [MO-255107], NY [NY00415885]).

Pygeum velutinosum Ridl., Fl. Malay Penins. 5: 306 (1925). – TYPE: Peninsular Malaysia, Pahang, gorge of S. Tras near Raub, 12 November 1924, *I.H. Burkill & Haniff SFN 16947* (lectotype K [K000737278], designated by Kalkman, Blumea 13(1): 61 (1965); isolectotypes BO, KEP, SING [SING0068735]).

Pygeum kingianum Craib, Bull. Misc. Inform. Kew 1930: 161 (1930). – TYPE: Thailand, Pang-nga, Kao Bangto, 21 February 1929, *A.F.G. Kerr 17167* (lectotype K [K000737334], designated by Kalkman, Blumea 13(1): 61 (1965); isolectotypes BM [BM000622037], SING [SING0096237], TCD [TCD0016633]).

Pygeum havilandii Ridl., Bull. Misc. Inform. Kew 1938: 281 (1938). – TYPE: Sarawak, near Kuching, 30 December 1892, *G.D. Haviland 2063* (lectotype K [K000737316], designated by Kalkman, Blumea 13(1): 61 (1965); isolectotypes A [A00032462], L [L0019636], SAR, SING [SING0068707, SING0068708]).

Pygeum hookerianum var. *borneense* Ridl., Bull. Misc. Inform. Kew 1938: 281 (1938). – TYPE: Sarawak, Baram District, Long Lama, October 1894, *C. Hose 186* (lectotype K [K000737314, K000737315 – a single specimen over two sheets], designated by Kalkman, Blumea 13(1): 61 (1965); isolectotypes BM [BM000622048], P [P01819072]).

Pygeum apiculatum J.E.Vidal, Notul. Syst. (Paris) 13: 294 (1949 [‘1948’]). – TYPE: Vietnam, Annam, Ba Na près Tourane, 14 July 1923, *E. Poilane 7152* (lectotype P [P01819074], first step designated by Kalkman, Blumea 13(1): 61 (1965), second step designated here; isolectotypes P [P01819073, P01819075]).

Pygeum longistylum J.E.Vidal, Notul. Syst. (Paris) 13: 295 (1949 [‘1948’]). – TYPE: Vietnam, Annam, prov. Qui Nhón, Col de Mangiang, 22 August 1930, *E. Poilane 18062* (lectotype P [P01819076], designated here; isolectotype P [P01819077]).

Notes. Kalkman (1965, 1993) recognised three varieties of *Prunus grisea*. Only *Prunus grisea* var. *tomentosa* occurs in Singapore and Peninsular Malaysia.

2.3 *Prunus polystachya* (Hook.f.) Kalkman, Blumea 13(1): 88 (1965). – *Pygeum polystachyum* Hook.f., Fl. Brit. India 2: 320 (1878). – TYPE: Malacca, 17 April 1867, *A.C. Maingay 2405* [Kew distribution no. 627] (lectotype K [K000737263, K000737264 – a single specimen over two sheets], designated by Kalkman, Blumea 13(1): 88 (1965); isolectotypes CAL [CAL0000011634], L [L0019678]). (Fig. 1)

Pygeum myriandrum Merr., Pap. Michigan Acad. Sci. 19: 155 (1934 [‘1933’]). – TYPE: Sumatra, Koealoe, Loendoet Concession, near Aek Kanopan,12 March 1927, *H.H. Bartlett 6871* (holotype US [US00107919]; isotypes G [G00437122], K [K000737306], L [L0019679], MICH [MICH1111291], MIN [MIN1002839], NY [NY00415886]).

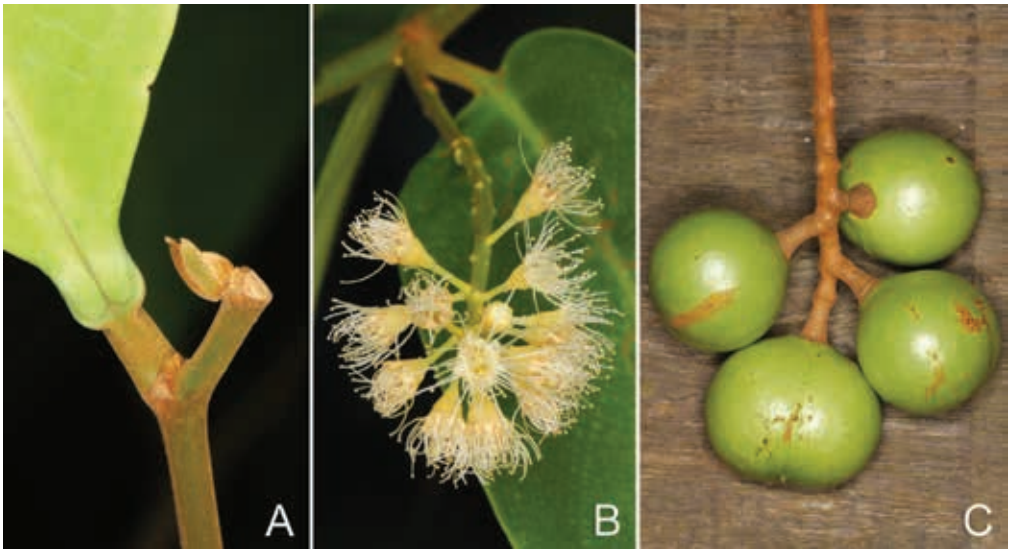

Fig. 1. *Prunus polystachya* (Hook.f.) Kalkman. **A.** Paired glands at leaf base. **B.** Inflorescence. **C.** Fruits. From MacRitchie, Singapore. (Photos: W.F. Ang)

3. *Rubus* L., Sp. Pl. 492 (1753). – TYPE: *Rubus fruticosus* L. (typ. cons.).

Dalibarda L., Sp. Pl. 491 (1753). – *Rubus* sect. *Dalibarda* (L.) Focke, Abh. Naturwiss. Vereine Bremen 4: 143, 145 (1874). – *Rubus* subg. *Dalibarda* (L.) Focke, Biblioth. Bot. 17(72(1)): 12, 13 (1910). – TYPE: *Dalibarda repens* L. (= *Rubus repens* (L.) Kuntze, nom. cons. prop.).

Chamaemorus Hill, Brit. Herb. 331 (1756). – *Bossekia* Raf., Autik. Bot. 175 (1840), nom. illeg. superfl. – *Rubus* subg. *Chamaerubus* Kuntze, Reform Deut. Brombeer. 45, 114 (1867). – *Rubus* sect. *Chamaemorus* (Hill) Focke, Abhandl. Naturw. Ver. Bremen 4: 142, 146 (1874). – *Rubus* subg. *Chamaemorus* (Hill.) Focke, Syn. Rub. Germ. 93 (1877), nom. illeg. superfl. – TYPE: *Rubus chamaemorus* L. (lectotype designated by Pfeiffer, Nom. 1: 693 (1873)).

Cylactis Raf., Amer. J. Sci. (New York) 1: 377 (1819). – TYPE: *Cylactis montana* Raf., nom. illeg. superfl. (= *Rubus pubescens* Raf.).

Ametron Raf., Sylva Tellur. 160 (1838). – TYPE: non designatus.

Ampomele Raf., Sylva Tellur. 160 (1838). – TYPE: *Ampomele triphylla* (Thunb.) Raf., as '*triphyla*' (= *Rubus triphyllus* Thunb.).

Cumbata Raf., Sylva Tellur. 160 (1838). – TYPE: non designatus.

Dyctisperma Raf., Sylva Tellur. 159 (1838). – TYPE: non designatus.

Manteia Raf., Sylva Tellur. 161 (1838). – TYPE: non designatus.

Selnorition Raf., Sylva Tellur. 160 (1838). – TYPE: non designatus.

Oreobatus Rydb., Bull. Torrey Bot. Club 30: 274 (1903). – TYPE: *Oreobatus deliciosus* (Torr.) Rydb. (= *Rubus deliciosus* Torr.).

Rubacer Rydb., Bull. Torrey Bot. Club 30: 274 (1903). – *Bossekia* Neck. ex Greene, Leafl. Bot. Observ. Crit. 1: 210 (1906), nom. illeg. superfl., non *Bossekia* Raf. (1840). – TYPE: *Rubacer odoratum* (L.) Rydb. (= *Rubus odoratus* L.).

Batidaea Greene, Leafl. Bot. Observ. Crit. 1: 238 (1906). – *Rubus* sect. *Batidea* Dumort., Fl. Belg. 94 (1837), nom. illeg. superfl. – TYPE: *Rubus idaeus* L.

Calyctenium Greene, Leafl. Bot. Observ. Crit. 1: 246 (1906). – TYPE: *Calyctenium pectinellum* (Maxim.) Greene (= *Rubus pectinellus* Maxim.).

Cardiobatus Greene, Leafl. Bot. Observ. Crit. 1: 244 (1906). – TYPE: *Cardiobatus nivalis* (Douglas ex Hook.) Greene (= *Rubus nivalis* Douglas ex Hook.).

Chamaemorus Greene, Leafl. Bot. Observ. Crit. 1: 245 (1906), nom. illeg. non Hill. (1756). – TYPE: *Chamaemorus anglica* Greene (lectotype designated here) (= *Rubus chamaemorus* L.).

Comarobatia Greene, Leafl. Bot. Observ. Crit. 1: 245 (1906). – TYPE: *Comarobatia lasiococca* (A.Gray) Greene (= *Rubus lasiococcus* A.Gray).

Glaucobatus (Dumort.) Greene, Leafl. Bot. Observ. Crit. 1: 243 (1906). – *Rubus* sect. *Glaucobatus* Dumort., Bull. Soc. Roy. Bot. Belgique 2: 220 (1864). – *Rubus* subg. *Glaucobatus* (Dumort.) Sabransky, Verh. Vereins Natur-Heilk. Pressburg 7: 4 (1890). – TYPE: non designatus.

Melanobatus Greene, Leafl. Bot. Observ. Crit. 1: 243 (1906). – *Rubus* subg. *Melanobatus* (Greene) House, New York State Mus. Bull. 254: 400 (1924). – TYPE: *Melanobatus occidentalis* (L.) Greene (lectotype designated by Huang et al., Taxon 72: 300 (2023)) (= *Rubus occidentalis* L.).

Parmena Greene, Leafl. Bot. Observ. Crit. 1: 244 (1906). – TYPE: *Rubus spectabilis* Pursh. (lectotype designated by Rydberg, Bull. Torrey Bot. Club 42: 122 (1915)).

Psychrobatia Greene, Leafl. Bot. Observ. Crit. 1: 245 (1906). – TYPE: *Psychrobatia pedata* (Sm.) Greene (= *Rubus pedatus* Sm.).

Rubus sect. *Idaeobatus* Focke, Abh. Naturwiss. Vereine Bremen 4: 143 (1874). – *Idaeobatus* (Focke) Börner, Fl. Deut. Volk 329 (1912), nom. illeg. superfl. – *Rubus* subg. *Idaeobatus* (Focke) Focke, Syn. Ruborum German. 97 (1877). – TYPE: *Idaeobatus idaeus* (L.) Börner (= *Rubus idaeus* L.).

Notes. Huang et al. (2023) provide an updated infrageneric classification of *Rubus* recognising 10 subgenera.

3.1 *Rubus moluccanus* L., Sp. Pl. 1197 (1753). – TYPE: [Published illustration] '*Rubus moluccus latifolius*', Rumphius, Herb. Amboin. 5: t. 47, f. 2 (1747) (lectotype designated by Tirvengadum, Rev. Handb. Fl. Ceylon 3: 353 (1981)).

Rubus moluccanus var. *obsoletus* C.Presl, Abh. Königl. Böhm. Ges. Wiss., ser. 5, 6: 197 (1851). – TYPE: Philippines, Luzon, *T.P.X. Haenke s.n.* (lectotype PR [PR989979], designated here).

Rubus acerifolius Wall. ex Kuntze, Meth. Sp.-Beschr. Rubus 61 (1879). – *Rubus moluccanus* var. *acerifolius* (Wall. ex Kuntze) Kuntze, Revis. Gen. Pl. 1: 222 (1891). – TYPE: Peninsular Malaysia, Penang, *G. Porter s.n.* [EIC 744] (lectotype K-W [K001111761], designated here; isolectotypes K, K-W, M [2 sheets], NY).

Rubus chartaceus Kuntze, Meth. Sp.-Beschr. Rubus 61 (1879), nom. illeg. non Foerster (1878). – *Rubus moluccanus* var. *chartaceus* Kuntze, Revis. Gen. Pl. 1: 222 (1891). – TYPE: Java, Kuripan, 15 February 1875, *O. Kuntze 4353* (lectotype NY [NY00429669], designated here; isolectotype NY [NY00429668]).

Rubus fontinalis Kuntze, Meth. Sp.-Beschr. Rubus 60 (1879). – *Rubus moluccanus* var. *fontinalis* (Kuntze) Kuntze, Revis. Gen. Pl. 1: 222 (1891). – TYPE: Java, Sindanglaia, 1875, *O. Kuntze s.n.* (lectotype NY [NY00429799], designated by Kalkman, Blumea 29: 346 (1984)).

Rubus reinwardtii Kuntze, Meth. Sp.-Beschr. Rubus 56 (1879). – *Rubus moluccanus* var. *reinwardtii* (Kuntze) Kuntze, Revis. Gen. Pl. 1: 222 (1891). – TYPE: not traced.

Rubus glomeratus var. *albulus* Focke, Bibl. Bot. 17(72): 91 (1910). – TYPE: Amboina, *J.G. Boerlage* (syntype); Sulawesi, Minahassa, *S.H. Koorders 28639* (syntype BO n.v.).

Rubus hallieri Focke, Bibl. Bot. 17(72): 94 (1910). – TYPE: Borneo, inter Sanggouw et Semedoem, *H. Hallier 750* (lectotype BO [BO-1314169], designated here; isolectotype BO [BO-1290637]).

Rubus vidalii Focke, Bibl. Bot. 17(72): 98, f. 40 (1910). – TYPE: Philippines, Luzon, Prov. Tayabas, *H. Cuming 750* (lectotype G [G00437148], designated here; isolectotypes BM [BM000622327], K [K000762010, K000762011], L [L0019814, L0019815], NY [NY00429834], P [P00682409]).

Rubus moluccanus var. *austropacificus* P.Royen, Phanerog. Monogr. 2: 113, f. 30 (1969), as '*austropacifica*'. – TYPE: Papua New Guinea, Bougainville, Tuareruku village west of Toiumonapu Plantation, 4 July 1963, *P. van Royen NGF 16444* (holotype L n.v.; isotypes BRI [BRI-AQ0317706], CANB [CANB151748], K [K000762039], SING [SING0068736]).

Notes. A more extensive synonymy for *Rubus moluccanus* is presented by Kalkman (1984). Kuntze (1891) reduced many other species, particularly from the Indian Subcontinent, to varieties of *R. moluccanus*, but these were largely excluded from the species by Kalkman (1984). Bean (1995) has added a few more names from Australia to the synonymy, but these have not been included here as their status has been difficult to check.

Kalkman's varieties seem quite finely drawn, certainly in comparison with the *Prunus* varieties recognised for Singapore. Perhaps this reflects the traditional narrow circumscription of taxa in *Rubus*. Nevertheless, Kalkman's infraspecific classification of *Rubus moluccanus* has been followed by all recent publications on the flora of Singapore, so it is maintained here. Kalkman (1984) considered *Rubus moluccanus* to be represented by four varieties in Malesia, two of which are recorded from Singapore.

3.1.1 ***Rubus moluccanus*** var. ***moluccanus***

Notes. Rubus moluccanus var. *moluccanus* has not been collected in Singapore for over a century.

3.1.2 *Rubus moluccanus* var. ***angulosus*** Kalkman, Blumea 29: 364 (1984). – *Rubus angulosus* Focke, Bibl. Bot. 17(72): 90, f. 35 (1910), nom. illeg. non Gremli (1871). – TYPE: Banka, *J. Amand & S. Kurz s.n*. (lectotype L [L0019808], designated by Kalkman, Blumea 29: 364 (1984); isolectotype U [U0226247]). (Fig. 2)

Notes. Rubus moluccanus var. *angulosus* can still be found at the margins of disturbed forest in Singapore.

Discussion

On the global scale the Rosaceae are a large and important family. In Singapore three genera are native or naturalised, with five species, two of which are represented

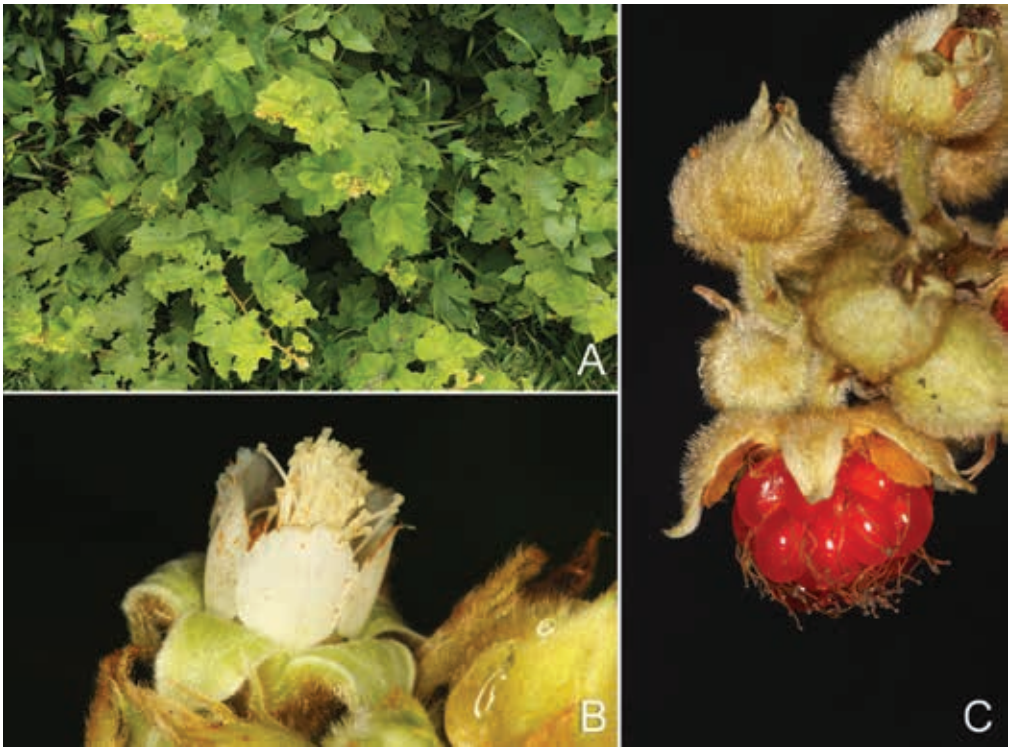

Fig. 2. *Rubus moluccanus* L. var. *angulosus* Kalkman. **A.** Habit. **B.** Flower. **C.** Fruit. A from Mount Faber; B, C from Nee Soon. (Photos: W.F. Ang)

by two varieties each. The Rosaceae are considerably less noteworthy, in terms of contribution to plant diversity or ecological importance, in Singapore than many other places. The regional taxonomic classification of the family was consolidated in the *Flora Malesiana* treatment by Kalkman (1993). There is evidence that this system may require further adjustment, particularly in the treatment of *Prunus* (Zhao et al., 2018). Hopefully, further morphological and molecular studies will establish an improved classification of Rosaceae in the Malesian region and Singapore.

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